local environment agency plan

NORTH CORNWALL

CONSULTATION REPORT

DECEMBER 1997

ENVIRONMENT AGENCY

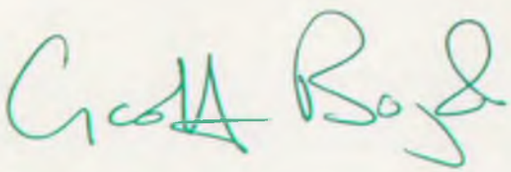
YOUR VIEWS

This Consultation Report is our initial view of the issues facing the catchment. Public consultation allows people who live in or use the catchment to have a say in the development of our plans and work programmes. We welcome your ideas on the future management of this catchment:

- Have we identified all the issues?
- Have we identified all the options for solutions?
- Have you any comments on the issues and options listed?
- Do you have any other information or views that you wish to bring to our attention?

This is your opportunity to influence our future plans.

We look forward to hearing from you.



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Please send your comments by 9 March 1998, preferably by writing to:

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Vision

The North Cornwall Catchment is an area of great diversity and outstanding beauty.

Our vision is of this area being managed in a sustainable way, that balances the needs of all users with the needs of the environment.

We look forward to a future where a healthy local economy leads to:

- biodiversity and physical habitat for wildlife being enhanced
- peoples enjoyment and appreciation of the environment continuing to grow
- pressures from human wants being satisfied sustainably

We cannot realise this vision on its own and will seek to work in partnership with local authorities, local industry and local people to turn this vision into reality.

CONTENTS

Part 1

INTRODUCTION

The Environment Agency

Who are we?

The Environment Agency is a non-departmental public body established by the Environment Act 1995 and formed on 1 April 1996. We are sponsored by the Department of the Environment with policy links to the Welsh Office and the Ministry of Agriculture, Fisheries and Food.

We have taken over the functions of our predecessors: the National Rivers Authority, Her Majesty's Inspectorate of Pollution (HMIP), the Waste Regulation Authorities (WRAs) and some parts of the Department of the Environment (DoE).

We provide a comprehensive approach to the protection of the environment by combining the regulation of air, land and water into a single organisation. We cannot work in isolation, but seek to educate and influence individuals, groups and industries to promote best environmental practice, and develop a wider public awareness of environmental issues.

Our Vision is:

- a better environment in England and Wales for present and future generations

We will:

- protect and improve the environment as a whole by effective regulation, by our own actions and by working with and influencing others
- operate and consult widely
- value our employees
- be efficient and businesslike in everything we do

Our Aims are:

- to achieve significant and continuous improvement in the quality of air, land and water, actively encouraging the conservation of natural resources, flora and fauna
- to maximise the benefits of integrated pollution control and integrated river basin management
- to provide effective defence and timely warning systems for people and property against flooding from rivers and the sea

- to achieve significant reductions in waste through minimisation, re-use and recycling and to improve standards of disposal
- to manage water resources to achieve the proper balance between the needs of the environment and those of abstractors and other water users
- to secure, with others, the remediation of contaminated land
- to improve and develop salmon and freshwater fisheries
- to conserve and enhance inland and coastal waters and their use for recreation
- to maintain and improve non-marine navigation
- to develop a better informed public through open debate, the provision of soundly based information and rigorous research
- to set priorities and propose solutions that do not impose excessive costs on society

Sustainable development

In 1987, the World Commission on Environment and Development (the Brundtland Commission) defined sustainable development as that *which meets the needs of the present without compromising the ability of future generations to meet their own needs.*

Sustainable development brings together four sets of values: environmental protection, providing for the future, quality of life, and fairness, to create a new policy which integrates environmental, developmental, social and economic concerns.

One of the primary reasons for setting up the Environment Agency was to provide a means of helping the government deliver its sustainable development strategy. Section 4 of the Environment Act (1995) defines the Agency's aims and states that *the minister shall give statutory guidance on objectives and the contribution to sustainable development.* Guidance has been published by the Department of the Environment, and the key elements are that the Agency should:

- take a holistic approach to the protection and enhancement of the environment
- take a long-term perspective
- maintain biodiversity by exercising its statutory obligations with respect to conservation
- discharge its regulatory functions in partnerships with business in ways which maximise the scope for cost effective investment in improved technologies and management techniques
- provide high quality information and advice on the environment

Our management of the catchment will take forward these key elements as our contribution towards sustainable development.

Our umbrella duties

There are a number of umbrella duties which we carry out for all our functions:

- Rural Areas - when considering any proposal, we must have regard to any effect which the proposals would have on economic and social well-being of local communities in rural areas. Some of our activities, such as meeting statutory objectives, emergency actions and the taking of legal actions are not subject to this appraisal

- Costs and Benefits - we are required to pay regard to the likely costs and benefits when deciding whether to exercise our powers. Costs include both financial costs and costs to the environment; benefits include those which communities will enjoy, both now and in the future

- Conservation - we must have regard to conservation in our pollution control functions, and we have a duty to further conservation in all our other functions. We also have a duty generally to promote the conservation of flora and fauna dependent on the aquatic environment

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.

Failure to comply with standards has helped us to identify the issues raised in this plan. Further detail on standards and compliance is available from the address given on the back of this plan.

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 Bodmin 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 www.environment-agency.gov.uk

What we do not do

We do not cover all aspects of environmental legislation and service to the general public. Your local authority deals with all noise problems; litter; air pollution arising from vehicles, household areas, small businesses and small industries; planning permission (they will contact us when necessary); contaminated land issues (in liaison with ourselves); and environmental health issues.

This Local Environment Agency Plan

This Local Environment Agency Plan (LEAP) slots into a sequence of Catchment Management Plans (CMPs) which were being prepared by the NRA to cover all river catchments in England and Wales. We will use LEAPs to cover the same topics as Catchment Management Plans but they will also deal with other topics to cover the full range of our responsibilities.

A holistic approach to environmental management is required to plan for sustainability and improvement. LEAPs allow the full range of management issues to be identified and considered within a geographical area which is both relevant and meaningful. They are strategic in nature, since individual catchments cover large areas of land, often straddling local authority boundaries.

Economic and political constraints will influence what we are able to do. For example the funds that the water service companies and other industries invest in pollution control will make a difference to the extent of water quality improvements that we are able to achieve.

Local Environment Agency Plans and Development Plans

While we can control some of the things that influence the quality of the environment, we have only limited control over the way that land is developed. This is the responsibility of local planning authorities.

Local authorities prepare statutory development plans; the policies in these plans will guide the way that land is developed in the future. We advise and guide local planning authorities to encourage them to adopt policies that protect the environment from harmful development. Where we can, we will reinforce these policies when we comment on planning matters or if we are making our own decisions.

This Consultation Report

This Local Environment Agency Plan 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, and outlines issues where we or others need to take action to address problems in the environment.

How to use this plan

This report is split into two parts:

Part 1 includes:

- an introduction;
- an outline of the issues that we face in our management of the catchment. Options and Actions for the resolution of these issues are also identified;
- Protection through partnership. This section outlines work that we do in collaboration with other organisations and where the work of other organisations plays an important part in helping us to achieve some of our aims and objectives.

Part 2 includes:

- a detailed account of the uses and pressures on the area. This section forms a useful reference document and will provide background information relevant to the issues identified in Part 1.

References are given in superscript throughout the document (i.e.[1])

AREA STATISTICS

Table 1: Statistics

Area Drained	838.75 km^2
Principal Towns	Bodmin, Bude, Newquay, Wadebridge
Approx. population	84350
Length of Main River	107.8km
District Councils	North Cornwall District Council, Restormel Borough Council, Carrick District Council
Annual licensed abstraction volumes: Surface water Groundwater	 47909.6 Ml 2865.9 Ml
Average Annual Rainfall	1115 mm

Table 2: Drainage Areas

River	Area drained upstream of:	Area drained (km^2)
Camel	Tidal Limit	413.00
Gannel	Tidal Limit	60.25
Strat	Tidal Limit	133.50
Valency	Tidal Limit	99.75

We monitor 213.4 km of rivers in the area. In 1995, 92% of monitored river lengths in the catchment were of good or very good chemical quality, 8% were fairly good. In biological terms 94.8% of the monitored river lengths were of good or very good quality while the remaining 5.2% were fairly good. Between 1990 and 1995 there was an overall improvement in chemical quality over 2.4% of the monitored network while biological quality improved by 3.1%. 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 consultation report.

Map 1 - North Cornwall

North Cornwall Local Environment Agency Plan

AREA CHARACTERISTICS

The Rivers Gannel, Camel, Valency and Strat, together with coastal streams, drain a large part of North Cornwall from Pentire Point West in the south to Marsland Mouth in the north. Major urban concentrations in the catchment are Bodmin and Newquay. The proximity of the sea gives the area much of its character and colours its way of life. The rest of the catchment is rural in character, ranging from moorland to horticulture and meadowland.

Landscape

This catchment consists of some very distinctive landscapes; most obvious is the spectacular rocky coastline along the whole length of the area. This is a focus for much of Cornwall's tourist industry, and the area's history is deeply rooted in the coast. A number of fishing ports still exist here, but the pleasure boat industry has become more significant in recent years.

Inland, farmsteads and hamlets are scattered throughout the district; most of the landscape being undulating farmland with arable farming dominating in some parts, livestock in others. Woodland is generally scarce, although many of the steep valleys are thickly wooded. Culm grassland is found in the Bude hinterland and damp, rushy meadows are still quite common. Sturdy Cornish hedges criss-cross the area, many with characteristic wind-sculpted trees on top.

High ground occurs in the south, where St Breock Downs forms the watershed between the Camel and Ruthern rivers. Bronze Age barrows are common here, and the area offers panoramic views over much of central Cornwall.

In the south east is Bodmin Moor with its rocky tors punctuating the skyline. This ancient landscape is of great importance for its Bronze Age settlements and barrows, its stone walls and its moorland and heathland. It is a unique area, and one of the most valued landscapes in the South West.

One of Cornwall's major rivers, the Camel, wends its way through the heart of this catchment. The landscape of its upper and middle reaches is essentially moorland, passing into woodland. The contrast with the adjacent exposed, higher ground is distinct. Around Wadebridge the river enters a highly scenic, wide estuary.

Wildlife

This catchment contains a range of habitats and species of national and international importance. The long, rugged coastline of the catchment displays nationally significant geological exposures, as well as maritime grassland, heathland and stunted woodland of high biological value. The influence of the Atlantic is great here, and is the major factor governing what can grow in these extreme conditions.

Populations of seabirds breed on the steeper cliffs and offshore islets, along with grey seals in the sea caves.

Inland there are a number of areas of heathland and bog which are of national importance. Many of these lie in the headwaters of the river Camel and its tributaries, which is of international importance for its otter population. Rare macrophytes are present in the river, and there is a noteworthy abundance and diversity of mosses and liverworts. This river drains to the Camel Estuary. A section of the estuary is designated as a Voluntary Marine Wildlife Area.

Across the wider countryside, other fragments of semi-natural habitat remain (Semi-natural habitat - Habitats or communities that have been modified to a limited extent by man, but still consist of species naturally occurring in the area). These are linked by vegetated stream and river valleys and Cornish hedges.

Throughout the area there are Red Data Book species (lists of threatened species) and other rare plants and animals, many occurring in designated sites.

Historic Environment

The activities of past generations have shaped the landscape of the catchment. Bronze Age remains survive on higher ground within the area and Iron Age cliff forts occur in several places along the coastline, most notably an Iron Age fort at Dunmere and Roman settlement at Nanstallon.

Following the Iron Age, and particularly throughout the Medieval period, agricultural activity developed and was responsible for shaping much of the landscape. Open moorland was enclosed for the first time and many of these hedges survive today.

The coastal settlements have developed around the fishing and coastal trading industries and although tourism plays the major role in their functioning today, much historic evidence remains.

Mining has taken place in some parts of the catchment, but not to the extent that it did in the rest of Cornwall. Iron extraction being the most significant activity in the Camel Valley and coastal lead mines now form an important habitat for bats. Quarrying has been, and continues to be, more significant.

Economy

The whole of the catchment is popular with visitors and tourism is an important part of the local economy. Visitors come for traditional seaside holidays and for water based activities, such as sailing and surfing. Padstow is an important fishing port and fishing takes place all around the coast.

Livestock farming is the principal farming activity, with mixed farming and rough grazing taking place on poorer land.

PROTECTION THROUGH PARTNERSHIP

The Agency works in partnership with many organisations and individuals concerned with the protection and enhancement of the environment. In the UK as a whole much has been achieved already but much more is possible by working closely with others. The Agency is essentially a regulatory body and does not give grants, so to achieve some of its aims it must co-operate with others such as local authorities and MAFF to harness their financial resources and technical expertise. The Agency can also work towards its objectives by working with voluntary groups such as the local wildlife trusts, and recreational associations.

Planning Authorities

Possibly the most important agencies that we deal with are the County and District Planning Authorities, who are responsible for controlling development within the catchment, particularly through the County Structure Plan, Local Plan and Minerals Local Plan process. The Agency is a Statutory Consultee for Structure and Local Plans and certain types of development proposals. The Agency works closely with Local Planning Authorities to ensure that Development Plans contain appropriate policies to protect the environment.

Development will normally have an effect on the environment but it can also provide opportunities for conservation and recreational enhancements or fund improvements to problems caused by contamination, flooding, infrastructure deficiencies or environmental nuisances.

The Agency, in liaison with Local Planning Authorities, seeks sympathetic development with the environment. However, in certain situations, such as deficient sewerage and/or sewage treatment services or severe flood risk river catchments, the Agency will recommend formal development restraints.

Local Agenda 21

In 1994 the UK government produced a national sustainable development strategy and action plan for the UK. At the local level, most authorities are working with local communities to produce their own Local Agenda 21 (LA21) programmes, to promote sustainable development and to improve quality of life. The majority of district councils have LA21 officers in place. At the heart of the LA21 concept is the idea of "thinking globally, acting locally".

The Agency is keen to be seen as a source of locally based environmental information, and a promoter of environmental initiatives suitable for delivery through LA21 groups. These include initiatives such as "Use Water Wisely", the Oil Care Campaign, and ideas to promote composting, also supported by County and District Council campaigns.

We would welcome the opportunity to work with Local Agenda 21 groups to help deliver some of the actions listed in the activity tables.

Working with Business

We are working in partnership with local businesses to promote pollution prevention and waste minimisation. Examples include:

- our "3 E's" campaign which aims to reduce waste, packaging, effluent and energy use and thereby both help the environment and save the business money;
- farm waste management plans developed with farmers and ADAS;
- our oil care campaign;
- our training video for construction workers.

We work with the Farming and Wildlife Advisory Group (FWAG) to promote environmentally friendly farming practices.

Education

We recognise that broad-based education covering the community, educational and industrial sectors will result in a more informed society that is better able to understand the environment, its needs, and the impact of society's activities upon it. In particular, there is a need to:

- educate young people to equip them to make informed judgements about future environmental decisions
- educate industry through consultation, collaborative activities and targeted campaigns to promote a culture of prevention rather than cure
- raise public awareness of environmental issues to engender in society a common ownership of the environment and its challenges

Currently, we provide a wide range of information to all sectors of society, and in addition give many talks and presentations. This LEAP is a practical example of the material we publish which can assist in raising public awareness and understanding of environmental issues.

Initiatives in the area

There are a range of initiatives by various bodies which at some level cover the area of this plan. These are both statutory and non statutory in nature and cover a variety of topics from environmental to social and economic interests. A number of bodies have produced, or are producing some form of documentation. It is important for all parties that where different interests overlap discussion occurs on those areas of common interest. In this way we can integrate action, being more efficient in our actions, avoiding duplication (or conflict) and make the most of limited budgets. A summary of those initiatives most relevant to this plan is given on page 15.

Shoreline Management Plans (SMPs)

SMPs are being produced, by a coastal group with statutory interests working together, for the coastline covered within this plan. They provide a forum for an integrated review of coastal processes and sustainable coastal defence policies to set objectives for the future management of the shoreline.

Camel Estuary Management Plan

The Camel Estuary Management Plan was published in 1996. The plan is intended to provide a strategic overview for estuary management. The issues and management requirements for the Camel Estuary have been highlighted in the Camel Estuary Management Plan ". The Agency sits on the Advisory Group overseeing actions coming out of the plan and is supportive of the aims of the initiative. Issues and actions contained within that plan will not be raised in this document unless they are a particular Environment Agency responsibility.

Table 3: Initiatives in plan area

Plan	Responsibility	Geographic area	Subject matter	Outputs	Dates	Steering Group	Contact
Local Environment Agency Plan	Environment Agency	Freshwater systems from Pentire Point West to Marsland Mouth	Environmental management, water, land and air	Consultation Report Action Plan Annual Review	Dec 1997 Summer 1998	Yes	Environment Agency Cornwall Area
County Structure Plan	Cornwall County Council	Entire county	Strategic planning - social, economic, environmental	Draft plan Deposit plan	Sep 1994 Nov 1995	Yes	Planning Dept Cornwall County Council
Local plans - North Cornwall DC Restormel BC	District Councils	Individual districts	Detailed planning - social, economic, environmental	Draft plans Deposit plans		Yes	Planning Depts at relevant District Council offices
Minerals local plan	Cornwall County Council	Entire county	Strategic and detailed planning - minerals issues	Draft plan Deposit plan	Dec 1994 Feb 1996	Yes	Planning Dept Cornwall County Council
Shoreline Management Plan	Relevant District Councils and Agency	Land's End to Hartland Point	Coastal processes management policies	Scoping study Draft management plan	Feb 1997 Oct 1998	Yes	Planning Dept. Kerrier District Council
Natural Areas	English Nature	Same as LEAP	Biodiversity and landscape	Framework documents to be trialled nationally	unknown		English Nature
Landscape assessment of Cornwall/New Map	Countryside Commission	Same as LEAP	Landscape quality, description, enhancements, archaeology	2 reports	1995 and 1994		Countryside Commission
Waste Management Strategy	Cornwall County Council	Cornwall County	Strategic management of wastes	Consultation Draft Final report	Spring 1997	Yes	Cornwall County Council
Camel Estuary Management Plan	Camel Estuary Advisory Group	Camel Estuary	Strategic planning - economic, environmental, recreation	Five year plan	October 1996	Yes	Padstow Harbour Commissioners
Cornwall Biodiversity Initiative	Cornwall Wildlife Trust and partners	Cornwall County Council	All geological and biological features and systems	Recommendations leading to action plans	June 1997	Yes	Cornwall Wildlife Trust

Map 2 - Candidate and Possible Special Areas of Conservation

North Cornwall Local Environment Agency Plan

ISSUE 1: SAFEGUARDING SPECIAL AREAS OF CONSERVATION

Background

There are three areas designated as candidate or possible Special Areas of Conservation (SACs) in North Cornwall.

The River Camel Valley and Tributaries is being notified as a Special Site of Scientific Interest (SSSI) because of its outstanding and varied wildlife interest (see page 47). In addition to its possible SSSI status English Nature have recommended to the government that subject to the site becoming a SSSI it should be consulted on as a possible Special Area of Conservation (SAC) under the EC Species and Habitats Directive because of its importance for otters and bullheads. If Government accepts that recommendation there will be a period of consultation with owners/occupiers and other interested parties.

Tintagel-Marsland-Clovelly has been recommended to become a SAC because it is an outstanding example of Vegetated Sea Cliffs.

Newlyn Downs SSSI is proposed for its heathland interest.

Discharges and pollutions

There are a number of licensed discharges within the catchment. As part of any SAC designation we are required to review consents thought to impact on the SAC. The Agency seeks to ensure that through its activities, licenses and authorisations it maintains and contributes to achieving favourable conservation status. One means of achieving this will be through the agreement of a Strategy and Consenting Protocol with other competent authorities.

We already have a number of designations in place against which we monitor and protect water quality (EC Freshwater Fish, Surface Water Abstraction and Dangerous Substances Directives). In addition, as part of this consultation exercise, we have set water quality targets using the River Ecosystem Classification, see page 41.

Option for action	Responsibility	Benefits	Constraints
* Review existing consents/ licenses potentially affecting the proposed SAC	Agency	Conserve and enhance natural environment and conservation features	
* Develop Strategy and Consenting Protocol for any river SSSI/SAC which aims to achieve favourable conservation status for the system	English Nature/ Agency/ other competent authorities	Conserve and enhance natural environment and conservation features	All options: Resources, information

ISSUE 2: MAINTAINING AND ENHANCING BIODIVERSITY

Background

Biodiversity simply means variety of life. Within the plan area there are a range of international, national, county and locally important habitats, wildlife and historic features, many of which have some form of designation aimed at their protection.

Conservation in its broad sense should be an integral part of all activities, and many of the issues and proposed actions within this document promote sustainable use of resources, or seek to make up for serious losses or impacts. A more targeted approach of specific conservation actions is being developed through the 'Cornwall Local Biodiversity Initiative' currently being progressed by a wide range of interested bodies in Cornwall, and through English Nature's 'Natural Areas' Initiative.

It is our aim to achieve sustainable use of, and development within, the catchment, allowing us to meet current needs without compromising the environment and the ability to meet our future needs. Key habitats and species have been identified for protection in Cornwall Biodiversity Audit and Priorities. This and subsequent Action Plans will provide a framework for our targets in nature conservation.

Semi-natural habitat

Semi-natural habitat is a habitat or wildlife community that has been modified to a limited extent by man, but still consist of species naturally occurring in the area.

An inventory of all Cornish Culm grassland is being completed for the Cornwall Culm Measures Biodiversity Action Plan. It identifies and lists the total area of this habitat that remains. Further actions arising from the Cornwall Biodiversity recommendations include identifying funding for marsh fritillary and dormouse surveys.

Within the catchment some areas of semi-natural habitats are used for waste spreading. In some cases physical damage to important wildlife sites has occurred through field drainage prior to spreading and by changing the nutrient level in the soil following spreading. We are concerned at the levels of spreading in parts of the catchment, an issue that needs reviewing in a comprehensive and integrated way (see page 26).

Biological assessment

During spring and summer 1997 we undertook an intensive freshwater biological survey throughout the catchment.

The assessment was undertaken to update the previous set of aged data, it included the application of new methods: Trophic Diatom Index (TDI) and Mean Trophic Rank (MTR). These methods were used for establishing a baseline to assess the impact of possible nutrient loads in sensitive catchments. The information gained contributed to the biodiversity audit and will provide baseline information prior to the designation of Special Areas of Conservation (SAC), and the increase of waste to land spreading that is expected in 1999 following the cessation of disposing of sewage sludge to sea in 1998.

Water level management

A key area for wildlife within this catchment is Amble Marshes. For wetland sites such as these designated as SSSIs in England and Wales, formal strategies are being produced. These are known as Water Level Management Plans and they seek to balance the needs of conservation, flood defence and agriculture. A Water Level Management Plan will assist in more holistic management of factors affecting the site, including land and water management adjacent to the site.

Consultation was held in March 1997 with all landowners at this site to gauge the level of interest in carrying out works to enhance the nature conservation value of the site. It was generally felt that a

significant scheme was unsuitable due to financial constraints, but it may be feasible to carry out more localised works in the near future. This possibility will be discussed with the relevant landowners.

Invasive plant species

During July and August 1997, sites along watercourses were surveyed for Himalayan Balsam, Japanese Knotweed and Giant Hogweed. Of the 61 sites surveyed 10 sites had invasive plants established on the banks. Most cover was 20% or less but Himalayan Balsam at Grogley on the River Camel dominated one bank.

Swan mortality

Whilst investigating swan health and mortality on the Fal Estuary, archived tissue from dead mute swans from the Camel Estuary were investigated to provide scientific control birds from a 'clean' estuary. In most respects these birds were found to be normal except that they had grossly enlarged thyroid glands.

The cause is unknown and may be due to anthropogenic influences. The Agency with MAFF will seek to carry out post mortem, histopathology, and tissue analysis on any further dead swans reported to us from the Camel Estuary in order to try and find the cause. The Fal investigation[iii] recommended that mute swans could be used as an indicator species of the health of the environment.

Options for action	Responsibility	Benefits	Constraints
* Draw up and implement Biodiversity Action Plans	Cornwall Biodiversity Initiative	Protection and enhancement of environment	Cost
* Draw up and implement Water Level Management Plan for Amble Marshes	English Nature/ Agency/ landowners/ Farming and Rural Conservation Agency	Increased understanding of system and better site management	Cost
* Bring together interested parties to plan directed eradication campaign for invasive plant species	Agency/ English Nature/ landowners/ etc.	Restore balance of indigenous species	Cost
* Study causes of enlarged thyroid glands in Camel Estuary mute swans	Agency/MAFF	Contribute to our knowledge of the biology of mute swans. Assess significance of the defect.	Cost

ISSUE 3: FRESHWATER AND ESTUARINE FISHERIES MANAGEMENT

Background

Natural fisheries are important ecological assets and are also of commercial value for angling. Fish are good indicators of the overall health of our rivers. We use information from our routine population surveys and fishing catch returns to assess the diversity and health of fish populations. We are currently involved in implementing a classification scheme following a research and development project which will enable us to set targets for the catchment and also to put the fisheries into a national context.

The Rivers Camel and Allen have been consistently recorded as being amongst the most productive rivers for salmon and sea trout in the South West. This is due to a combination of high water quality, suitable habitats and sufficient water flows. Non-intensive use of land adjacent to the rivers throughout much of their length contributes to this high productivity.

Low juvenile fish densities found during 1997 fisheries survey of the River Allen

Fisheries survey data recently gathered on the River Allen indicate a serious problem in both trout and salmon stocks on the River Allen catchment. Densities in some areas are considerably down on the 1994 survey. It is not thought that the drought of 1995 and subsequent dry winters are entirely responsible. Urgent investigation is required.

Poaching

Rigorous and high profile enforcement within the rivers, estuaries and coast needs to be maintained by the Environment Agency, Ministry of Agriculture, Fisheries and Food (MAFF) and Cornwall Sea Fisheries Committee (CSFC). Whilst the Agency endeavours to respond quickly to all reports of poaching, reductions in staff and funding mean that we rely heavily on information from other bodies and the general public to alert us quickly to poaching incidents. We can then target resources effectively to combat the problem.

Bass fishery

Currently there is a difference in the size limit between bass caught within and those caught outside the Camel Estuary. Within the estuary we are the sea fishery authority and the minimum landing size is 36 cm. Outside the estuary Cornwall Sea Fisheries Committee (CSFC) are the authority and the size is 37.5 cm. CSFC have asked us to raise the minimum landing size limit to 37.5 cm to make enforcement easier. We have agreed to pursue this, and will be seeking permission from MAFF to create a new byelaw. External consultation will be required as part of this process.

MAFF are currently putting forward proposals to extend the bass nursery area to a line from Stepper Point to Pentire Point.

Introductions and escapees

Within the catchment there are stillwater lakes containing a variety of fish species not found within the river system. We are concerned about the occurrence and impact of fish escapees on native species. For example, serious diseases can be spread to wild populations and predation by alien species can cause damage.

Perch have also been found in the River Camel recently. Investigations into the origin of the fish are progressing.

Construction of instream structures

Whilst benefiting the river by creating deep water habitat, instream structures may cause flooding, erosion and prevent spawning if placed in inapropriate locations. The Agency is currently undergoing a review of current legislation and procedures for handling applications, including any implications of the designation of the River Camel system as a Special Area of Conservation (SAC).

Potential improvements

Results from freshwater surveys have indicated low juvenile salmon numbers recorded on the Issey Brook, Croan Stream and River Valency, and low juvenile trout densities on River Valency, upper Lappa Valley Stream, Whitston Stream, St Lawrence Stream and River Strat. Further investigations will establish the cause.

Within the plan area there are several obstructions (see Map 10) that are considered to prevent access of migratory fish and where action might be undertaken. Assessment of these obstructions is required to see if action is possible.

Thousands of tonnes of granite from De Lank Quarry prevent the free passage of salmonids to the upper reaches of the De Lank River and prevents utilization of a large area of potential sea trout spawning gravel. Removal of the obstruction is not appropriate. Local angling interests have proposed constructing a fish pass to circumvent the obstruction. This would be a huge undertaking and must be considered in the context of the proposed SSSI/SAC designations. Any proposals to change the existing fishery in the upper catchment will need full assessment and consultation.

Knowledge of fish populations

EC Habitats and Species Directive listed fish species such as shad species, sea lamprey, river lamprey, brook lamprey, bullhead and Atlantic salmon which have all been identified within the catchment. Further information on presence and densities would assist in future management decisions.

There is currently poor rod catch information for sea trout on the Gannel, Porth, Menalhyl, Valency and Strat/Neet. Adding these rivers to the national list of rivers with individual monthly records (rather than a combined total for a number of rivers) would give improved information for future fishery management. Greater monitoring of changes in sea trout stocks (via fish scale analysis from rod caught fish) would also provide valuable data on the biological status of the stock.

Commercial bait collection

The collection of peeler crab/hard backed crab and digging of polychaete worms (such as lugworm and ragworm) in commercial quantities has been raised as an issue in the Camel Estuary Management Plan. Concern exists of the impact of such activity on the target populations and other species, as well as human safety and nuisance. Action will be co-ordinated through the Estuary Management Plan.

Cockle harvesting in the Camel Estuary

During 1996 a commercial enterprise harvested, by suction dredging, quantities of cockles from within the Camel Estuary. This caused concern about the impact of dredging on the cockle population as a whole and that of other organisms living on the estuary bed affected by the operation. Investigations revealed that there was no formal control which could be imposed on the dredgers during the period when dredging took place.

Following the dredging, surveys and research have indicated that there are commercially viable quantities of high quality cockles. With suitable management these populations could support a sustainable fishery, to complement existing shellfish beds. Controls could include catch quotas, restrictions on the number of vessels, seasons, equipment and methods. There would also need to be careful zoning of activity to avoid unnecessary impact on other users and environmentally sensitive areas.

Options for action	Responsibility	Benefits	Constraints
* Rigorous and high profile enforcement to prevent poaching * Create byelaw to increase minimum bass size limit	Agency/ MAFF/ CSFC Agency	Protect stocks Assist enforcement	All options: Cost/resources
* Update database on distribution of non-native species within still water fisheries * Regular inspections of still water fisheries * Monitoring of non-native escapees recorded during fisheries work * Publicise the effects of escapees, regulations and hazards of fish disease * Advise on measures to prevent escapees	All options: Agency	Provide data for decision making Reduce illegal non-native introductions Provide data for decision making Better public understanding	All options: Cost/resources
* Review and draw up protocol of best practice for positioning and construction of croys	Agency	Prevent adverse effects and minimise need for maintenance	Cost/resources
* Investigate causes of low fish numbers in certain rivers * Identify areas for potential improvement * Survey obstructions to assess economically feasible actions	Agency Agency Agency	Enable effective action Prioritisation of available resources To enable prioritisation and open up new areas	All options: Cost/resources
* Full assessment of proposals for De Lank quarry obstruction	Agency		Cost/resources
* Survey for EC Directive species	Agency	Enable future management of populations	Cost/resources
* Investigate potential effects of cockle harvesting * Use of appropriate existing legislation to regulate a sustainable cockle shellfishery	Agency/Harbour commissioners/ EN/ Duchy of Cornwall/ Cornwall Sea Fisheries Committee	Planned or managed resource use or sustainable use	Cost/resources

ISSUE 4: MEETING CURRENT AND FUTURE DEMAND FOR WATER

Background

The availability of water resources is a high profile topic. We are in a position to develop public awareness of this issue and guide people towards a more sustainable use of water.

The Environment Agency has a duty under the 1991 Water Resources Act to conserve, redistribute, augment and secure the proper use of water resources in England and Wales. In fulfilling this role the Environment Agency must also carry out its general duties of environmental conservation and have regard to the statutory obligations of water companies. Management of water resources development is planned over long time-scales, usually about 30 years. This allows sufficient time to bring additional resources on line ahead of any forecast potential supply demand deficit.

At certain times local supplies are supported by imports of water into the catchment and issues related to these sources have been discussed in other plans[v].

Public water supply - meeting 'normal' demand

There is not likely to be a shortfall in available resources until after 2014 and this should not occur any sooner providing demand is managed, sources are operated efficiently and leakage is reduced to economic levels. The Agency will adopt a staged approach whereby we will ensure that all appropriate demand management, leakage control and resource management options as outlined in 'Tomorrow's Water - Regional Water Resource Development Strategy'[vi] are implemented before considering the development of new resources.

The detailed Drought Management Plan for 1997, for the Colliford Strategic Supply Area (SSA) has been incorporated into the recently agreed Colliford Operating Agreement (OA) and Operating Manual (OM) which is currently under consideration. This establishes a staged programme of water conservation measures to be taken as a drought intensifies. These will include operational management of public water supply sources, such as maximising the use of river abstractions within licensed limits to conserve reservoir storage, demand management such as enhanced leakage control and/or hosepipe bans as well as drought orders/permits where these are deemed necessary.

The public water supply sources in the catchment are included within the Colliford OA and OM to ensure that the need for environmentally damaging drought measures such as a reduction in reservoir compensation flows are minimised. The only implication for the catchment may be changes to the operational management of sources within current abstraction licence limits, to ensure adequate water conservation during droughts.

Increased water abstraction

South West Water are assessing the need for measures to help assist natural refill of Colliford Lake during the winter months. One option might be to pump water from the Camel System. Any proposal must properly consider the status of the River Camel as a Candidate Special Area of Conservation (SAC) , Site of Special Scientific Interest (SSSI) as well as important salmonid fishery. The De Lank River has been identified as one that may be affected by abstraction. These factors are likely to restrict future abstractions and with the importance of the fishery we will advocate a precautionary approach to any abstraction proposals.

We have specific conservation concerns, centred around the potential effects of abstraction on watercourse ecology and on sensitive wetland habitats. The higher reaches of the system are of particular importance and we would object to any new abstraction which took upstream of Bodmin. However, we would still have considerable concerns about any proposal downstream of that point and any feasibility study should consider options outside the catchment.

Non - public water supply abstractions

It is possible that there may be local environmental problems associated with full uptake of the few consumptive private abstractions in the catchment. The Agency will continue to monitor the net commitment to private water abstractions and have a regard to the amount of licensed volume take up and its effects. Future abstraction needs will continue to be addressed through the abstraction licensing procedure.

Options for action	Responsibility	Benefits	Constraints
* Review and revise accordingly the Colliford reservoir operating aggreement * Modelling of Colliford Strategic Supply Zone to: estimate the yield, assist with making the best use of available resources, and help to identify the need for future developments * Encourage water company demand management and leakage control * Encourage consumers to undertake water saving measures * Feasability studies on possible new resources	South West Water/ Agency	All options: Efficient use of water resources Improved water environment	All options: Resources Co-operation of the water company
* Assess need for potential future resource development and complications during reviews of Regional Water Resource Strategy	Agency		

ISSUE 5: GENERATION AND MANAGEMENT OF WASTES

Background

With the exception of household wastes, for which closely monitored collection and disposal contracts are in place, there is only sparse information on the types and quantities of wastes generated in Cornwall. Some estimates are being made as part of Cornwall County Council's waste management strategy in their Waste Local Plan for the County. The Environment Agency's forthcoming national survey of waste arisings due to commence later in 1997 will provide better data in future. The Agency is to prepare a Regional Waste Management Plan, based on the survey findings.

The Government has stated its intention to redefine Mining/Quarrying/Agricultural wastes as "controlled wastes" to be formally regulated by the Agency.

The Agency liaises with the Cornwall Waste Management Forum, a partnership with the six District Councils and the County Council, and works in collaboration with the Payback organisation in the set up of Waste Minimisation Groups. Through our regular contact with businesses we are advising firms on their environmental management systems including waste minimisation. The Agency is producing a Commercial Recycling Directory that will assist businesses in identifying recycling outlets for recoverable wastes. In time this will stimulate a need for the new treatment and recovery facilities locally to provide a more sustainable alternative than landfill disposal. These initiatives have enabled many companies to discover scope for cost savings whilst changing their approach to waste and other emissions.

Household, commercial and industrial wastes can be potentially polluting if not correctly managed. Certain particularly harmful materials are designated as "special wastes" (see Glossary) and 90% of these are exported from Cornwall for specialised treatment or disposal elsewhere at purpose built facilities.

Newlyn Downs

The site for Newlyn Downs transfer station has been given planning permission but will be considered at a public inquiry due to take place in late 1997 for the development of a waste transfer station. English Nature notified landowners in June 1997 that the site was to be included as a Site of Special Scientific Interest mainly because of its populations of the rare plant Dorset Heath. It is likely to go forward as a proposed Special Area of Conservation (SAC) under EU legislation (See Issue 1). If the site becomes a candidate SAC we can use our powers to safeguard its nature conservation value and the Agency would have grounds to refuse an operating licence for the site.

Water pollution problems

East Wheal Rose Stream significantly fails its Long Term River Quality Objectives (RQOs) due to the impact of diffuse pollution from Wheal Rose Landfill, a closed wate disposal site. Funds are being investigated to carry out remedial work.

Conce Moor is a closed waste disposal site run by Cornwall County Council. There was no form of containment on the site and the council are still involved in active management, irrigating leachate on the site. Leachate does escape, particularly into two streams which are culverted through the site, resulting in pollution. Cornwall County Council are undertaking site investigations to identify the causes prior to taking remedial action.

Improvements have been carried out at Tiscott Wood over the last few years. The Agency has worked in co-operation with the operators to comply with the licence conditions. Monitoring of gas and leachate will continue to be carried out regularly.

Provision of waste facilities

The County Council's Waste Local Plan for Cornwall will identify the criteria for the provision of sufficient and adequate facilities as guidance to potential operators and to direct planning policy.

Specific proposals will then be vetted by the County Planning Authority in consultation with the Agency.

There is an established hierarchy of planning for waste, from national strategy to regional and local planning. There is a requirement from the Environment Agency to produce a regional strategy to outline the current and future needs for waste management. This work will be undertaken in two distinct phases, firstly data on current requirements will be collected in a waste arisings survey. This information will also feed into the national strategy. The second stage is the production of the regional strategy. Due to pressures on facilities Cornwall County Council has had to embark on the production of a local Waste Strategy for consultation, ahead of national and regional plans. The survey is due to start early next year and will take 9 months.

The development of a waste minimisation plan for Padstow Harbour is being progressed through the Camel Estuary Management Plan. This might also go some way to establishing a waste management plan for Padstow.

Waste spreading to land

Poor waste management can result in pollution incidents. Waste applied to existing semi-natural habitats may result in a loss of conservation value through the potential build-up of nutrients in soil, surface or ground water and decline of semi-natural vegetation. Certain controlled wastes spread on land for agricultural benefit are exempt from a formal waste management licence. This activity has developed in a particularly concentrated way around the Camelford/Otterham area.

This is an issue we feel needs reviewing in a comprehensive and integrated way to ensure that the activity does not cause undue impact. Such a review will involve landowners, spreaders, MAFF and other interested parties.

Sludge disposal to land

Land is already used for the disposal of agricultural and industrial wastes and sewage sludge. In 1998 the disposal of sewage sludges at sea will be prohibited by the EC Urban Waste Water Treatment Directive increasing disposal to land. Good management practices and the use of existing codes will mean this could benefit the land, however there is a risk of pollution if care is not taken.

Options for action	Responsibility	Benefits	Constraints
* Improvements to Newlyn Downs	Carrick District Council	All options: Environmental improvements	Cost
* Encourage the development of necessary facilities, particularly those which recover value from wastes * Identify suitable new sites * Draw up sustainable waste strategies * Promote waste minimisation * Implement relevent Waste Regulations	Agency/ Cornwall Planning Authority/ District Councils Developers Cornwall County Council Cornwall County Council/ Agency Agency/ Cornwall County Council/ District Councils	All options: Adequate planning for future management of wastes and a more sustainable use of the earth's resources	Availability of suitable sites Public acceptance Resources
* Review of waste to land practices	Agency/ MAFF/ spreaders/ landowners	Improved environmental protection	Use of resources
*Carry out National Agency Waste Arisings Survey	Agency	Better data with which to plan provision of facilities etc.	Cost Co-operation of businesses

ISSUE 6: IMPACT OF AGRICULTURE

Background

Agricultural land covers approximately 93% of the catchment. There is a declining trend in the numbers and severity of pollution incidents relating to farming. This has resulted from the extensive, proactive pollution prevention work carried out by the former NRA and the subsequent positive response from the farming community. However, farming continues to have an impact on water quality and habitats within the catchment.

Habitat change

Surveys by Cornwall Wildlife Trust identified a high proportion of semi-natural habitat in the river corridor throughout the freshwater Camel system. Semi-natural habitat is an indication of less intensive farming and permits more habitat for wildlife. The linking of habitats by corridors of semi-natural habitat allows movement of wildlife, as well as providing buffer zones between working agriculture and the river.

Changes in farming practices, could erode the ecological quality of the river system. This could include the movement to more intensive agricultural practices which could result in increased sediment, nutrients and pollutants entering the rivers.

An initiative by the Farming and Wildlife Advisory Group in part of the Camel Valley has resulted in the production of whole farm plans and the implementation of various projects to improve management of and create new habitats especially alongside watercourses. Further evaluation of the benefits will indicate the potential to build upon the initiative.

Water pollution

The Benny Stream has significantly failed its long term River Quality Objective because of elevated levels of total ammonia. A possible cause is farming activities. Farm campaign work identified several problems which have been remedied and should result in future water quality improvements. We will continue to monitor the situation and investigate any future non-compliance.

Marginal failures of River Quality Objectives on the Issey Brook and the Rivers Allen and Neet are possibly caused by farming. There are large dairy farms in the Issey Brook and Allen subcatchments and cattle are frequently noticed in the stream. Cattle having access to watercourses can cause an increase in the organic material and ammoniacal nitrogen entering the stream, in addition to poached river banks and increased suspended solids. A combination of farming practises in the upper Neet catchment and a slow flowing river is the probable cause of non-compliance.

Bank erosion

Bank erosion caused by cattle trampling can cause water pollution and can alter river flow due to widening of the river channel. In the Rivers Neet and Strat, and some areas of the River Camel catchment, bank damage by cattle is thought to have an effect on salmonid spawning as increased sediment is entering the watercourse. Some areas have been fenced to limit livestock access, but further vulnerable areas remain unfenced.

Options for action	Responsibility	Benefits	Constraints
*Identify levels and causes of habitat change * Promote the retention of semi-natural habitat within the Camel river system through a Camel River Project; developing/ funding conservation management	Cornwall Wildlife Trust/ EN/Agency Agency/ EN/ LPAS/ FWAG/NFU/ Landowners	Conserve and enhance natural environment and conservation features in possible SSSI/SAC	Cost
* Monitor and investigate inputs from agriculture * Minimise nutrient inputs from farm runoff into Porth Reservoir	Agency Farmers/ National Farmers Union/ MAFF	Achieve compliance with RQOs Prevent eutrophication	Cost Cost
* Minimise bank erosion by cattle in River Neet, Strat and the River Camel catchment	Farmers/ Agency	Improved environmental protection	

ISSUE 7: IMPACT OF SEWAGE DISCHARGES

Background

Rivers have a natural ability to render the main constituents of many effluents harmless, providing that effluent disposal is properly controlled. Throughout the catchment there are numerous sites where the Agency consents the discharge of effluent into freshwaters, estuaries and coastal waters. Discharge consents only apply to point source discharges; specific, identifiable discharges of effluent from a known location.

Non-compliance with River Quality Objectives (RQOs)

St Columb storm sewer overflows (SSO) are a possible cause of RQO and long term RQO failures on the River Menalhyl. Investigation work is currently underway to assess the impact of the overflows.

The stretch of the River Camel from Camelford Bridge to Pencarrow significantly fails its RQO due to elevated levels of total ammonia. The raised ammonia levels are attributed to Camelford STW which discharges secondary treated effluent to this stretch. At present there is no ammonia standard on the consent. We will be seeking funding through SWW Asset Management Plan 3 (AMP3) so that we can review the consent.

The Wanson Water significantly fails its long term RQO for unionised and total ammonia and marginally fails its long term RQO for Biochemical Oxygen Demand (BOD). Work is in progress to determine the impact of ammonia levels from a large caravan site which may require a consent review.

Non-compliance with EC Bathing Waters

Failures have occurred at a number of bathing waters in the catchment (see Table 10, page 74). Improvements are already planned and in progress at Crantock (Newquay) and Bude (see Table 15, Page 83). Improvements for the Camel scheme are now complete. Further investigation at Mawgan Porth and Porthcothan bathing waters is required to establish the cause(s) of failure.

One option that could be evaluated at Mawgan Porth is to create a reedbed above the beach, which would improve water quality and could have wildlife benefits.

Urban Waste Water Treatment Directive (UWWTD)

The discharge from Newquay requires improvement under the Urban Waste Water Treatment Directive (UWWTD). However, SWW have publicly stated that they will be completing a scheme, which includes secondary treatment and ultraviolet disinfection, by the end of 1998. This level of treatment meets and exceeds the requirements of the UWWTD.

Options for action	Responsibility	Benefits	Constraints
* Investigate impact of SSOs at St Columb * Review Camelford STW discharge consent * Review caravan site discharge consent	Agency/SWW Agency Agency	All options: Compliance with River Quality Objectives	All options: Cost
* New STW and sewerage improvements at Newquay	SWW	UWWTD	
* Sewerage improvements at Bude * New STWs at Padstow and Porthilly	SWW SWW	All Options: Compliance with Bathing Waters Directive	All options: Cost
* Investigate cause(s) and suggest remedial action at Mawgan Porth and Porthcothan	Agency	Compliance with EC Bathing Waters Directive	
* Evaluate creation of reedbed at Mawgan Porth	Agency/ Parish Council/ Restormel Borough Council/ SWW/ EN	Improved water quality and habitat	Cost

ISSUE 8: NUTRIENT ENRICHMENT OF SURFACE WATERS

Background

We undertake chemical and biological monitoring using a number of classifications to determine whether water quality has an effect on river life. Where results indicate nutrient enrichment (eutrophication) we undertake investigations to identify the cause. Runoff from farmland and discharges from sewage treatment works both contain plant nutrients such as nitrogen and phosphorus. These nutrient inputs often lead to luxuriant water plant growth, especially within standing bodies of water such as lakes, ponds or penned river stretches. Water plants such as duckweed (*Lemna*) can choke eutrophic waters, reducing the quality of the water and the range of plants and animals it can support.

The Agency has performed a baseline biology survey to assess any future changes in nutrient loadings. There are a number of sites in the area where poor macro-invertebrate diversity may indicate nutrient enrichment. Investigations need to be carried out to establish causes and to recommend appropriate actions.

Trenance Boating Lake

Intermittent algal blooms (Green filamentous - Cladophora sp.) have occurred, interfering with the operation of the pedal boats. The problem has been addressed through the use of barley straw which was successful when initially used, but amounts were reduced and there was a further algal bloom. This was treated with herbicide which resulted in the death of fish in the lake. The fish deaths were due to oxygen depletion caused by the decomposing weed, not by the herbicide itself. Partial treatment to avoid a low dissolved oxygen (D.O.) level was carried out, but a small population of flounder were killed by the localised D.O. sag on the bottom of the lake. There was no threat to the ecology of the Gannel Estuary due to this herbicide application.

We are concerned about the effect of herbicides in the lake and on wildlife in the Gannel Estuary. Neither of the above treatments have addressed the cause. Possible sources of nutrients may be from the feeding of birds on the lake, inputs from Newquay Zoo, inputs from the sewerage system (scheduled for improvement) and mis-connections by households into the surface water system.

Porth Reservoir

There have been algal blooms in Porth Reservoir and biological surveys have shown high nutrient loads in each of the three inflowing streams. Farm runoff is likely to contribute to the loading. SWW have concerns regarding the nutrient loading in Porth Reservoir.

Possible high nutrient loadings in rivers

Preliminary results from biological surveys have also highlighted a high nutrient loading in the River Menalhyl at St Columb and the River Neet, especially at Hele Bridge. Low biotic scores were also recorded on Nanstallon Stream below Bodmin STW. The significance of these scores will be addressed when the complete data set is analysed at the end of 1997.

Options for action	Responsibility	Benefits	Constraints
* Investigate causes of algal blooms at Trenance Lake and take appropriate actions possibly including: * Maintain barley straw treatment at Trennance Lake, * Review discharge from Newquay Zoo, * Stop bird feeding on lake Investigate mis-connections	Agency Restormel Borough Council Agency/Zoo Restormel Borough Council	Improved water quality	Resources
* Investigate effects of algal blooms on ecology of the Gannel Estuary and take appropriate remedial action	Agency	Improved water quality	Potential cost
* Investigate causes of high nutrient loads to Porth Reservoir and take appropriate remedial action	Agency	Improved water quality	Potential cost
* Investigate causes of high nutrients loads in watercourses where indicated by biological monitoring	Agency	Improved water quality	Potential cost

ISSUE 9: IMPACT OF DEVELOPMENT

Background

Development has significant implications for the environment. It requires the extraction and processing of building materials and may generate significant amounts of waste through construction. The natural landscape can be altered, which could lead to flooding and introduce activities which bring a higher risk of pollution. New housing and industry increases the demand on services, including water supply, and result in increased amounts of waste. Air emissions, particularly from industrial premises can affect the local and wider environment.

Flooding

There are areas that have been troubled with flooding in the past which have been relieved by flood alleviation schemes. These were built by our predecessors and have allowed further development to go ahead in the respective subcatchments. However, there are still areas where further development will increase flood risk. In order to manage such development part of our ongoing work is to give development control advice to local planning authorities.

Proposals to develop in the catchments of the Bodmin Town Leat, River Paradise, River Jordan and the Lanivet Stream give us cause for concern and often results in us recommending refusal of planning permission because of the extra runoff the development will add to the watercourse. There are also problems at Helebridge, Camelford, Sladesbridge, Kestle Mill and several small localities around the catchment.

Major capital flood defence proposals can have potential effects on river processes and wetland habitats, as they involve engineering works in the floodplain or river valley. For any capital scheme we carry out an environmental assessment and incorporate mitigation and compensation elements in the design. This applies equally to fluvial or coastal defence schemes. The Shoreline Management Plan process will help to provide information on the latter.

Currently in our capital programme are schemes at Bodmin Town Leat, Boscastle, Sladesbridge and Polmorla near Wadebridge. Work is currently in progress to increase the defence standard of the scheme at Bude.

A programme of flood risk data survey, interpretation and provision to planning authorities is in hand, though currently predominantly for "main rivers" (see Glossary). Floodplain information for main rivers for the catchment should be delivered to local authorities during 1997.

The Agency is encouraging the adoption of source control; the selective use of structures such as soakaways as part of a development to promote infiltration. These would help to replenish groundwater as well as reduce the erosion potential in watercourses, however their use must be site dependent.

Water pollution

There are a number of locations where consented sewage treatment discharges are having an environmental impact where we recommend development constraint, for instance at Newquay and Camelford. These are listed in our regularly updated consultation guides (see Local Environment Agency Plans and Development Plans, page 8 and Table 19, page 95).

Water quality problems associated with urban runoff also occur. Surface water runoff from developments can carry pollutants such as oils. There are a number of methods of source control which can be designed into new developments and used with infrastructure such as interceptors to limit such pollution. These are highlighted on a video 'Natures Way'™ which is available from us.

The Environment Act introduced new duties on water service companies to provide public sewers for domestic properties that were built by June 20th 1995 in either rural or urban areas where there are

environmental or amenity problems which exist or are likely to arise. This duty is subject to environmental, engineering and economic criteria. Any owners, occupiers, Parish or District Council may apply to SWW for a scheme. If there is a disagreement over the need for a scheme or the implementation of the new duty then the Agency will be called in to arbitrate. We are concerned that the cumulative effect of septic tanks draining to soakaways from the unsewered part of New Polzeath could cause environmental effects and would encourage exploration of first time sewerage options.

Review of old mineral permissions

The Environment Act 1995 introduced new requirements for Mineral Planning Authorities to carry out an initial review and updating of old mineral planning permissions and the periodic review of all mineral permissions thereafter. The broad aims of the Review are to provide for improved operational and environmental practices and for the appropriate restoration of Mineral Sites through updated planning conditions, (although the nature of the new conditions will be constrained by a liability to pay compensation where they unreasonable prejudice the economic viability or the asset value of active mineral sites).

The Agency is a consultee in the process of determining new conditions, and this will require a thorough assessment of each site. Often sites, particularly those which have been dormant for many years, are of valuable nature conservation and archaeological interest. Clearly, many sites will be of geological interest, and may also have implications for surface and groundwater resources and quality. It is important that appropriate conditions are put in place to protect these interests.

Wildlife

New development is one of the major threats to semi-natural habitats and the species they support. Cornwall Wildlife Trust, through the 'LIFE' project, are mapping the levels of change in such habitats, and what they have been converted to.

The foreshore is a specific area subject to frequent development pressure in this catchment. We seek to prevent such areas being lost through development, as this results in a loss of wildlife habitat and can have adverse effects on currents and sedimentation patterns within the estuary as a whole. This issue has been raised in the Camel Estuary Management Plan.

The Special Area of Conservation proposed for the River Camel will generate conservation objectives followed by a scheme of management governing development within the intertidal area. Shoreline Management Plans are also likely to generate site specific option recommendations for coastal defence in this area.

Options for action	Responsibility	Benefits	Constraints
* Promote source control through policies and increased awareness	Agency/ LPAs	Improved environment	
* Plan development to prevent increase of flooding risk	LPAs / Agency / developers	No additional flooding problems	None known
* Construct flood alleviation schemes at Bodmin, Boscastle, Sladesbridge, Polmorla	Agency/ LPAs MAFF	Alleviate flooding	Cost Cost for ordinary watercourses
* Produce Section 105 survey to identify flood risk in the catchment	Agency	Updated information on flooding problems	
* Promote source control through policies and increasing awareness	Agency/ LPAs	Improved environment	
* Develop first time sewerage	Local authorities/ parish councils/ individuals/ SWW	No further environmental effects	Engineering and economic
* Review all existing Planning Permissions for mineral extraction	Mineral Planning Authority	To ensure that environmental needs are fully considered	Many sites to cover, many interests to balance
* Resist any development which results in loss of semi-natural habitat	Planning authorities	Protect biological diversity	
* Re-create habitat where loss is unavoidable	Planning authorities		More expensive and less effective than protecting original habitat

ISSUE 10: IMPACT OF RECREATIONAL ACTIVITIES

Background

There is widespread recreational use throughout the catchment with a large proportion based on or around the water. Much of this can be absorbed without unacceptable impact on the environment or conflict between competing uses. However, incidences do occur where recreational activities need to be more carefully managed.

Canoeing

There is no statutory right to canoe on the River Camel upstream of the normal tidal limit. Below this point canoeing does occur and supports a rental business in Wadebridge. However, there is an interest from canoeists to canoe the freshwater part of the river under particular conditions which could only occur with the permission of the riparian owners, usually through an access agreement. This would be an agreement between the British Canoe Union and riparian interests which establishes the timing and conditions under which canoeing occurs. Such agreements operate on other rivers in Cornwall. The Agency is willing to act as 'honest broker' in any negotiations.

Dam construction

Members of the public construct small dams on part of the De Lank River during the summer months, when easily accessible parts of the river are popular with tourists. The removal of the larger stones from the riverbed deprives plants and animals of a micro-habitat. The use of turf exacerbates the erosion of the riverbank and contributes towards the siltation of the substrate. This seemingly innocent recreation could damage stretches of one of Cornwall's most pristine river habitats.

Camel Trail

The 16.5 km Camel Trail running through the Camel valley from Bodmin to Padstow is now a premier site for recreation in the County with 350,000 visitors a year. It is managed by Cornwall County Council.

The Camel system has a very high nature conservation status and it is important to ensure that wildlife does not become unnecessarily disturbed.

A recent engineer's report has shown that urgent repairs are required to 300 m^2 of the traditionally stone faced embankment supporting the trail along the estuary. Replacement of fencing is also required to allow for the management of trail users and the appropriate grazing of important habitat alongside the trail. Failure to address these problems will allow further damage through erosion at much greater cost with a consequent threat to the facility.

Bude Canal

North Cornwall District Council are funding a scoping report for a feasibility study to look at the options for the restoration of features of the Bude Canal. The Agency is keen to have early input into these studies to ensure that the environmental implications are fully taken into account.

Motorised recreation

Recently, concerns have been raised about jet-skiing taking place in the Gannel Estuary. Investigations into the scale of the problem and suggested solutions, such as voluntary codes of practice, will need to involve all interested parties.

Options for action	Responsibility	Benefits	Constraints
*Develop a canoe Access Agreement	British Canoe Union/ Riparian Owners/ Agency	Managed canoe use	SAC for otters
* Management of Camel Trail * Protection for eroded banks along Camel Trail	Cornwall County Council/ North Cornwall District Council	Protection of premier recreation site	Cost
* Dismantle dams * Produce educational material	Agency/EN/ Landowners/ North Cornwall District Council	Reduce damange	
* Consider restoration and management of Bude Canal	North Cornwall District Council/ Bude Town Council and others	Increased recreational facilities Access to archaeological features	Water Resources Funding

ISSUE 11: SEA LEVEL RISE

Background

Flood defence schemes are designed to accommodate future sea level rises. Information regarding the predicted rise in sea level is obtained from the Intergovernmental Panel for Climate Change. The net sea level rise estimates are then used to establish the anticipated effects over the life of a flood defence 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.

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 5mm/year until the year 2030 and 7.5 mm/year thereafter. A further potential effect of global warming is that of increased storminess, which could lead to increased wave action and annual rainfall, resulting in increased flooding.

We have designed our flood defence schemes with an allowance for a rise in sea levels. An annual review of the condition of existing sea defences is undertaken.

Flooding

Whilst we plan for a rise in sea level when constructing new and maintaining existing defences flooding might occur in new locations. Design of our flood defences at Padstow, Wadebridge, Mawgan Porth and Bude have all had allowances for sea level rise included. The forthcoming Shoreline Management Plans (SMP) will recommend preferred options for the management of coastal defences, taking into account such changes.

Ecological impacts

Intertidal habitats may be lost, unless they re-create naturally or through human intervention. Any intervention could have knock-on effects for other fringing habitats. Assessment of the potential for preservation or recreation at different locations, and consequences of each needs to be carried out.

Options for action	Responsibility	Benefits	Constraints
* Make recommendations for the management of defences through SMP process	Shoreline Management Plan Coastal Group	Clearer understanding of coastal processes	Cost
* Undertake appropriate modification of existing flood defence schemes	Agency/Local authorities/ MAFF	Alleviation of flooding	Cost
* Design of new flood defence schemes taking account of sea level rise	Agency/Local authorities/ MAFF	Alleviation of flooding	Impacts on other parts of coastal system
* Identify sites vulnerable to habitat loss through SMP	SMP Coastal Group	Provide basis for decisions	Cost
* Assessment of suitable sites for habitat re-creation	Biodiversity Action Plans	Maintain existing size of habitats	Cost

ISSUE 12: OIL SPILL CONTINGENCY PLANNING

Background

Through the Camel Estuary Management Plan it has been identified that there is a need to review existing contingency plans to enable rapid and effective response to an oil spill (hazardous cargo) incident. Such potential spills could come from land or water-borne sources inside or outside the estuary. Although those responsible have an existing contingency plan it will need to be significantly reviewed and measures strengthened.

Requirements

A working group comprising of Harbour Commissioners, English Nature, Environment Agency, District and County Councils has already been established. Sensitivity mapping of features requiring protection have been produced and booming points have been established. Principle areas for future development include:

Agreeing clean up methods - highlighting areas vulnerable to oil spills and proposing appropriate clean up methods,

Booming exercise to test the booming points, due in Spring 1998,

Contingency planning - setting out agreed courses of action under different circumstances and as appropriate, to be drawn up after booming exercise.

Options for action	Responsibility	Benefits	Constraints
* Carry out booming exercise Spring 1998 * Draw up contingency plan * Establish suitable clean up methodology	All options: CCC/Harbour comissioners/ Agency/EN	All options: Increased environmental protection	All options: Resources

ISSUE 13: AIR QUALITY

Background

Air pollution may be in the form of gas or particulate matter. Its dispersion and dilution depends on the nature of pollution and climatic conditions. Its impact may be local, especially with regard to particulate matter which will often settle on nearby land or water. Or it may be global, for example affecting the ozone layer or the concentrations of greenhouse gases such as carbon dioxide. It is vital that we protect the air since the future health of mankind and the environment depends on it.

Air pollution

Levels of ground level ozone in parts of the catchment are generally above those at which damage to vegetation may occur. Management of these issues will be picked up in the work of the Cornwall Air Quality Forum.

Option for action	Responsibility	Benefits	Constraints
* Draw up air quality strategy	NCDC	Information for management decisions leading to environmental improvement	Availability of information

ISSUE 14: OUR PROPOSED TARGETS FOR RIVER WATER QUALITY

Background

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

We also manage water quality by applying standards set in EC directives and other international commitments. Failures to comply with these standards are outlined in the issues section.

Proposed RQOs

We have proposed RQOs using a classification scheme known as the River Ecosystem (RE) Classification which was introduced by the National Rivers Authority, following public consultation, in 1994. It replaces a former scheme introduced by the Water Authorities in the late 1970s and used by the NRA until 1994. The RE Classification comprises five hierarchical classes as summarised below. Further information regarding the RE standards is available in Appendix C, page 119.

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 may also set a Long Term RQO. We will measure compliance against RQOs but use Long Term RQOs as a basis for setting consents for new discharges. This will ensure that future developments will not prevent us from achieving our long term objectives.

The rivers of the North Cornwall Catchment have been divided into 49 classified reaches and the RQOs that we intend to set are outlined in Appendix C, page 119.

We welcome your comments on the River Quality Objectives that we propose.

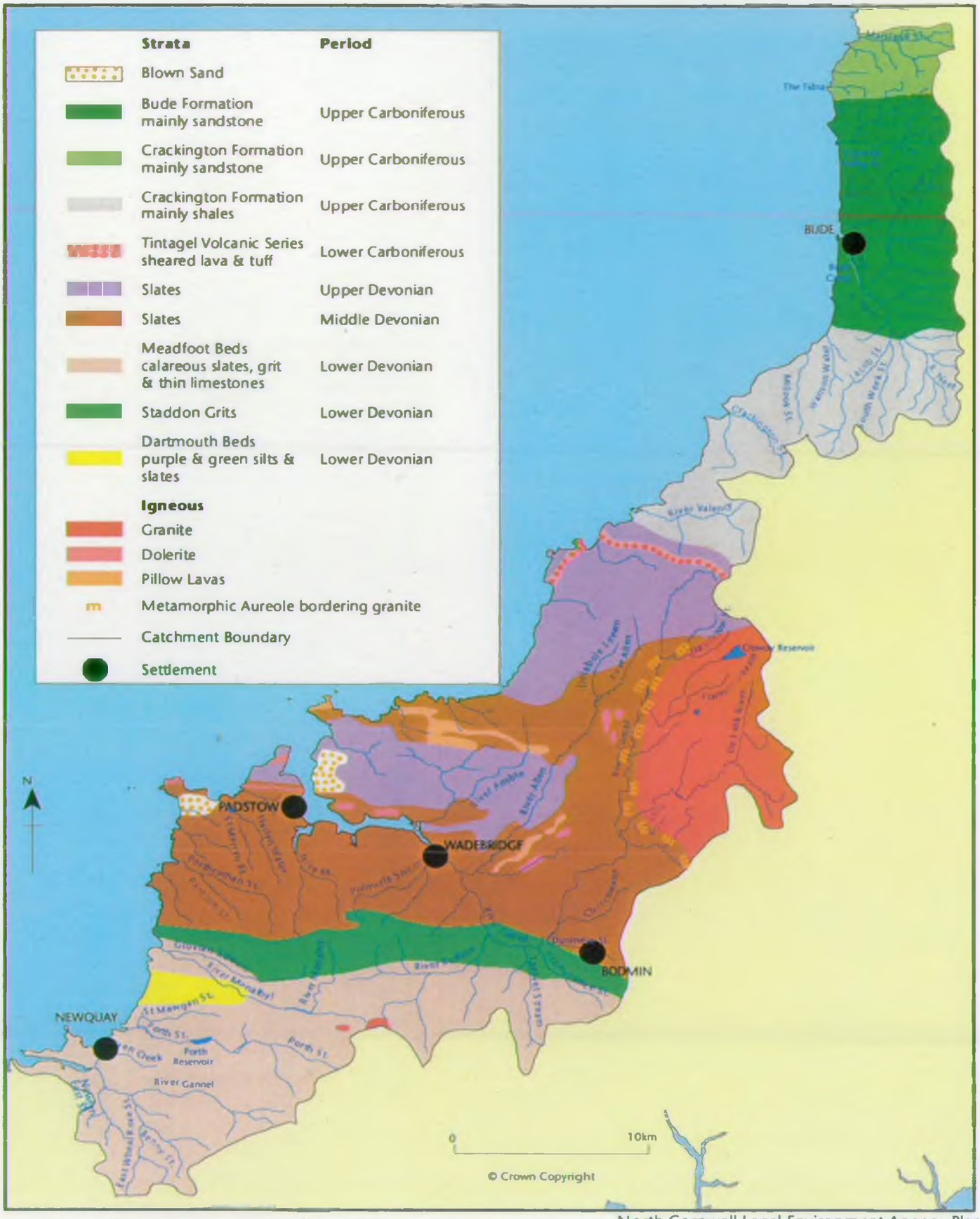
Page 71 in Part II provides more information on the RQOs proposed for the North Cornwall Catchment and includes a map which details compliance with them. Where a reach does not comply with the proposed RQO, the reasons are investigated and the necessary actions are taken to achieve compliance.

Map 3 - Proposed River Quality Objectives (River Ecosystem Classification)

North Cornwall Local Environment Agency Plan

Part 2

Map 4 - Simplified Geology



North Cornwall Local Environment Agency Plan

Physical Characteristics

Geology

The catchment is made up mainly of sandstones, slates and shales ranging in age from Upper Carboniferous strata deposited about 285 million years ago, to Lower Devonian rocks formed some 395 million years ago. The exception in the east of the catchment is the western margin of the granite of Bodmin Moor, and minor dolerite intrusions and volcanic lavas to the west and north of the granite. In general, the oldest sediments occur at the southern end of the catchment and get progressively younger towards the north. At the end of the Carboniferous Period, all these sediments were caught up in a major mountain building event, the Hercynian orogeny, and were crumpled into the often spectacular folds seen today along the coast.

Hydrogeology

The geology of the catchment is unsuitable for the formation of a major aquifer. Even where the Carboniferous bedrock is predominantly sandstone, its permeability is low. Although not capable of supporting large abstractions, often sufficient groundwater is held within the fractures and fissures of the rocks to allow for small abstractions to be sustainable. The availability of this groundwater is, however, highly variable even over a short distance. Seasonal changes in rainfall can also greatly influence yields from boreholes, wells and springs with flows sometimes being greatly reduced during the summer.

Because of the low permeability of the rocks, rainfall can result in rapid runoff and, therefore, stream levels generally rise quickly after rain.

Hydrology

The major river in the catchment is the River Camel rising on Bodmin Moor and flowing some 40 km to Wadebridge and out into the estuary at Padstow. The average flow (1964 to date) is 5.993 cubic metres/second (cumecs) with a Q95 (the flow which is exceeded 95% of the time) of 0.850 cumecs and a Q5 of 18.028 cumecs (the flow which is exceeded 18 days a year on average).

The watercourses in the north of the catchment are short, steep and respond quickly to rainfall. Those to the south are generally longer, not so steep and respond more slowly to rainfall.

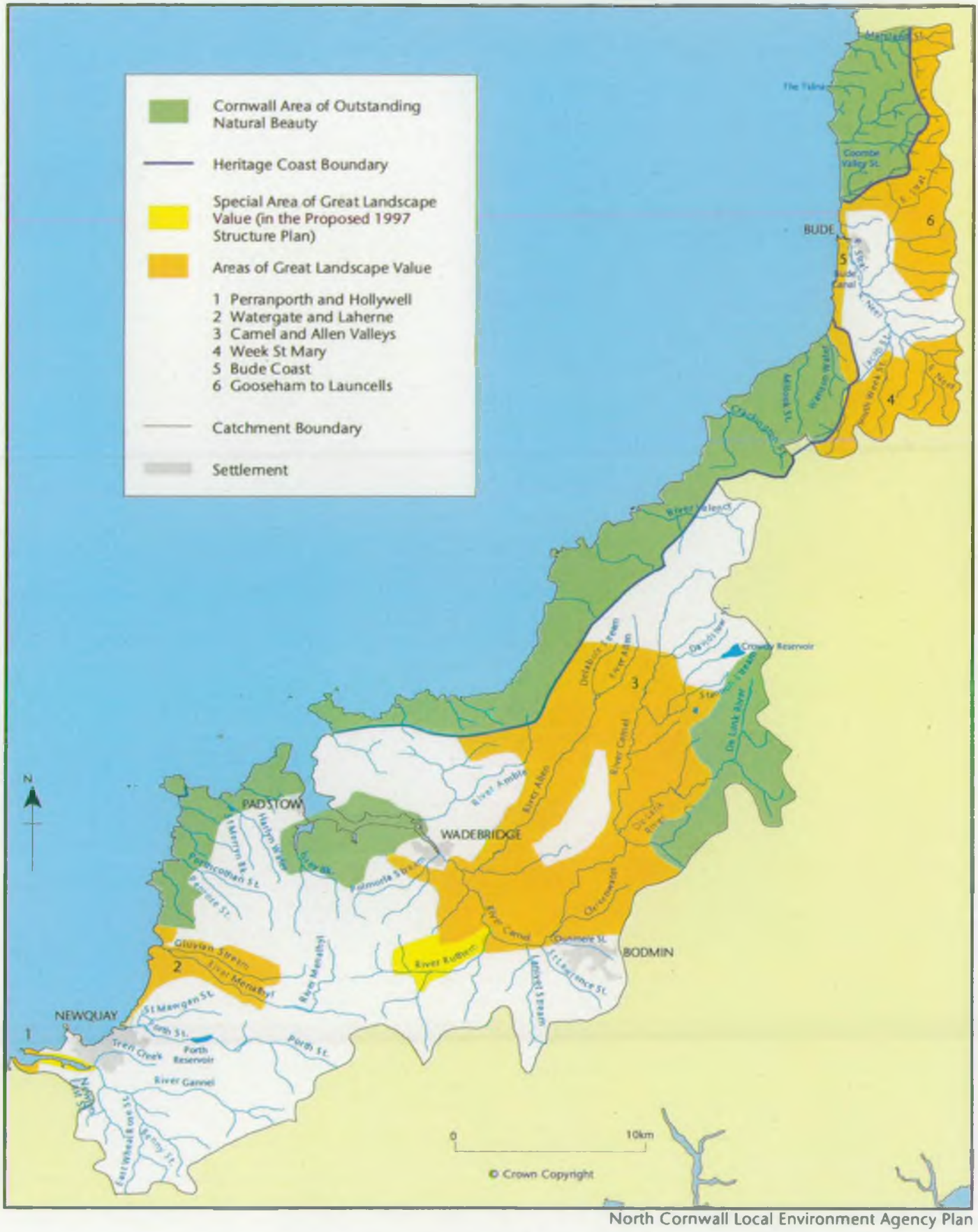
Hydrometric gauging

The Environment Agency hydrometric network is shown on Map 18. The 3 river gauging stations take river level/flow measurements every 15 minutes. Average flows, catchment areas and length of records at the gauging stations are shown in Table 4. In addition to the gauging stations, data exists from spot measurements taken at locations throughout the catchment. A network of 12 rain-gauges provide good coverage of the catchment (see Map 18). Annual rainfall totals at rain-gauge sites vary from 880 mm on the coast to 1567 mm on Bodmin Moor (1961-90 Long Term Average). There are no groundwater monitoring sites within the catchment.

Table 4: Hydrometric Gauging Stations

Station	River	NGR	Start Date	Catchment Area (km^2)	Gauged Average Daily Flow (cumecs)
De Lank	De Lank	SX 133 766	23.11.66	22	0.742
Denby	Camel	SX 017 682	11.8.64	209	5.993
Gwills	Gannel	SW 829 593	01.12.69	41	0.696

Map 5 - Landscape Designations



North Cornwall Local Environment Agency Plan

Conservation - Landscape, Wildlife and Historic Environment

In fulfilling all our functions we must 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. An important part of our work is to influence land use planners and land managers to look after rivers and wetlands sensitively.

Landscape - designated areas

Area of Outstanding Natural Beauty (AONB) - Virtually the whole of the coastline here, the Camel Estuary and Bodmin Moor are within the Cornwall AONB. These landscapes are of national significance and are afforded special protection from development by planning authorities.

Heritage Coast - Trevose Head, the coastline from Pentire Head to Widemouth Bay and the coast north of Bude are designated Heritage Coast. This is a national designation applied to coastlines with a rich landscape, conservation and recreation resource.

Special Areas of Great Landscape Value (SAGLV) - Trenance Point and the Camel Valley upstream of Wadebridge are designated SAGLV. This is a County designation given to landscapes felt locally to be as valuable as AONBs. These areas are afforded protection through the County Structure Plan.

Areas of Great Landscape Value (AGLV) - A number of parts of the catchment are designated AGLV. This is a County designation given to areas with landscape of a high quality, but not quite meeting the criteria of AONB or SAGLV. Protection of these areas is afforded through the County Structure Plan

Wildlife - designated areas

Special Areas of Conservation (SACs) - SACs are currently being proposed across the European Union member states to protect the habitats and species of prime conservation importance within the EU. Three sites are being proposed in this catchment. The coastline from Tintagel to Marsland, which contains vegetated sea cliffs of high conservation value, is already a candidate SAC.

The Camel has been proposed for its importance as it contains a significant population of otter and bullhead, a range of important/rare habitats, high water quality and good fish stocks. The SAC will include the Rivers Camel, Ruthern, Allen and De Lank. The SAC also contains good populations of Atlantic salmon, brook lamprey and sea lamprey, all fish on Annex 2 of the EC Species and Habitats Directive and sea trout. (See Map 2).

Newlyn Downs SSSI has been proposed as a possible SAC because of the occurrence of wet heath with Dorset Heath and cross leaved heath.

The Agency is a Competent Authority in relation to SACs. A competent authority is any public body or public office exercising legislative powers on land or sea. In addition to general management and regulatory functions the Agency, as competent authority has a statutory function to make decisions on applications for consents, authorisations, licences and permissions governed by statute. In terms of the Habitats Directive these will need to be assessed to ensure they do not have a significant effect, either alone, or in combination on the features for which the site was identified.

Sites of Special Scientific Interest (SSSIs) - SSSIs are recognised as nationally important sites, and are afforded specific protection through legislation. Within the catchment there are 23 SSSIs covering a variety of habitats - see Appendix A for details. A number of the sites have been designated wholly or partly for geological reasons - a reflection of the area's complex geology and the importance of the coastal exposures.

Map 6 - Conservation Designations

North Cornwall Local Environment Agency Plan

River Camel Valley and Tributaries proposed SSSI - English Nature are consulting landowners over this proposed SSSI. The Rivers Camel, Allen and their tributaries and their associated unspoilt river corridors are of outstanding importance for wildlife. The site has otter, bullhead, pearl bordered fritillary, woodland, river, wet meadow, fen and heath interests. The proposed SSSI includes the De Lank river which has been identified as one of 27 proposed national river SSSIs; rivers which are outstanding examples of their type.

Under the terms of a Memorandum of Understanding signed between English Nature and the Agency we will agree a Conservation Strategy and a Consenting Protocol. The protocol will establish respective responsibilities, clarify procedures with landowners and reduce bureaucracy with regard to activities which require authorisation by the Agency or English Nature.

Areas of Great Scientific Value (AGSVs) - There are several AGSVs in the catchment. The AGSV designation recognises that important sites such as SSSIs cannot be sustained effectively as isolated islands and seeks to provide (through County Structure Plan) buffer zones around sites, wildlife corridors to link sites, and emphasise the most important areas of nature conservation to concentrate resources.

Cornwall Nature Conservation Sites (CNC Sites) - CNC Sites are identified by the Cornwall Wildlife Trust as sites of county importance for wildlife, but are not afforded statutory protection. As with SSSIs we would not normally issue an authorisation which would damage a CNC site.

Local Nature Reserves (LNRs) - This is a statutory designation given to sites which are of at least local wildlife importance, where management is carried out by the District Council to enable the public to gain a better understanding of wildlife and the countryside. In this catchment Bude Marshes and Bodmin Beacon have been designated.

Polzeath Voluntary Marine Nature Reserve - This is a part of the Camel Estuary which is utilised particularly for the study of coastal and marine wildlife. An advisory group oversees management and events at the site.

A high proportion of the coastline of this catchment is under the protective ownership of the National Trust, who carry out conservation and amenity management.

Biodiversity

Biodiversity quite simply refers to the variety of life on Earth. We are losing biodiversity. We have lost over 100 species in the UK this century; globally half of all species of birds and mammals could be extinct within the next thirty years.

The conservation and enhancement of biodiversity must be integrated into all our decision-making. Targets need to be set to prevent further loss and guide recovery.

The recently published document 'Biodiversity: the UK Steering Group Report'[vii] contains costed targets and actions for the protection and restoration of priority habitats and species up to the years 2000 and 2010. Regional and County Biodiversity Action Plans (BAP) will give the local focus. 'The Biodiversity of the South West: An Audit of the South West Biological Resource' has been produced by a partnership of organisations - the County Wildlife Trusts, RSPB and the Regional Planning Conference.

The Agency serves on the working group which is developing a Biodiversity plan for Cornwall for a wider Steering Group, covering all environmental interests in the county. Cornwall's Biodiversity Audit and Priorities Volume was published in June 1997. For some species and habitats the Environment Agency is identified as being the co-ordinating body (sometimes jointly) for a number of Action Plans. These are all linked to the water environment, reflecting previous involvement and expertise. Additionally, we are identified as having a role to play in the delivery of Action Plans for other habitats and species. Habitats and species which are considered to be under particular threat,

or of particular importance found within the plan area include: otters, estuaries, saltmarsh, maritime cliff and slope and sand dunes.

A survey by the Cornwall Wildlife Trust in 1994/95 showed levels of semi-natural habitat in the river corridor of between 53% to 79%. These very high levels of a variety of semi-natural habitats can be expected to support a great variety of plants and wildlife and are therefore of great importance for biodiversity. Work by the Cornwall Wildlife Trust in the Cornwall Biodiversity Vol I: Audit and Priorities shows habitat change and the reasons for change. Such information will be used in the planning and management process.

The Southern Damselfly is one rare species for which the Agency is the national lead organisation charged with guiding its conservation under the Biodiversity Action Planning process. On behalf of the Agency, field naturalists from the Cornwall Dragonfly Group will be surveying sites in the catchment as this rare species is possibly present there.

The De Lank River is noted for its diverse and abundant flora and fauna. The invertebrate fauna is species rich, particularly in caddis which include the rare Ylodes sumulans. Nationally scarce species include the water beetle Stictonectes lepidus and the meniscus midge Dixella filicornis.

Historic environment

Scheduled Ancient Monuments (SAMs) - There are numerous SAMs within the catchment: SAMs are of national importance, protected in law. English Heritage advises the Secretary of State for the Department of National Heritage on matters relating to SAMs. They are given full consideration by the Agency in any relevant applications. There are also many more unscheduled monuments that could be of national, regional or local importance.

Areas of Great Historic Value (AGHV) - Bodmin Moor, St Breock Downs and several areas of coastline have been designated AGHV by the County Council in recognition of the concentration of archaeological remains found there. Protection is afforded through the County Structure Plan.

Historic Settlements - These are of county importance for archaeological conservation, both above and below ground. As with AGHVs, these are afforded special protection in the County Structure Plan. There are seven Historic Settlements. They are: parts of Bodmin, Wadebridge, Padstow, Tintagel, Bossiney, Boscastle and Camelford.

Listed Buildings - There are numerous listed buildings within the catchment which are considered of county importance. Records are kept by District and County Councils and protection is offered through the planning system.

The Environment Agency checks that any 'in-house' developments or operations, or anything we authorise, do not impact on listed buildings.

The Agency has funded an archaeological assessment of Camel Estuary. A desk study, has been completed but not yet published.

Freshwater Biology

We monitor the ecological quality of rivers by sampling the benthic aquatic macro invertebrates. These are the small animals that live in river sediments or on stones in the river. They are unable to move far and so are affected by the long term conditions in the river. We use this biological information to classify rivers as follows:

We collect samples from the river during spring, summer and/or autumn and we list the different families or taxa of macro invertebrates found. We then use the Biological Monitoring Working Party (BMWP) system to assign a score to each family. This score reflects the tolerance of a particular family to pollution. We then use this information to calculate the Average Score Per Taxon (ASPT) which varies according to the levels of pollution in the river. We then compare the number of families found and the ASPT value to predicted scores for an unpolluted river using a computer model called the River Invertebrate Prediction and Classification System (RIVPACS) developed by the Institute of Freshwater Ecology. The ratio of observed and predicted ASPT and number of taxa (N-taxa) is called the Environmental Quality Index (EQI) and is used to classify rivers as follows:

Table 5 : Biological classification

Biological Class	Description	River Lengths (km)
a	Very Good	158.6
b	Good	39.9
c	Fairly Good	10.8
d	Fair	0
e	Poor	0
f	Bad	0

Two new methods have been developed which uses plants and diatoms as indicators of nutrient status. The Macrophyte Trophic Rank (MTR) recognises that nutrients can influence the distribution and abundance of plant species. Using plant identification we have a quick reliable indicator which can direct further investigation. A range of plants have been awarded scores based on their sensitivity to nutrient enrichment. At each site, a 100 m survey of plant distribution is recorded and the diversity and abundance used to calculate an MTR score. This can then be compared with other scores within the catchment to determine sources of nutrient enrichment.

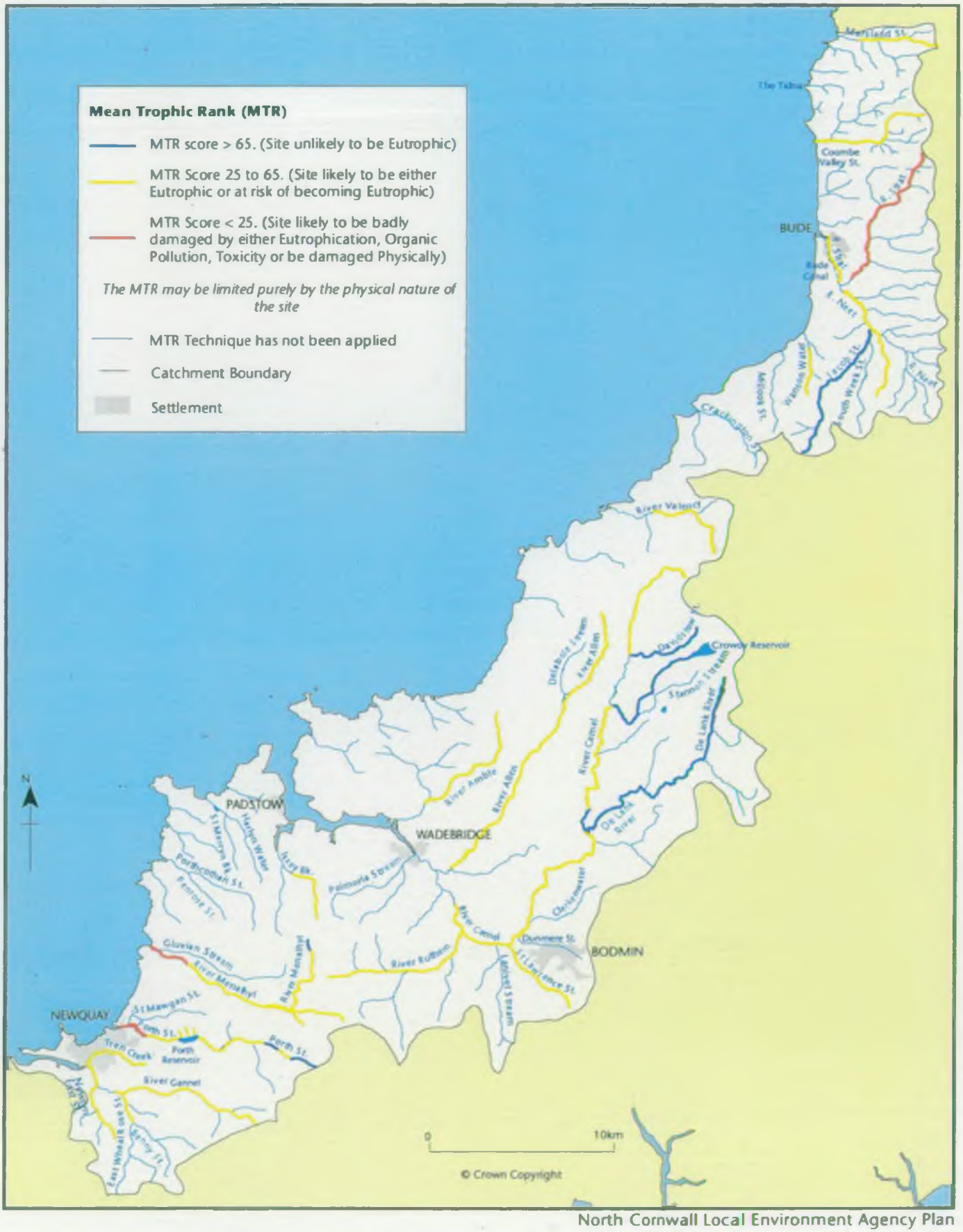
Diatoms, which are a variety of algae, can also be used in a similar fashion. The Trophic Diatom Index is used to classify sites based on the abundance and distribution of diatoms, which are collected from the surface of submerged objects in the spring and autumn when diatoms naturally form blooms.

During spring, summer and autumn 1997 we carried out an intensive biological survey of the catchment, including Macrophyte Trophic Ranking and Diatom surveys.

Map 7 - Biological Classification

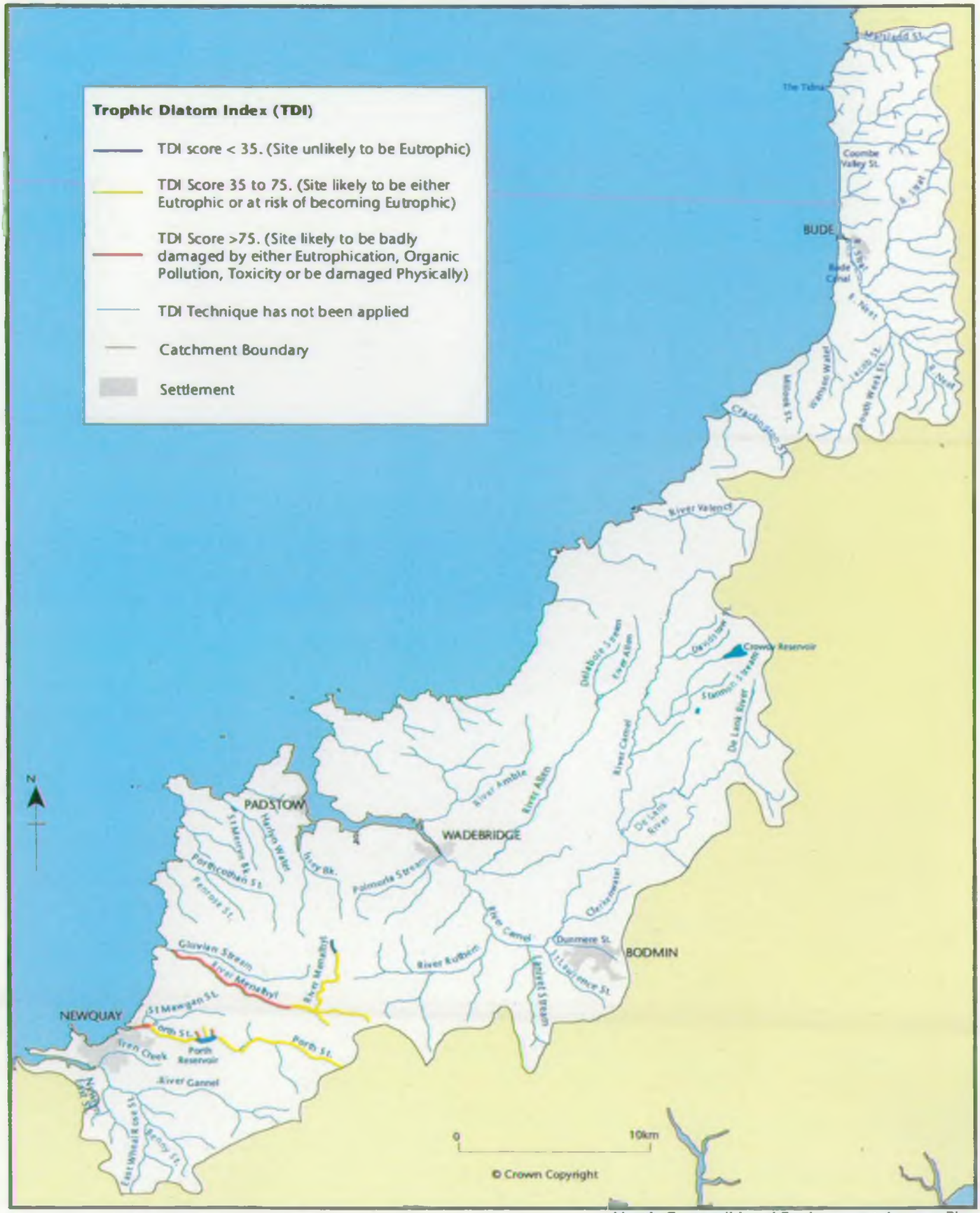
North Cornwall Local Environment Agency Plan

Map 8 - Biological Classification - Mean Trophic Rank



North Cornwall Local Environment Agency Plan

Map 9 - Biological Classification - Trophic Diatom Index



North Cornwall Local Environment Agency Plan

Fisheries

The catchment contains riverine salmonid fisheries, lake based coarse and game fisheries and a coarse fishery on the Bude canal. In particular the River Camel has a renowned Atlantic salmon and sea trout rod fishery and supports seven licensed estuary netsmen.

Fisheries surveys

The catchment contains a variety of fish species within the rivers. We have carried out fish surveys on the majority of larger rivers and streams (over 5 km in length), see Table 6. Historical results for rivers within this LEAP are available on request from the Bodmin Area Office.

Table 6: Freshwater fish species within the catchment

River/Stream	Salmon ★	Brown and sea trout	Lamprey ★	Eel	Bullhead ★	Minnow	Stone loach	Three spined stickleback
Gannel	×	✓ ✓	✓	✓	✓	×	×	×
Porth	×	✓ ✓	✓	✓	×	✓	×	×
Menalhyl	×	✓ ✓	✓	✓	×	✓	×	✓ (1986)
Issey Brook	P	✓ ✓	×	✓	×	×	×	×
Polmorla	⍼ P	⍼✓ ✓	×	✓	×	×	×	×
Camel	✓	✓ ✓	✓	✓	✓	✓	P	P
Allen	✓	✓ ✓	✓	✓	✓	✓ (1991)	✓ (1991)	✓ (1991)
Amble	⍼ P	⍼✓ ✓	✓	✓	×	✓	×	✓
Rocky Valley	□ ×	□ *		✓	×	×	×	×
Valency	P	✓ ✓	✓	✓	✓	×	×	×
Neet	×	✓ ✓	✓	✓	✓	✓	✓	×
Strat	×	✓ ✓	✓	✓	✓	✓	✓	×

Key

★	Denotes European Community Habitats Directive listed species
✓	Species present and self sustaining
*	Only brown trout present
✓ ✓	Both brown and sea trout present
P	Species present but unknown if self sustaining
×	Species not recorded from fishery surveys
□	Natural obstruction prevents adult migratory salmonid migration
⍼	Man-made obstruction impedes adult salmonid migration
(1991)	Year species was last recorded, if not found in most recent survey

Bude Canal

Species identified in surveys and also known to be present from angling records include: eel, trout, carp, perch, dace, rudd, roach, tench, minnow, crucian carp, three spined stickleback, gudgeon, and flounder. An additional fish species recorded within Bude Canal prior to 1972 (Maitland 1972) was the Ruffe. There appear to be no more recent records of this species and it has not been identified anywhere else in Cornish rivers or lakes.

Map 10 - Fisheries

North Cornwall Local Environment Agency Plan

Juvenile Salmonid production

Spawning targets are being set for each principal salmon river in England and Wales. These are set using a Nationally agreed formula and based on rod catch data. The aim is to set a target which reflects the Minimum Biological Acceptable Level (MBAL) to sustain a salmon population. The targets are expressed in the number of eggs required to be deposited per 100 m^2. For the River Camel, the target is 287 eggs/100 m^2 which equates to 1.2 million eggs. During 1998/99 we will produce a Salmon Action Plan for the River Camel addressing salmon stock management in much greater detail.

For the period 1991 to 1995 the River Camel exceeded its egg deposition target on the basis of work and data currently available.

Spawning areas

Salmonids require clean gravels, with a continuous flow of well oxygenated water to excavate a redd, and spawn. Generally most rivers and streams throughout the LEAP area support salmonids, and will have spawning areas wherever suitable instream conditions are found. Brown trout are the most commonly distributed salmonids, primarily because many rivers and streams are inaccessible to migratory sea trout and salmon. It should be noted that as juveniles brown trout and sea trout cannot be differentiated.

The River Camel is highly productive for salmon and sea trout. Trout spawn throughout the catchment. The distribution of salmon fry indicates that salmon are more restricted and have not been recorded in some areas of the upper Camel, Clerkenwater, Crowdy, St Lawrence and Lanivet Streams. In addition salmon and sea trout are unable to spawn on the majority of the De Lank, because of in-stream obstructions from the quarry works. Salmon fry are generally not recorded as high upstream as trout on all tributaries.

The River Allen is extremely productive for both juvenile trout and salmon, with the highest recorded fry densities of rivers in Cornwall. Salmon and trout fry have been recorded at all sites, with the exception of no salmon fry being recorded on the Trewalder Stream.

Brown trout are ubiquitous throughout the area. Established populations have been recorded on all surveyed streams (see Map 10).

It is likely that other un-surveyed streams support populations within the area. Sea trout are more restricted than brown trout, as many of the North Coast streams have obstructions impeding the passage of migratory salmonids (see Map 10).

We are currently implementing a National Fisheries Classification scheme following a research and development project which will help enable us to set salmonid fisheries targets for rivers in the catchment. The methodology also allows us to view the productivity of the rivers in a National context. The most recent survey data (1994) for the Camel and Allen have been categorised against the methodology (see Appendix B, page 117). The classification shows that both the Camel and Allen are amongst the most productive rivers in Cornwall and the South West for salmon and trout production. This puts them as some of the most productive in England. This productivity is a result of sufficient water flows, high water quality and good habitat. These important rivers should be protected, see Issue 2.

Trends in abundance of adult salmonids

Currently the only way to assess abundance of adult stock is through catch return data from the rod and net fisheries. Juvenile survey data enables monitoring of the potential availability of future returning adults and spawning utilisation of the catchment.

Spring run multi-sea winter salmon have never been abundant in the River Camel. The stock is dominated by small summer salmon and grilse, particularly late run grilse. The slight increase in rod catches in September to November and the decline in average weight suggests that grilse are becoming more dominant.

The nets and rods exploit different components of the sea trout stock with nets taking older and larger fish. Current trends suggest that the nets are exploiting fewer large old fish, whilst the exploitation by the rods of smaller younger fish does not seem to have changed.

Net fishery: Camel Estuary

The Camel Estuary sustains an important net fishery, supporting seven licensed netsmen and is the only licenced drift net fishery for salmon and sea trout on the North Coast of Cornwall. The netting season is from 1st March to the 31st August inclusive. A weekly closed period for netting operates from 6am Saturday to 6am Monday throughout the season. The Net Limitation Order (NLO), due for renewal 1997, has been proposed to keep the number of nets at its present level. MAFF will make the final decision on the NLO.

Declared catches of salmon have varied considerably since records began in the 1950s (see Appendix B, page 117). Some of this will be due to a variation in fishing effort. Reported catches were low until the early 1970s when a rapid and uncontrolled escalation in the number of nets led to a tenfold increase in the reported catch. A Net Limitation Order was introduced in 1978 which has stabilised effort to the current seven licences. Since 1978 there has been no annual trend apparent in the declared catch. Peak netted salmon catches usually occur during July and August. Netsmen were paid not to fish during the period 1989 to 1991, following the Lowermoor pollution incident.

The reported net catch of sea trout also shows wide variation. Catches declined in the early 1970s and rose to a peak in the mid 1970s. Since then there has been a decline. Generally there is no monthly trend for catches. However in recent years catches have peaked in July.

Rod fishery

Juvenile salmon have been recorded on various streams within the catchment. However, the Rivers Camel and Allen support the only rod fishery for adult salmon. The fishery is important in the South West Region of the Agency with the third highest catch for salmon and fourth highest sea trout catch recorded during 1995. The main areas for salmon fishing are on the middle to lower reaches of the Camel and Allen.

Grilse make up the majority of the salmon catch. There is no obvious trend in the total annual catch since 1959. The majority (51%) of salmon are caught during November and December.

Similarly the sea trout catch has varied widely, showing no obvious trends. The majority of sea trout are caught in July and August.

Sea trout have also been recorded in catches from the Gannel, Menalhyl, Porth River, Valency and the Strat and Neet.

Within the catchment the fishing seasons vary and are listed in the Byelaws section.

Impact of major pollution incidents

Lowermoor incident

On 6th July 1988 a major pollution occurred on the River Camel resulting in the death of approximately 40,000 to 60,000 juvenile salmonids on the Rivers Camel, Allen and Trewalder Stream. A detailed survey of the environmental damage and long term effects on fish stocks was then initiated. As a result of this survey a comprehensive three year rehabilitation plan was drawn up for the recovery of the fish stocks, aimed at increasing the escapement of fish upstream to spawn, thereby allowing the natural recovery of the genetic Camel stock. The main points addressed were:

- Compensating the 7 licensed nets not to fish for 3 years
- Increased anti-poaching effort to reduce the numbers of salmon taken illegally
- Rehabilitation of silted spawning gravels to increase spawning productivity
- Installation of a fish pass at Camelford Weir and Allensford

Additional voluntary restrictions were agreed with the River Camel Fisheries Association including bag limits, no selling of fish on a commercial basis, sanctuary areas and no angling before May. These restrictions have continued to date.

It appears that these measures have been successful in restoring fish stocks to at least pre-incident levels.

Farm pollution

On 30th August 1994 a major pollution occurred on the upper River Camel resulting in the loss of 5500 to 8200 juvenile salmonids in an area particularly important for trout production.

Follow up fisheries surveys identified extremely good densities of trout fry and parr upstream of the source of the pollution and these fish were expected to help recolonise the affected stretch. Evidence of strong trout year classes in 1991 and 1994 throughout the remainder of the Camel catchment should remove any long term effect on the trout stock. The 1997 fisheries survey will give a better indication of recolonisation after the pollution. The results of these surveys will be available in spring 1998.

Introductions and escapees

During the most recent extensive survey of the River Camel and North Coast streams in 1994, rainbow trout were recorded in the Camel, Allen, Rocky Valley and Valency Streams. Perch were recorded in the River Camel and Menalhyl Stream. Other species recorded during previous surveys include rudd, roach and goldfish, found in the Gannel, Camel and Allen respectively. None of these species are indigenous to the catchment. They are most likely to have escaped from local fish farms or private ponds within the catchment. Such introductions pose a threat to existing species, through the risk of the introduction of diseases and parasites, as well as possible predation and interspecific competition.

Stocking

There have been various stocking of salmon and trout of different origins into the Camel, Allen, De Lank and Menalhyl. It should be noted that the Camel recovery plan was successful without stocking.

Obstructions to migratory fish

Throughout the catchment there are numerous obstructions to the free passage of migratory fish (see Map 10). The degree of impact varies from passable (but difficult) to impassable. Access cannot be improved at some obstructions, such as Crowdy Dam. However, there are others which we would like to investigate the potential to improve passage, see Issue 3.

Legislative controls in estuaries

Sea fisheries in the estuarine and coastal waters of England and Wales, out to 6 miles, are regulated by Sea Fisheries Committees (SFC) established under the Sea Fisheries Regulation Act 1966 and, in the case of migratory salmonid stocks by the Environment Agency. Outside the estuaries Cornwall Sea Fisheries Committee (CSFC) has regulatory powers relating to sea fish.

The Environment Agency is the Sea Fisheries Authority in the Camel and Gannel Estuaries and has many byelaws regulating sea fisheries, in addition to migratory salmonid regulations (see Appendix B). We restrict the use of nets with the Salmon and Freshwater Fisheries Act 1975 (SFFA 1975) Section 6(1) as amended by the Salmon Act 1986 (SA 1986) Section 33. These sections prohibit the use of fixed engines. Section 27 of SFFA 1975 also prohibits the use of any net to fish for salmon, sea trout or freshwater fish unless licensed.

SFFA 1975 also places many restrictions on the use of rod and line as do the numerous rod fishery byelaws.

Within Environment Agency Sea Fisheries Authority Areas (see Map 10) other estuary legislation exists. This includes Cornwall River Authority Sea Fishery Byelaw - Attended Draft and Seine Nets. No

person shall use in fishing for sea fish any draft or seine net having a mesh size of less dimensions than 1½ inch from knot to knot, or six inches round measured when wet.

Two additional netting restrictions apply which prohibits the use of nets during the months May to December inshore of a line from the westernmost extremity of Trebetherick Point to the seaward extremity of Stepper Point. No person shall use any kind of trawl net or trammel net in fishing for sea fish between 1st December and 1st April inclusive.

Bass legislation

In 1990 MAFF implemented a strategy for the conservation and management of the bass fishery. The strategy involves:

- A minimum landing size for bass of 36 cm. This applies to both commercial fishermen and anglers.
- Restrictions on the use of gill and similar nets.
- A prohibition on bass fishing from any vessel inside the nursery areas for all or part of the year. The bass nursery areas are shown on Map 10. In the CSFC area (outside the estuary) a byelaw prohibits the landing of bass below 37.5 cm.

Although the above regulations legally protect juvenile bass within the nursery areas it is difficult to prove that juvenile bass survival has greatly improved.

The bass nursery area within the Camel Estuary operates between 1 May and 30 November. Illegal netting of undersized bass still occurs within these sanctuary areas. Policing of the estuaries is actively carried out by the Environment Agency.

The Camel Estuary Management Plan contains the objectives of increasing awareness of rules and regulations governing fishing within the estuary, and we will be involved in carrying this out.

A guide to Agency estuary and coastal fisheries legislation in Cornwall is currently being produced. Copies will be available from our Bodmin office.

Coastal legislation

Restricted areas for surface fixed nets exist to protect salmonids migrating around the coast prior to entering estuaries and rivers. These prohibit the use of any net that is less than 3 metres below the surface at any state of the tide. Restricted areas are shown on Map 10 .

Within Area 1 on the landward side of a line from Merope Rocks to Cataclews Point and thence to Roundhole Point, a fixed engine may be used between 10 October and 31 December and 1 January and 31 March within 3 metres of the surface. Therefore this area is excluded from the surface fixed net restricted area. These regulations are actively policed by the Environment Agency.

Byelaws

The catchment fisheries are protected by many byelaws. A full list is available from the Fisheries Department. Table 7 shows the rod fishing open seasons i.e. the period when it is permitted to fish in the river.

Table 7: Rod fishing open seasons

Species	Open Season
Atlantic Salmon	1 April - 15 Dec
Migratory trout (Sea trout)	1 April - 30 September
Non-migratory trout (Brown trout)	1 April - 30 September
Rainbow trout	1 April - 30 September
Coarse fish/eels	16 June - 14 March

Within enclosed still waters there is no coarse fish, eel or rainbow trout close season unless one is imposed by clubs or fishery owners; as in the case of Bude Canal where the Bude Canal Fishing Assocation have a closed period during April and May.

The Environment Act 1995 allows fisheries regulators to make byelaws to control fisheries for environmental reasons as well as for fisheries management. The duty to have regard to the conservation of marine flora and fauna from the Sea Fisheries (Wildlife Conservation) Act 1992 remains, thus conservation implications must be considered for fisheries management byelaws as well as for environmental ones.

Habitat Improvement

Habitat improvements have focused on the Camel system, starting through the Camel recovery programme. Projects completed to date include:

- Fish passes at Camelford, Allensford and Waterloo Stream (3 jump pools)
- Gravel cleaning at the top end of the Camel, where spawning areas are cleaned annually. Techniques will be reviewed with the possibility of extending the programme
- Fencing of banks to protect from erosion caused by livestock
- Trash dam clearance is ongoing following routine surveys
- Smolt gate installation at Kenningstock Mill to allow smolts to escape from the leat and continue downstream.

Estuarine fisheries

The camel estuary is an important bass nursery area as well as other marine species. Coastal areas of the catchment also support many marine fish species, some of which are commercially important. Cornwall Sea Fisheries and MAFF are the regulatory bodies outside the estuaries and set restrictions, such as minimum landing sizes and netmesh sizes.

Shellfisheries

There are established shellfish beds for Pacific oysters, mussels and cockles within the Camel Estuary. The operation of shellfish beds requires the lease of the sea bed from the owner of the fundus (the channel bed below high water mark). Additionally to protect the shellfish beds from other activities which may be damaging to cultivation, 'Several' or 'Regulating' Orders may be sought. Both are granted by government, after application to MAFF, and give protection for specified species and areas for a number of years. In 1996 there was extensive dredging for cockles in new areas which are not covered by any Orders or licences and which caused local concern, see page 21.

Abstraction and Water Supply

Our management of water resources is guided by the European Union and UK legislation. We have duties and powers to:

- ensure that water is used properly, regulating abstractions using licences
- conserve water supplies and protect them from over use.

The role of South West Water

Public water supplies are provided by water companies such as South West Water (SWW). They have duties to:

- provide mains water
- ensure water is of suitable quality
- meet demand.

Environment Agency policies and activities

We have adopted a range of key policies in order to fulfil our statutory duties. Foremost amongst these are:

- Sustainable Development: Ensuring that there will be no long-term deterioration in the water environment due to water resources development and use
- Precautionary Principle: Making sure that decisions made and measures implemented err on the safe side of caution if significant environmental damage may occur, or if knowledge on the matter is incomplete
- Demand Management and Better Use: Ensuring due attention has been given to the management and conservation of water resources by measures to control waste and manage demand and to make best use of existing resources, before licensing the development of additional sources.

Local Perspective

The natural resource

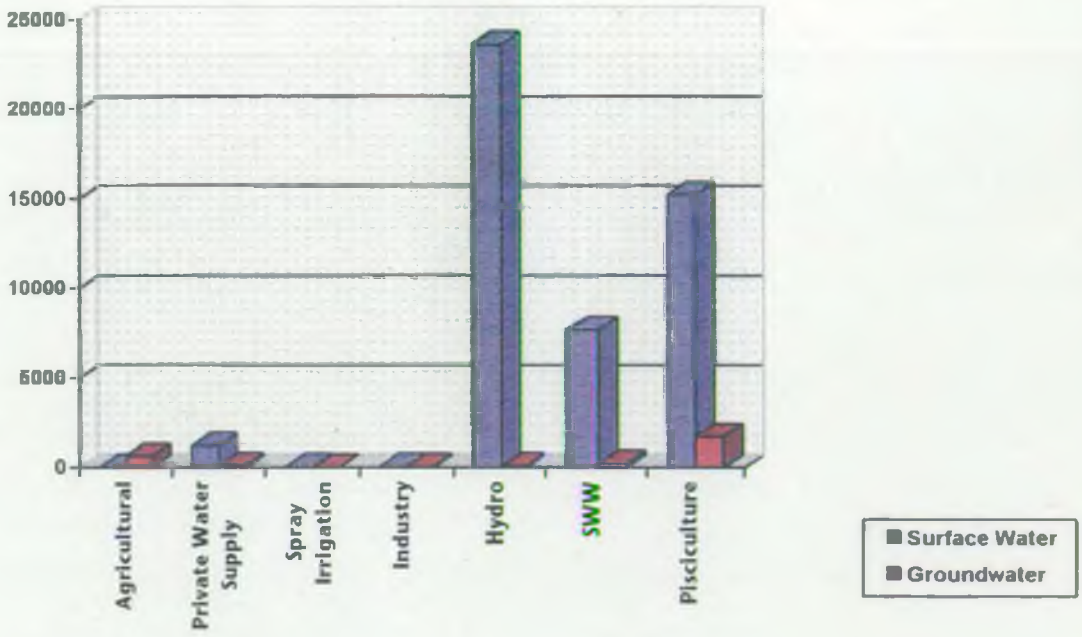
On average the total quantity of water available in the catchment is of the order of 485,000 Mlyr. This water represents the proportion of rainfall not evaporated or taken up by plants.

Current licensed abstraction

In the catchment there are currently 38 licensed surface water and 375 licensed groundwater abstractions for public water supply and for private water use. The latter includes the supply of water for some private dwellings, industrial use, agriculture, fish farming and amenity purposes. The annual total of water which is authorised to be abstracted from the catchment is 50,776 Megalitres/year (Ml/y), 47,910 Ml from surface waters and 2,866 Ml from groundwater sources (1Ml = 1 million litres).

The total volume licensed for abstraction therefore represents 10%, on average, of the total available natural resource. However, this is a distortion of actual resource consumption. In reality many abstractors take less than their authorised quantity and abstracted water is often returned to the catchment and is available for re-use.

Figure 1: Annual licensed abstraction



Licensed abstractions can either be consumptive or non-consumptive. Consumptive abstractions use most of the abstracted water with little returned to the original point of abstraction. Examples are public water supply, industrial processing and spray irrigation. Non-consumptive abstractions use only a small proportion of the abstracted water and return the remainder to the vicinity of the abstraction point. Examples include fish farming, hydropower generation and amenity features such as ornamental lakes.

Public water supply

Abstractions for public water supply represent 16% of surface water and 8% of groundwater total annual licensed volume in this catchment. The sole provider of supplies to the catchment is South West Water (SWW).

The Company's total supply area is split into three Strategic Supply Areas (SSA), each dependant on a large strategic reservoir which augment smaller, local sources. The majority of this catchment lies within the Colliford SSA. The SSA is served by a complex water supply system, based principally on Colliford Lake, which in conjunction with other reservoirs and river abstractions is used to supply Cornwall.

The sources available to SWW in the catchment are used to meet local demands and are supported by imports of water from Colliford lake and the River Fowey via the Cornwall Spine Main. Demands in the north eastern area of the catchment, centred around Bude, are supplied by Tamar Lakes, and potentially Meldon and Roadford reservoirs in the Roadford SSA, also operated by SWW.

There are four public water supply licences within the catchment with a total annual authorised abstraction of 7932.45 Ml. As the table below shows, surface abstractions comprise the vast bulk of the licensed resources available to SWW.

Table 8: Abstractions

Source	Daily Licensed Quantity (Ml)	Annual Licensed Quantity (Ml)	Comments
Trewallock Shaft (NGR SW 849 611)	2.27	227.30	
River Porth (Rialton) (NGR SW 848 623)	8.20	2300.31	Subject to a prescribed flow of 0.52 Ml/d (Regulation releases maybe made from Porth Reservoir to support the licensed abstraction from the river at Rialton. Compensation release of 1.59 Ml/d from Porth Reservoir)
Crowdy Reservoir (NGR SX 139 833)	9.09	2204.84	Compensation release of 1.38 Ml/d
Delank River (NGR SX 135 765)	10.00	3200.00	Subject to a prescribed flow of 0.95 Ml/d at intake and 5.70 Ml/d at a point 457 m downstream

The demand for public water supply

The current water supply demand across the Colliford SSA represents 151 Ml/d on average, less than 25 Ml/d is used within this catchment, with demand in the Bude and surrounding area in the order of 8 Ml/d. However, demand can rise significantly during prolonged dry weather, for example the drought year of 1995 when annual average demand for the Colliford SSA rose to 161Ml/d. An influx of holiday makers into the area during the summer months can also lead to increased demands.

The main demand centres are the coastal towns Bude, Padstow and Newquay and further inland Bodmin, Wadebridge, St Columb Major, Camelford and Stratton.

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 operational constraints. The *reliable yield* of a source is the theoretical amount of water that can be physically abstracted during critical dry periods. SWW reliable yield in the catchment is approximately 20 Ml/d, representing 12% of the Colliford SSA reliable yield (166 Ml/d). The reliable yield figures have been reduced by 2.5% to allow for 'outage'. This is an operational allowance for planned and unplanned events which results in the sources being temporarily inoperable.

Current resource - demand balance

Demand in the Colliford SSA is expected to increase from 151 Ml/d to 222 Ml/d by 2021 assuming a high growth rate and 1992 levels of demand management and 183 Ml/d under a low forecast where demand management and leakage control are encouraged. Comparing these forecasts to the current reliable yield of 166 Ml/d indicates that in 2021 under the high growth rate scenario there will be a deficit of 56 Ml/d and under the low growth rate scenario a deficit of 17 Ml/d (see Issue 4).

Further detail and discussion on the management and operation of public water supply within the Colliford SSA can be found in the previously published Seaton, Looe and Fowey Catchment Management Plan (available from the Environment Agency, Bodmin office).

Private water use

Predictions of future growth in non-public water supplies are more difficult to assess than those for public water supply. Water use is influenced by a number of environmental, political, economic and commercial factors.

The Agency must have regard to the reasonable future needs for water for private abstractors. Future abstraction needs will be addressed through the abstraction licensing procedure.

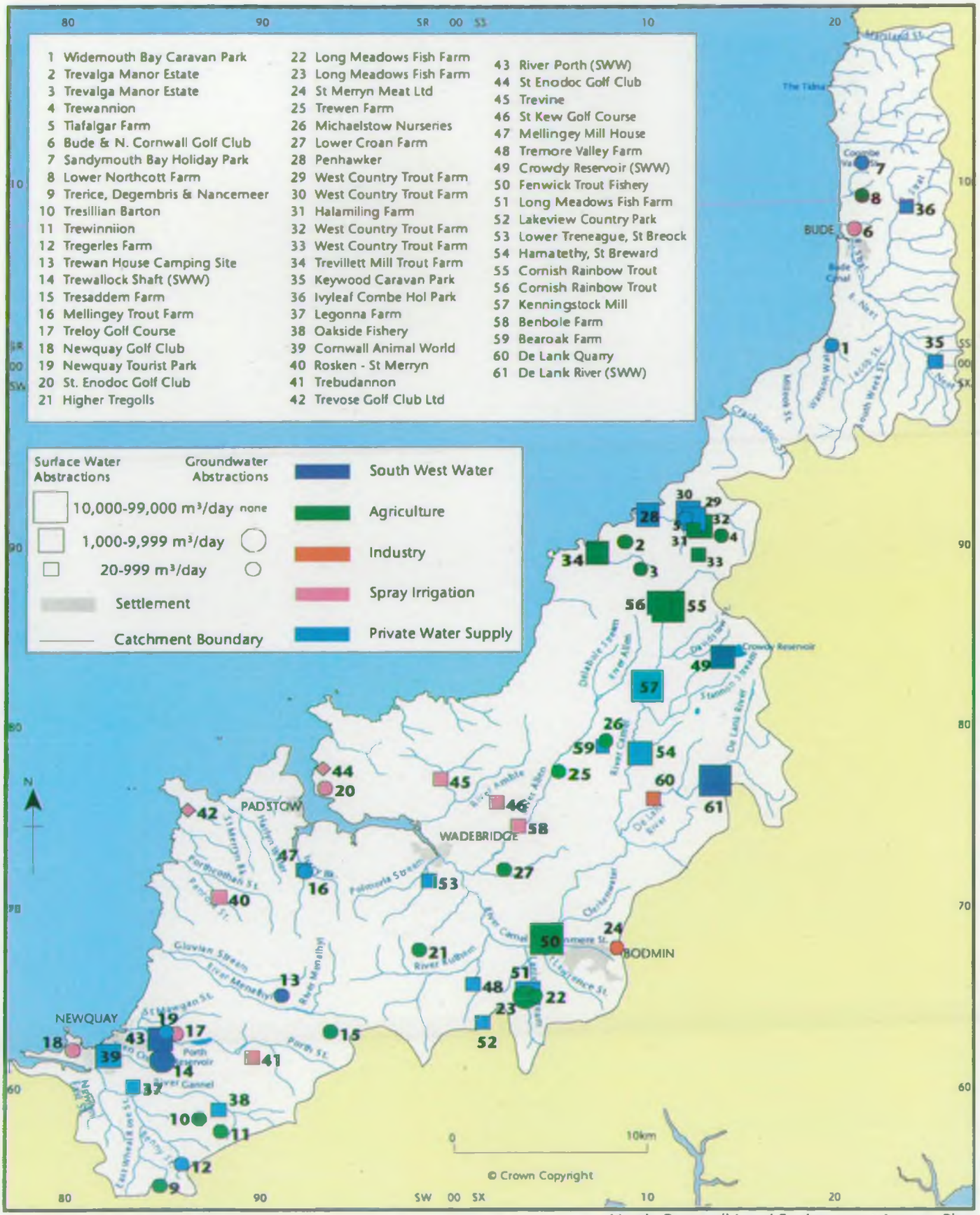
Coping with droughts - public water supplies

The 1995 drought provided a reminder of the value of good distribution interlinkages between supply zones in enabling strategic storage to be used when local resources become stretched. Following experience in 1995, SWW have undertaken a wide range of measures to help make best use of their resources within the Colliford SSA. These include the introduction of compulsory metering for users of sprinklers and/or swimming pools, an enhanced leakage control programme and the provision of a free "hippo bags" to each customer in the Colliford SSA. This is a semi-soft plastic bag which fits inside the cistern of a toilet and reduces the flush volume, effecting a permanent saving in domestic water use. Use is being trialled in the Colliford SSA by SWW, following use by other water companies. If successful it is likely to be used within other Strategic Supply Areas in due course.

The Agency has agreed the basis of the SWW Drought Management Plan for the Colliford SSA with SWW. This establishes a staged programme of water conservation measures to be taken as a drought intensifies. Measures include operational arrangements to minimise wastage of resources, such as maximising the use of river abstractions within licensed limits to conserve storage; demand management such as hosepipe bans; and contingency plans for winter refill of Colliford should storage drop below critical levels.

Water conservation control curves have been developed as part of the drought operating agreement. These enable SWW, its customers, and the Agency to compare the current status of strategic storage in Colliford with green, amber or red states of shortage. The curves show the seriousness of the situation as resources decrease and enable SWW and its customers to see the need for, and benefits of, enhanced demand management and other water conservation actions in maintaining the resources necessary for essential supplies.

Map 11 - Abstractions



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Drought permit

This is a drought authorisation made by the Agency following the successful application by a water undertaker, under powers added to the Water Resources Act 1991 by the Environment Act 1995. Essentially, they enable the Agency to grant a water undertaker a permit to enable an abstraction to take place, or vary the conditions within an existing abstraction licence. This is for six months. As for a Drought Order, the precondition is "that by reason of an exceptional shortage of rain, a serious deficiency in supplies of water in any area exists or is threatened."

Low flows

The Agency is currently committed to a resolving a number of low flow problems in the region. Overall this catchment is not stressed by abstraction. However, 9 sites were identified in the catchment by consultants, Sir William Halcrow and Partners in 1991, where abstractions may be adversely affecting the river environment. None of the identified sites were considered 'serious'. Kenningstock Mill, was ranked as 'major' and Worthyvale Trout Farm (Cornish Rainbow Trout) was ranked as 'significant'. The rest were considered 'minor'.

Water is abstracted into a leat at Kenningstock Mill for hydropower generation. The leat leaves about 500 m of the River Camel deprived of flow during dry weather. As a Licence of Entitlement (LoE) we were unable to impose any conditions on the licence. However, the abstractor has agreed an operating procedure with the Agency which minimises the impact of the abstraction on the river environment. The Worthyvale abstraction, also an LoE, can result in reduced flows in the watercourse.

Map 12 - Public Water Supply Distribution System

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Groundwater Protection

The protection of aquifers from pollution is of great importance since once pollution has occurred it is extremely difficult, if not impossible to clean up, and this will always be expensive. Pollution can put public supplies at risk, and may impact on river water quality where the baseflow is dependent on groundwater.

The Policy and Practice for the Protection of Groundwater (PPPG) (NRA 1992) contains policy statements on the following aspects of groundwater protection:

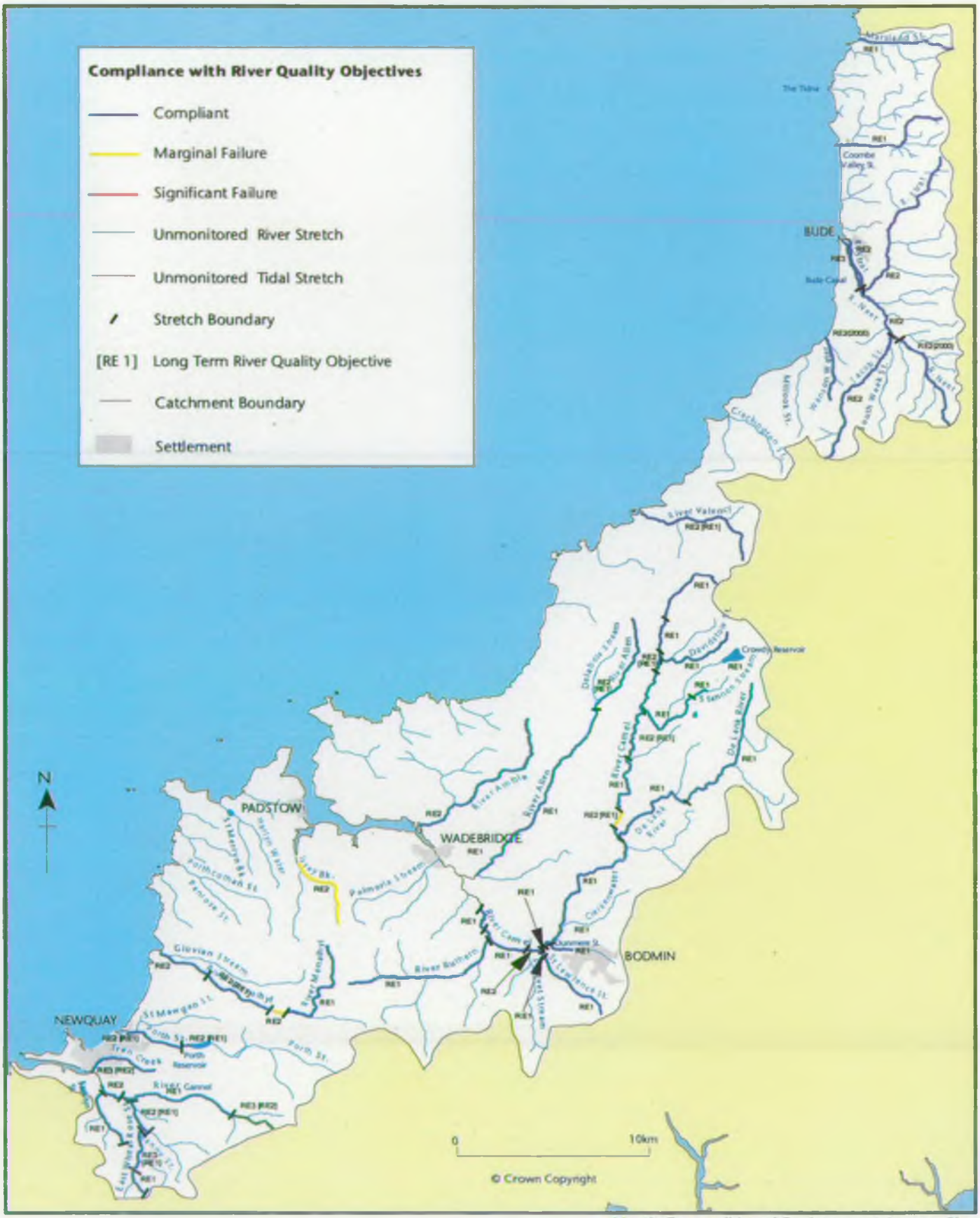
- waste disposal to land
- contaminated land
- disposal of sludges and slurries to land
- discharges to underground strata
- diffuse pollution
- other activities affecting groundwater quality

We commit substantial resources to groundwater protection, and apply our Policy and Practice for the Protection of Groundwater through our own authorisations (integrated pollution control, discharge consents and abstraction licences). We also seek to protect groundwater quality in our role as a statutory consultee to the planning authorities. Many of the policies are not supported by any formal role of the Agency, but rely on us to persuade and educate landowners of the benefits of good practice.

The PPPG is supported by Groundwater Vulnerability Maps and Source Protection Areas. The maps show the location of aquifers and classify their vulnerability according to the properties of the soil and underlying strata. These maps allow planners, developers and regulatory bodies to make better informed judgements on the location of new developments, avoiding potentially polluting activities in high vulnerability areas. The maps for the catchment area will be published in May 1998.

Source Protection Areas are defined for all major groundwater abstractions for supply and other human consumption, and are sub-divided into 3 zones of proximity and hence risk to the source. Local Plans do and will contain policies relating to groundwater protection and Source Protection Areas are being reproduced on the proposals maps. The 3 zones of proximity will never be definitive, but always represent the best information available at the time of drafting. It must not be overlooked that all aquifers need protection, not just those parts supplying abstractions.

Map 13 - 1996 Compliance with Proposed River Quality Objectives



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The Quality of Controlled Waters

River Quality Objectives

The water quality targets that we use for managing river quality are known as River Quality Objectives (RQOs); these are based on the River Ecosystem (RE) classification scheme. The RQOs that we are proposing to set for this catchment are shown on Map 3. Map 13 and Table 9 show where current water quality fails to meet its RQO. This assessment is based on three years of routine monitoring data from the Public Register collected between 1994 and 1996. 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 less certain (between 50% and 95%) that the stretch has failed to meet its RQO.

Of the 49 monitored river stretches (213.4 km) in the Camel and North Cornwall Streams catchment there are 4 stretches (13.5 km of river) which marginally fail to meet their current RQO. We have also assessed whether river stretches meet their long term RQO. There are 6 stretches (16.4 km) which significantly fail to meet their long term RQO, and 3 stretches (12.8 km) which marginally fail to meet their long term RQO.

Table 9: RQO non-compliance

River	Stretch name	Reason for RQO non-compliance	Reason for long term RQO non - compliance	Possible cause
Benny Stream	Benny Mill Bridge - Gannel Confluence		Total Ammonia (significant)	Agriculture see page 27
East Wheal Rose Stream	East Wheal Rose Bridge - Benny Stream Confluence		Total Ammonia (significant)	Wheal Rose Tip - see page 25
Porth Stream	Porth Reservoir - Melancoose		Biochemical Oxygen Demand (BOD) Marginal	Algal problems in the reservoir. Farm runoff contribute to nutrient load - see page 31
Menalhyl	St Columb Major Bridge - Below St Columb STW	BOD (marginal)		St Columb storm sewer overflows - see page 31
Menalhyl	Below St Columb STW - St Mawgan Bridge		BOD (significant)	St Columb storm sewer overflows - see page 31
Camel	Camelford Bridge - Pencarrow		Total Ammonia (significant)	Camelford STW - see page 29
Camel	Wenford - Below Wenford Driers	BOD (marginal)	BOD (significant)	China clay operations - see page 103
Issey Brook	Source - Normal Tidal Limit	BOD (marginal)		Agriculture - see page 27
Allen	Source - Knights Bridge		BOD(marginal)	Agriculture - see page 27
Wanson Water	Source - Mean High Water		Unionised and Total Ammonia (significant) BOD (marginal)	Caravan site discharge - see page 29
Neet	Source - Langford Bridge	BOD (marginal)		Agriculture - see page 27

Map 14 - EC Directives Monitoring

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'Set Aside' of data

In certain circumstances we can 'set aside' data, that is we will not take into account some or all of the results of a particular determinand when we assess compliance with an RQO.

We will set aside data where high concentrations of metals or low pH are caused by the natural geology of the catchment. This allows us to protect good water quality reflected by other parameters in the RE classification.

The table below shows stretches where data is 'set aside' during RE classification.

River	Stretch Name	Stretch Ref. No.	Set Aside
Benny Stream	Trewerry Mill - Gannel	6	Zn
East Wheal Rose	Source - East Wheal	7	Zn, pH
	Benny Bridge - Benny	8	Zn
Allen (Camel)	Source - Knightsmill	28	Zn
De Lank River	Source - Bradford	34	pH

EC Bathing Waters Directive

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

We are responsible for monitoring the quality of identified, popular bathing waters and providing the results to Department of Environment, Transport, Regions (DETR, formerly Department of the Environment) 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.

There are 22 identified EC Bathing Waters in the catchment, shown on Map 14. Table 10 shows which beaches failed to meet the requirements of the Directive, the probable cause(s) and improvements which are required, planned or have been carried out.

At 12 of the 22 sites we monitor freshwater inputs to the bathing waters. We carry out this additional monitoring to help clarify causes of non-compliance where they are not known.

PART 2: SUPPORTING INFORMATION

Table 10 : Compliance against principal mandatory standards of the EC Bathing Water Directive as assessed by the Department of Environment

	Compliance												
Name	1986	87	88	89	90	91	92	93	94	95	96	Probable Cause(s) of Failure	Improvements
Crantock Beach	F	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Intermittent discharges to the Gannel.	Improvements to the sewerage system in the Gannel catchment may be required. Sewerage studies required by SWW before investment can be targeted.
Fistral Beach	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass		The sewage discharge at Newquay will be treated as a requirement of the UWWTD. SWW have made additional non statutory commitments which will include secondary treatment and UV disinfection of the discharge which will result in improved bacterial quality in the bathing water (See Issue 7).
Towan Beach	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass		The sewage discharge at Newquay will be treated as a requirement of the UWWTD. SWW have made additional non statutory commitments which will include secondary treatment and UV disinfection of the discharge which will result in improved bacterial quality in the bathing water.
Great Western Beach	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Pass		Designated as an EC Bathing Water for the 1996 Bathing season. The sewage discharge at Newquay will be treated as a requirement of the UWWTD and additional commitments will result in improved bacterial quality in the bathing water.
Tolcarne Beach	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Pass		As Great Western Beach.
Lusty Glaze	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Pass		As Great Western Beach.
Porth Beach	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Pass		
Watergate Beach	Pass	Pass	Pass	Pass	Pass	F	Pass	Pass	Pass	Pass	Pass	Stream contamination and intermittent discharges.	Investigations not undertaken as compliance has been good since 1991.
Mawgan Porth Beach	F	F	Pass	F	F	F	Pass	F	Pass	Pass	F	Contamination of the Menahyl River.	The performance of St Columb STW and the effects of intermittent discharges to the river are being investigated. Disinfection of the discharge was installed in June 1994.
Porthcothan Beach	N/A	N/A	N/A	N/A	N/A	N/A	F	F	Pass	Pass	Pass	Stream contamination.	This bathing water was not designated until 1992. An area investigation into bacterial inputs which may have caused non-compliance is continuing during 1997.
Treyarnon Beach	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass		
Constantine Bay	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass		
Mother Ivey's Bay	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass		
Harlyn Bay Beach	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass		

Compliance													
Name	1986	87	88	89	90	91	92	93	94	95	96	Probable Cause(s) of Failure	Improvements
Trevone Bay Beach	F	F	F	Pass	Pass	F	Pass	F	Pass	Pass	Pass	Trevone Bay Outfall.	Camel Clean Sweep Scheme. East Bank Scheme is to be completed by the end of 1997, discharging UV disinfected effluent from Porthilly STW to the Camel Estuary. West Bank scheme, including the removal of the Trevone continuous discharge, discharging UV disinfected effluent from Trecerus STW to coastal waters at Cataclews was completed July 1997.
Rock Beach	F	F	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Porthilly STW Outfall, Polzeath Outfall and Padstow Fine Screening Installation.	As Trevone Bay Beach.
Daymer Bay Beach	Pass	Pass	Pass	Pass	Pass	Pass	F	Pass	Pass	Pass	Pass	As above.	As Trevone Bay Beach.
Polzeath Beach	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass		
Widemouth Sand	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass		
Bude (Summerleaze)	F	F	F	Pass	Pass	F	Pass	F	Pass	Pass	Pass	Intermittent discharges and other contamination of Rivers Neet and Strat.	The crude outfall at Bude was replaced by a new Long Sea Outfall in 1992, discharging primary treated effluent. Improvements to sewerage are required, timings and details of which are subject to discussion with SWW. Secondary treatment requirements will depend on the outcome of Comprehensive Studies under UWWTD.
Bude (Crooklets)	F	F	F	Pass	Pass	F	Pass	Pass	Pass	Pass	Pass		
Bude (Sandy Mouth)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass		

C - Compliance Not Determined F - Fail N/A - Not Applicable

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, for example roach and chub. The other set of standards that are stricter, protects salmonid or game fish populations for example, salmon and trout.

We are responsible for monitoring the quality of identified fisheries and reporting the results to the Department of Environment, Transpaort and Regions (DETR) 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.

Designated Freshwater Fisheries Directive Salmonid stretches in the catchment, with compliance with Imperative Standards of the EC Freshwater Fisheries Directive (1993-1996) are shown in the table below.

Table 11: Salmonid Designated Stretches

River	Stretch	Length (kilometres)	Compliance since 1990
Crowdy Stream	Crowdy Reservoir	Not Applicable	Compliant
Porth Stream	Porth Reservoir - Normal Tidal Limit	3.6	Compliant
River Menalhyl	St. Columb Major Bridge - Normal Tidal Limit	7.8	Compliant
River Camel	Slaughterhouse Bridge - Gam Bridge	9.5	Compliant
River Camel	Gam Bridge - Normal Tidal Limit	20.2	Compliant
River Allen	Knightsmill Bridge - Normal Tidal Limit	12.8	Compliant
St. Lawrence Stream	Bodmin - Confluence with River Camel	2.5	Compliant
De Lank River	Scribble Downs - Confluence with River Camel	9.6	Compliant
River Valency	Lesnewth - Normal Tidal Limit	3	Compliant
Coombe Valley Stream	Coombe - Normal Tidal Limit	1	Compliant

Designated Freshwater Fisheries Directive Cyprinid stretches in the catchment, with compliance with Imperative Standards of the EC Freshwater Fisheries Directive (1993-1996) are shown in the table below.

Table 12: Cyprinid Designated Stretches

Water	Stretch	Length (km)	Year of non compliance and failing determinand	Reason for non-compliance
Bude Canal	Hele Bridge to Normal Tidal Limit	2.8	1995 Dissolved Oxygen	Low flow due to drought. No known pollution. No further action

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 standards that must be achieved, 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 DETR 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.

Identified surface water abstraction points in the catchment are shown in the table below.

Table 13: EC Surface Water Abstraction Directive Sites and Compliance in the Catchment

Site	**Non compliant determinands and year**	**Possible cause of failure**	**Action taken**
Porth at Rialton	Colour 1994, 1996	Natural caused by humic acids in peaty soils.1996 failure due to land runoff after rainfall event and algae being flushed out of reservoir	Apply for waiver
	Total Phenol 1994	Natural from run off	The high levels of phenols are considered to be natural
	Dissolved & Emulsified Hydrocarbons 1994,1995		See Note 1
Crowdy Reservoir	Colour 1994, 1995	Natural from run off	Waiver applies
	Total Phenol 1994	Natural from run off	The high levels of phenols are considered to be natural
	Dissolved Iron 1994,1995	Natural from run off	Waiver applies
	Dissolved & Emulsified Hydrocarbons 1994,1995		See Note 1
De Lank River Intake	Colour 1994, 1995	Natural from run off	Waiver applies
	Dissolved & Emulsified Hydrocarbons 1994,1995		See Note 1

Note 1:

Dissolved & Emulsified Hydrocarbons

We are currently concerned about the suitability of the methods for analysis of Dissolved & 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 vegetation. We are involved in discussions with the Department of the Environment, with a view to reviewing the analytical methods used.

We will continue to report exceedences of the EC Surface Water Abstraction Directive Standards. However, as there are no obvious sources of these compounds in the catchment we are not planning to undertake any further studies until we receive direction from the DETR.

EC Dangerous Substances Directive

The EC 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 DETR 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.

We monitor six designated sites for List I substances and eight designated sites for List II substances in the catchment. Between 1993-6 there were no failures for list I substances at the monitored sites.

Table 14: Non-compliance with EC Dangerous Substances Directive (List II Substances)

Discharge	Receiving Water	EQS Exceedence	Year of Failure	Cause
Bodmin (Nanstallon/ St. Lawrence) STW	Camel	Copper Zinc pH	1994	Investigations concluded that elevated metals are a catchment wide problem, resulting from historic mining, geology and low hardness waters. The reasons for failure have been attributed to various sources including the Tregullen Moor and the abandoned Tretoil mining area. The specific contribution from the STW is not easily quantifiable
		Copper Zinc	1995	
		Copper Zinc	1996	

Additional monitoring

The EQSs for copper and zinc have been exceeded every year at Grogley Halt on the River Camel. The monitoring point is just downstream of the River Ruthern which drains an area of historic mining activity, resulting in increased loads of metals (including copper and zinc) in the River Camel.

Although the UK has not yet achieved its 50 % reduction target for inputs of copper and zinc to the North Sea, there is no action that can be taken by the Environment Agency as we are unable to control inputs of metals from abandoned mines.

EC Urban Waste Water 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 that secondary treatment must be provided for all discharges serving population equivalents greater than 2,000 to inland waters and estuaries, and greater than 10,000 to coastal waters. Discharges below these population equivalents receive appropriate treatment as defined in the AMP2 guidance note[vii]. We are responsible for making sure that discharges receive the level of treatment specified in this Directive.

Camelford STW is required to have improved secondary treatment to further reduce organic loadings from the works installed by 2005.

This Directive also requires 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.

The DETR decide if a watercourse is sensitive. We carry out monitoring and provide information to DETR and also ensure that discharges to sensitive areas receive a higher level of treatment.

The St Lawrence Stream from Bodmin (Nanstallon) STW (SX 0432 6715) to the tidal limit of the River Camel at Polbrock Bridge (SX 0140 6945) has been proposed as a Sensitive Area (Eutrophic) under the EC UWWTD. The qualifying STW with a direct discharge to the St Lawrence Stream is Bodmin (Nanstallon) STW.

The River Camel from Dunmere Weir (SX 0515 6816) to the tidal limit at Polbrock Bridge (SX 0140 6945) has been proposed as a Sensitive Area (Eutrophic) under the EC UWWTD. The qualifying discharge with a direct discharge to the River Camel is Bodmin (Scarletts Well), and the qualifying STW with an indirect discharge is Bodmin (Nanstallon).

Monitoring work on the St Lawrence Stream and River Camel found there was lack of sufficient evidence to demonstrate submitting for Sensitive Area (Eutrophic) designation at these sites.

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, known as Comprehensive Studies, are carried out correctly.

The areas off Newquay and Bude have been proposed as HNDAs.

SWW are carrying out Comprehensive Studies to establish whether primary treatment is sufficient to protect the environment in the HNDA off Bude. We will be working closely with SWW when we receive their report on these studies. Were the Comprehensive Study to demonstrate no harm the present primary treated effluent at Bude discharging through a Long Sea Outfall would be acceptable. However, if this is not so then either outfall relocation within the HNDA (which may

involve extending the outfall subject to a new Comprehensive Study) or secondary treatment would be necessary.

Although the area off Newquay has been designated as an HNDA, SWW are not undertaking a Comprehensive Study and they have publicly stated that they will be completing a scheme which includes secondary treatment and UV disinfection by the end of 1998. This level of treatment meets and exceeds the requirements of the Urban Wastewater Treatment Directive.

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.

The most recent Shellfish Hygiene Classification lists indicate the following sites are classified in the catchment:

		Classification			
Site	Species	1994	1995	1996	1997
Porthilly Farm (renamed Gentle Jane in 1996)	Crassostrea gigas (non-native Pacific oysters) and mussels	B	B	B	B
Porthilly (new site in 1996)	Crassostrea gigas			C	C
Port Arthur (new site in 1996)	Cockles			C*	C

* provisional classification

EC Groundwater Directive

The EC Groundwater Directive (80/68/EEC) controls the release of certain substances to groundwater. There are two lists of substances: List I substances, which should not be released and List II substances, which can only be released in limited amounts. Currently the principles of the Groundwater Directive are implemented only through our waste management activities and by controlling the discharge of effluents to soakaways. Other potential sources of List I and II substances are currently unregulated, such as disposal of spent sheep dip (organophosphorus compounds) and sewage sludge to land (heavy metals and ammonia). Consequently the DETR is currently consulting on new regulations (the 'Groundwater Regulations') under the European Communities Act 1972 to bring all such currently unregulated discharges under control. The current anticipated date for implementation is early 1998.

There are no statutory standards for the quality of groundwater, and because of the difficulties in obtaining and interpreting information we have only limited data on the impacts of human activity on groundwater quality. However in drought conditions most of the flow in rivers is derived from groundwater and our river monitoring data indicate that throughout most of the region there are no known major areas of contaminated groundwater.

Aqueous Discharges

The Environment Agency regulates the disposal of liquid effluent direct to surface or groundwater by issuing discharge consents.

Discharges which have the greatest potential to affect the quality of the water environment have numeric concentration limits attached to their consents. These limits may apply to individual or groups of substances and are set at levels needed to protect the environment from harm and ensure compliance with River Quality Objectives (see page 41), EC Directives (from page 73) and International Conventions.

The following EC directives affect the control of aqueous discharges in this catchment. For more information see page 73:

- EC Bathing Water Directive (76/160/EEC)
- EC Dangerous Substances Directive (76/464/EEC)
- EC Freshwater Fish Directive (78/659/EEC)
- EC Urban Waste Water Treatment Directive (91/271/EEC)
- EC Surface Water Abstraction Directive (75/440/EEC)
- EC Groundwater Directive (80/68/EEC)

Discharge consents can only be used to control point source discharges. Point source discharges fall into the following types:

- Continuous e.g. sewage works discharges
- Intermittent e.g. sewer overflows
- Discharges to ground e.g. soakaways.

Diffuse sources of pollution such as agricultural runoff and much urban/highway runoff has to be tackled using other regulatory powers.

Continuous discharges

Treated sewage

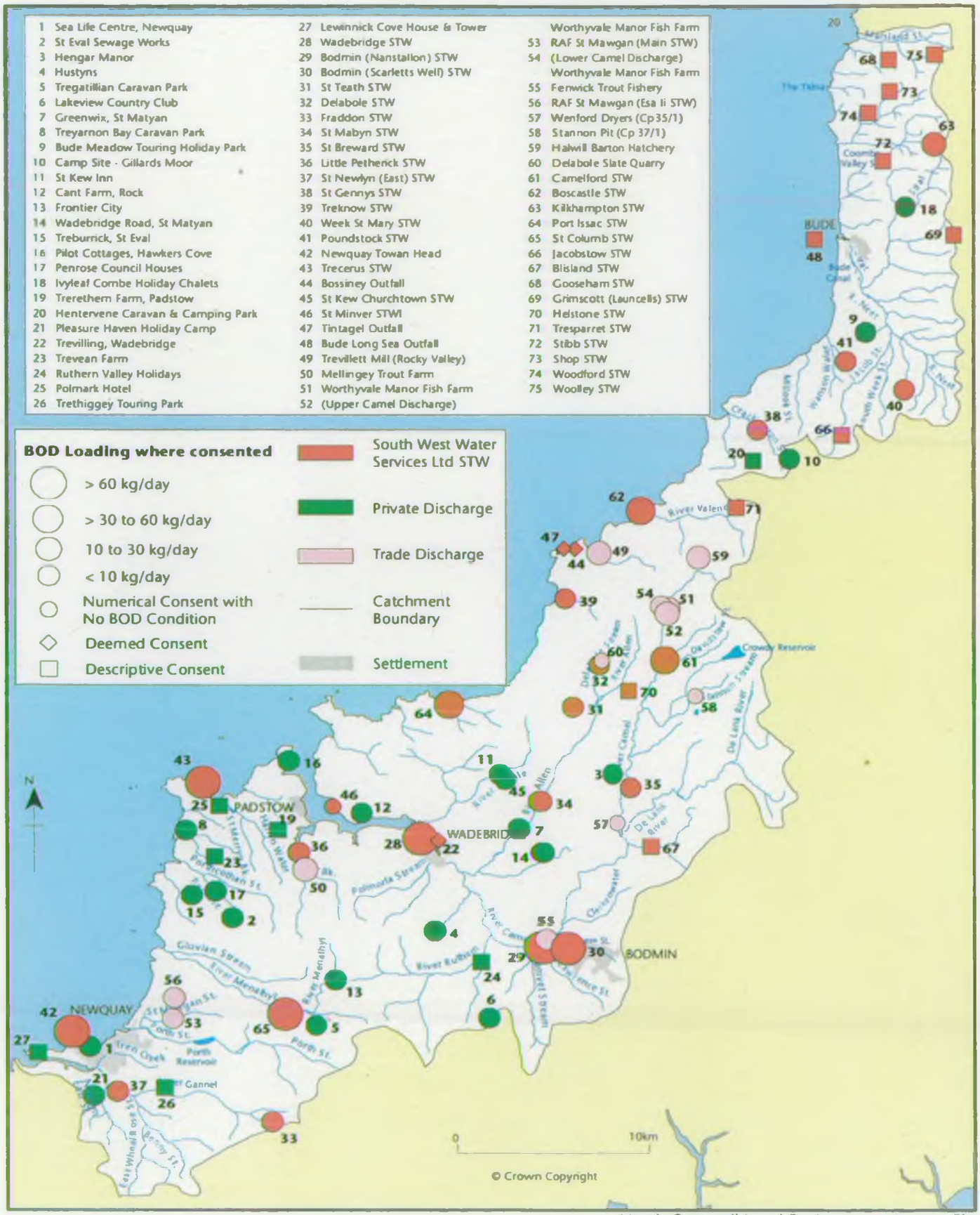
In areas served by mains sewerage both trade effluents and sewage are normally treated at the local sewage treatment works (STW). In this area, the sewerage undertaker is South West Water Services Ltd (or SWWSL), which operates 34 STWs of which 13 are small works which receive no trade effluent and have descriptive consents (see Map 15). There are also two deemed consents and two long sea outfalls, one of which is a Deemed consent (see page 83).

Extensive parts of the area covered by this plan are unsewered and therefore there are many small domestic treatment plants in operation.

Our national policy is to discourage the proliferation of small private treatment plants in favour of mains connections. We will refuse consent applications where people on mains sewerage wish to change to private discharges.

There are currently seven recommended areas of development restraint in the catchment of which three are for water quality reasons (see Table 19). Restraints may be in place where sewage treatment works (STWs) are; not complying with their consents: having an environmental impact on receiving

Map 15 - Effluent Disposal >= 5 m³/day



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waters or causing EC Directive failure. Development restraints are requests by the Agency to planning authorities to prevent development which would require connections to mains sewerage systems where this would make an existing problem worse.

Sewage treatment funding plans

Improvement schemes to South West Water Services Sewage Treatment Works over the next five to ten years are subject to available funding approved by OFWAT, the water industry's regulator. A strategic business plan, known as Asset Management Plan (AMP2) was developed based on guidelines agreed between the NRA (National Rivers Authority), DoE (Department of the Environment) the water services companies and OFWAT in 1994. 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 and future legal obligations
- those which have been justified separately to maintain river quality relative to the 1990 NRA survey of water quality or to achieve river or marine improvements.

OFWAT declared the associated customer charging base in July 1994. Planned improvements to various sewage systems and treatment works by SWW in the next few years are shown in the table below.

Table 15: Planned improvements in the catchment, Continuous Discharges

Site	Receiving waters	Investment driver	Treatment level	End date
Newquay	Sea	UWWTD	UV Disinfection/ Secondary	1999
Bude	Sea	UWWTD	Secondary/ Outfall relocation*	*
Camel scheme East West	 Camel Estuary Sea	EC Bathing Water Directive	 Secondary/ UV Disinfection Assisted Primary/ UV Disinfection	 End 1997 completed July 1997

* dependant on the outcome of the Comprehensive Studies. (See page 79)

Deemed consents

Deemed consents are 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.

Trade effluents

Most trade effluents are discharged to the catchment via STWs; there are 48 consented private trade discharges of greater than $5m^3$/day volume (see Map 15).

Intermittent discharges

These include storm sewer overflows and sewage pumping station emergency overflows. These are mainly associated with urban areas as are discharges of contaminated surface runoff.

During heavy storms, large volumes of oily water can be generated by runoff from carparks and industrial estates. The Agency carries out pollution prevention visits and surveys to identify such problems.

The storm sewer overflows at St Columb are thought to cause water quality problems, see Issue 7.

Discharges to ground

Remote properties and small villages are not usually connected to mains sewer. Septic tanks discharging to ground soakaway systems as well as small treatment plants and sealed cesspools are used instead. Pollution problems in local ditches, streams and groundwater aquifers can result, if soil conditions are unsuitable.

Pollution events

Table 16: Pollution incidents arising from industrial and sewage effluents 1994 to 1996

Pollution Incidents	Major	Significant	Minor
Industrial			
1994	0	2	8
1995	0	0	10
1996	0	0	8
Waste Water Treatment			
1994	0	3	58
1995	0	6	42
1996	0	1	20

Aquaculture

Aquaculture is the use of riverside beds or ponds to rear fish. Water used by fish farms is all returned to the river at some point downstream of the abstraction. Impacts arise due to the reduction in river flow in the bypassed reach and from the effluents in the returned water.

Authorisations of commercial fish farms in the area have been reviewed by a fish farm control group to ensure that fish farms had all relevant permissions for abstractions, discharges and weirs.

Changes in licensing following the Water Act 1989[ix] had given rise to anomalies that the Group has endeavoured to put right. Licences of Entitlement (LoE) for abstractions were issued at some fish farms by the NRA. Licences of Entitlement were granted under the Water Act of 1989. The NRA were required by law to issue these types of licence on the basis of established use and could not impose conditions to protect the environment. Where such licences cause significant detrimental impacts on the water environment or downstream uses, the Environment Agency can negotiate agreement with holders of LoEs for a modification of the abstraction to moderate or prevent any impacts.

Agriculture and Forestry

Over 80% of the land in England and Wales is farm land. The way this land is used affects the quality of the environment. We are concerned about the pollution of surface and groundwaters from animal wastes, fertilisers and pesticides. Soil erosion, land drainage and stock damage to riverbanks can also be a problem. A sustainable farming system that conserves the soil and minimises and recycles wastes will reduce the risk of damage to the environment.

There is only a limited range of things we can do to influence the way farmers use land. Other agencies such as MAFF can encourage sensitive farming practices using financial incentives. However we can control and prevent pollution in the same way as we do with any other industry.

Agricultural land covers approximately 78,500 hectares of the catchment, approximately 93% of the total area. The majority of the agricultural land, over 74%, is grass reflecting an area largely devoted to livestock farming.

With the area's southerly latitude and maritime location the coastal areas have a long growing season and infrequent frosts. However, they also have the disadvantages of exposure to strong west and north-westerly winds. Although relatively wet compared with the rest of the country it is drier than other parts of the South West. Inland the effects of exposure decrease but this is countered by a drop in temperature and increased rainfall as altitude increases so slightly reducing the length of the growing season.

Farm types

Livestock farming based on grassland is the dominant activity in the plan area. Dairy farming involves 17.6% of the holdings, with cattle and sheep accounting for 22%.

The number of dairy farms has fallen by over 27% whilst cattle and sheep holdings have increased by over 50%. The dairy herd in the catchment has fallen by nearly 10% over ten years to about 24,000 cows but there has been a substantial increase of 70% of beef cattle. An increase of nearly 28% has been seen in numbers of sheep. The decline in dairy farming is a function of many factors: in addition to milk quotas, there has been an increased level of concern about pollution and a difficult economic climate. Such changes may reduce the use of fertilisers and general pollution load from dairy farming, however a reduction in the total number of dairy units is offset by remaining units getting larger.

The cereal area has decreased over the past ten years by nearly 20%. Much of this is likely to have been put into set aside. On many farms cereals are grown as a mixed farming system in support of livestock. Crops which benefit from European support and provide a profitable break crop have shown varying figures over the last decade.

Long term trends

Long term trends indicate that the movement to two types of holding, part-time farms and large specialist units, is likely to continue. The smaller holdings are becoming part-time and interest in diversification schemes will increase to maintain employment and incomes. Reforms in the Common Agricultural Policy and milk marketing are likely to exacerbate these trends, in the short term benefits favouring livestock farmers.

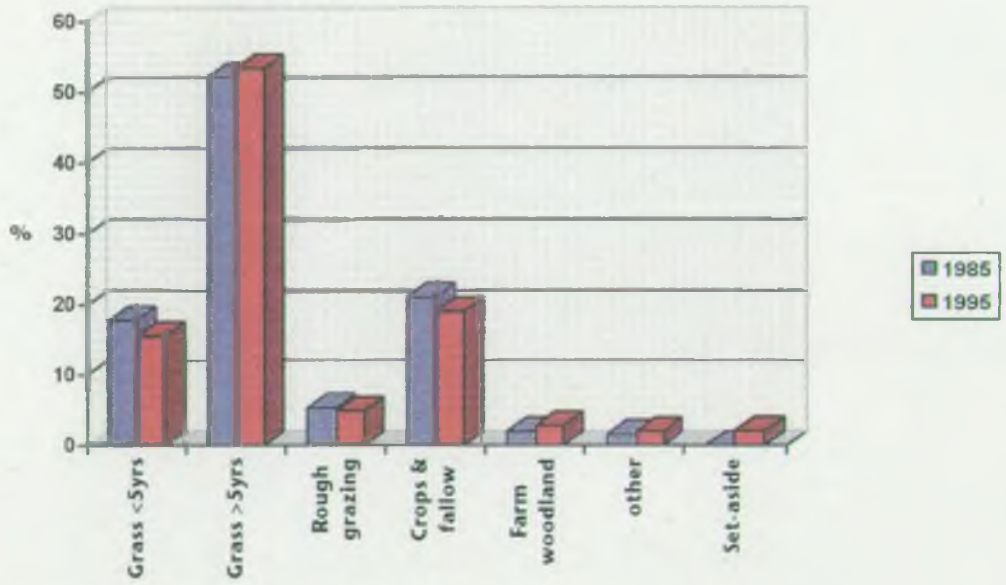
Farm diversification can have various impacts on the environment and concerns for us, for example, pond creation. Increased acreage under maize may have implications for pollution loading as this is a crop which requires large quantities of organic manure. Once harvested the soil is often left exposed through the autumn and winter which can result in significant erosion and soil loss from the land. We have produced a leaflet on the environmental considerations of growing maize which is freely available on request from Environment Agency offices.

Grants for installing or improving farm waste facilities have been removed which leaves the full cost of further improvements with farmers. Limited non-chargeable independent pollution advice continues to be available from ADAS and we urge farmers to take advantage of this service. Table 17 shows a continuing decline in the numbers and severity of pollution incidents relating to farming.

Table 17: Pollution incidents arising from agricultural activities 1994 to 1996

Pollution Incidents	Major	Significant	Minor
1994	2	7	63
1995	0	7	40
1996	0	0	27

Figure 2: Agricultural Land Use



(Source: MAFF, Land Use Planning Unit).

Farming and Wildlife Advisory Group (FWAG) Camel Valley Project

The Agency supports this group farm project, where local farmers co-ordinate the management of their land productive and non productive for the benefit of wildlife and landscape. This is done through whole farm plans which pick out the networks and corridors which link areas of high wildlife value across their holdings. Many of these corridors are associated with the rivers and watercourses.

South West Forests Project

The aim of the South West Forests Project is to use forestry planting and management as a catalyst for positive land use changes, and stimulate other sectors of the rural economy. The project comes at a time of uncertainty and change in the long-established agricultural structure of north west Devon and north Cornwall. This project seeks to regenerate the rural area through large-scale tree planting. The

Agency is keen to work with the project to ensure that proper consideration is given to the protection of existing habitats, notably Culm grassland which only occurs in this area in the UK, and for protection of landscape quality.

Alder tree disease

When carrying out other duties the Agency will continue to report instances of this disease to the Forestry Authority. Our current advice is not to plant alder for fear of introducing the disease to new areas. We have produced a leaflet offering advice available from our Bodmin office.

Waste Management

The management of controlled wastes may include storage, treatment, processing or disposal facilities. Each type of operation may impact on the catchment but landfill disposal in particular can result in the formation of a highly polluting liquid known as leachate, or landfill gas containing methane, which is potentially dangerous and also a 'greenhouse gas'. Leachate is produced as wastes break down and decompose and the quantity is multiplied by any ingress of water into the waste. Any escape of this pollutant from a landfill site would have a serious impact on the catchment as leachate can pollute surface and groundwaters. Operation of waste sites can also generate noise, dust, odour and unsightliness, and vehicle movement may cause a highway nuisance. It is therefore important that the potential impact on the proposed locations for new facilities is given careful consideration.

The NRA previously published its views on landfill in its 'Position Statement on Landfill and the Water Environment'[*]. In this statement the concepts of waste minimisation and recycling are stressed. These concepts have been further stressed in the Government White Paper 'Making Waste Work'[*] which sets out the draft Government strategy for the sustainable management of waste. The Environment Agency will itself be forming a Regional Waste Strategy based on the recommendations of the White Paper.

Government strategies

In December 1995 the DoE produced the strategy for sustainable waste management based on a hierarchy of waste reduction, reuse, recovery and, lastly, disposal. In it they have set two primary targets; to reduce the proportion of controlled waste going to landfill to 60% by 2005 and to recover 40% of municipal waste by 2005. They have also made a commitment to a third target; by the end of 1998, to set a target for overall waste reduction. These primary targets are supported by a number of more detailed targets.

On 1st April 1996, we became responsible, under the Environment Act 1995, for an enlarged system of waste regulation and control. We have a duty to undertake a detailed national survey of waste sources as part of the formative work leading towards the publication of a statutory National Waste Strategy due in 1998. This work will, it is hoped, substantially improve the quality of waste source statistics and assist greatly in the preparation of waste local plans.

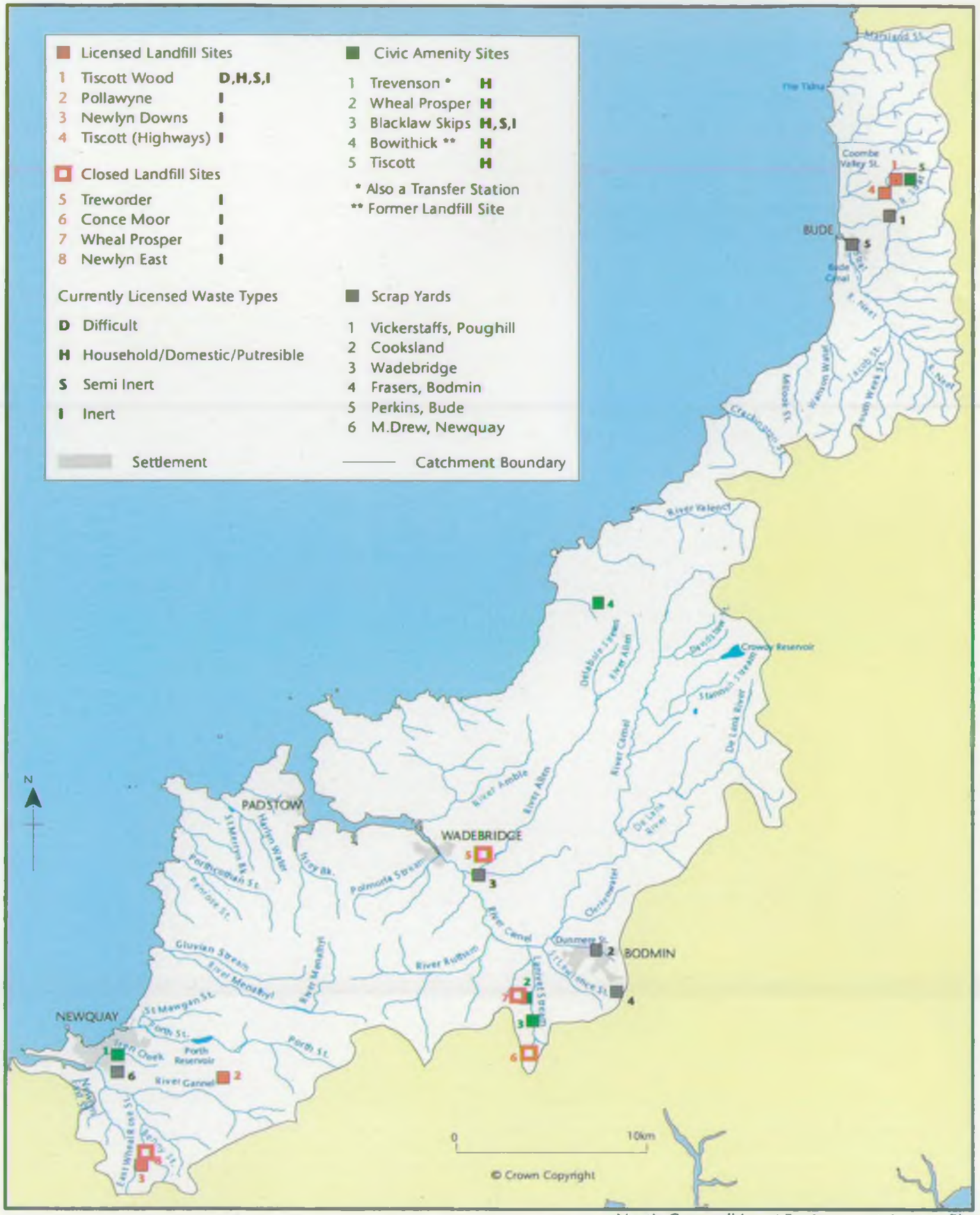
Landfill tax

The introduction of the Government Landfill Tax in October 1996 is expected to have a significant impact on waste management. The charges made to landfill operators are likely to be passed on to their customers by raising the "gate fee". The principle behind the tax is to provide a financial incentive to waste producers to minimise the waste they produce or to use methods of disposal which have less of an environmental impact. It is possible that some waste producers will simply dispose of the waste at unauthorised sites to avoid the rise in costs. Illegal waste disposal activities can cause pollution and we treat them very seriously. Regulation officers examine all such activities and enforcement action is taken where necessary. Within Cornwall the number of licensed landfill sites has remained fairly static since a number were surrendered at the time Fees and Charges were introduced about two years ago. More recently, during the period leading up to the introduction of the Landfill Tax, a number of operators have expressed their intention to set up waste recycling or recovery plants. Some schemes are currently in the planning stages and this indicates there will be an increase in the number of such licensed activities rather than landfill operations.

Waste production

With the exception of household wastes, for which closely monitored collection and disposal contracts are in place, there is only sparse information on the types and quantities of wastes generated in Cornwall. Some estimates are being made as part of Cornwall County Council's waste

Map 16 - Waste Management



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management strategy in their Waste Local Plan for the County. The Environment Agency's forthcoming national survey of wastes sources due to commence later in 1997 will provide better data in future. The Agency is to prepare a Regional Waste Management Plan, based on the survey findings.

It is estimated that mining and quarrying wastes in Cornwall account for approximately 75% of total waste tonnage produced. These wastes are currently outside the scope of the Waste Regulations administered by the Environment Agency and their disposal is controlled by Cornwall County Council as minerals planning authority.

Agricultural wastes are the next most important by quantity, at about 20% of total waste tonnage. Large quantities of animal manure and organic matter are applied to fields as fertiliser. Due care is required to ensure that over application is avoided which may lead to polluting runoff. All wastes arising from agricultural premises are outside the scope of the Waste Regulations.

The Government has stated its intention to redefine Mining/Quarrying/Agricultural wastes as "controlled wastes" (see Glossary, page 122) to be formally regulated by the Agency.

Whilst only relatively small by comparison, the tonnage of household, commercial and industrial wastes can be some of the most potentially polluting if not correctly managed. Certain particularly harmful materials are designated as "special wastes" and 90% of these are exported from Cornwall for specialised treatment or disposal elsewhere at purpose built facilities.

Current estimates of Cornwall's annual waste production is around 30 million tonnes.

Waste disposal facilities

The area is generally lightly populated but includes the towns of Newquay, St Columb Major, Bodmin, Wadebridge, Padstow, Camelford and Bude-Stratton. The area was until quite recently served by a number of landfill sites taking household, commercial and industrial wastes. There is now only one putrescible landfill at Tiscott Wood near Bude. The two waste collection authorities are Restormel Borough Council and North Cornwall District Council. At present Restormel waste from the Newquay area is disposed outside the Plan Area to the United Mines landfill near St Day via a waste transfer station at Trevenson, Newquay. The remainder of the Plan area lies within the North Cornwall District and waste is carried by the collection vehicles direct to Tiscott Wood landfill.

There are civic amenity sites provided by Cornwall County Council where householders can take their waste. These sites are transfer stations where some recovery of recyclable materials takes place but the residual waste is transported to landfill. The civic amenity sites are located at:

- Trevenson Road, Newquay
- Wheal Prosper, Lanivet
- Tiscott Wood, Bude
- Bowithick

There are no immediate proposals to increase the provision of civic amenity facilities or disposal sites in the catchment. Landfill capacity at United Mines and at Tiscott Wood is becoming limited and future planning of waste management facilities in this part of Cornwall will be an important part of the County Waste Local Plan.

North Cornwall District Council operates a mobile collection service for household recyclables. There are also fixed recycling banks for various materials throughout the Plan Area operated by County and District Councils and charity groups. District Councils have Recycling Plans which identify their proposals to meet national targets.

A private company has put forward proposals for a waste recovery and transfer station at Newlyn Downs near St Newlyn East, see page 25.

Waste spreading to land

There is considerable spreading of controlled wastes to agricultural land for the benefit of the soil. If this is not done in accordance with current codes of practice however, there is a potential for the waste to cause pollution to water and harm to wildlife. Farmers accept suitable wastes from the food processing industry or from abattoirs. Although exempt from formal waste management licensing the activity has to be registered in advance with the Agency and inspections are made. Further information on waste spreading to land is given in Appendix D, page 120.

Former putrescible landfills

The following landfills are now in their post-closure aftercare stage and are subject to environmental monitoring by the Agency.

- Newlyn East, near Newquay
- Treworder, near Wadebridge
- Wheal Prosper, Lanivet
- Conce Moor, near Lanivet
- Bowithick Quarry, near Tintagel

All these sites were operated on dilute and disperse principles without containment liners etc. They are still biologically active with potential to pollute unless monitored and managed. Engineering works are in place to deal with leachate and landfill gas and the Agency carries out regular monitoring checks.

Illegal tipping

Unlike much of Cornwall, this Area is largely free of land despoiled by former metalliferous mining activity. Where such pockets of dereliction occur there is always a risk that indiscriminate fly-tipping will take place. The same applies to unenclosed moorland where free access is available. The Agency seeks to co-operate with landowners, the public and local authorities to help prevent illegal waste disposal and has an advisory role in remediation works.

In the Plan Area the predominance of enclosed farmland tends to limit the fly-tipping problem but the Agency's inspectors deal with many reports of incidents mainly on a small scale. Fly-tipped waste can enter watercourses causing pollution and localised flooding.

Waste planning

There is an established hierarchy of planning for waste, from national strategy to regional and local. There is a requirement on the Environment Agency to produce a regional strategy to outline the current and future needs for waste management. This work will be undertaken in two distinct phases; firstly data will be collected in a national waste arisings survey. This information will advise the planning process at national, regional and local levels. Due to dwindling waste disposal capacity the County Council has had to embark on the production of a local waste strategy for consultation, ahead of national and regional plans. There is a general drive to obtain value from waste either by materials recovery or energy from waste schemes. The present situation in Cornwall is that over 90% of waste is landfilled. Future Agency effort is to be directed at promoting waste minimisation, waste or energy recovery, with disposal as a last resort for unavoidable residues.

Waste planning is generally carried out in larger geographic areas than that covered by a LEAP. There is a need to look at demand and supply beyond the boundary of this catchment. Individual proposals for waste facilities will be decided through the Town and Country Planning process with consultation with the Agency.

The Built and Developing Environment

Development is essential to the economic and social well-being of the community. However, its effects on the environment can be detrimental. We liaise with local planning authorities and developers to ensure sympathetic development with the environment.

The planning liaison section of the Agency provides a single point of contact to ensure that all relevant issues relating to the environment are properly addressed by the planning system.

Planning Liaison represents the views and policies of the Environment Agency to a variety of customers, including local planning authorities, highway authorities, developers and their agents and others who have the potential to affect the environment.

Through planning legislation the Agency aims to protect and enhance the environment so as to make a positive contribution towards sustainable development. We are concerned with quality and quantity of development and its general appropriateness in a particular location with respect to our interests.

Sustainable development does not mean environmental protection at all costs. It involves finding ways to encourage environmentally compatible economic activity and discouraging or controlling environmentally damaging activities.

During the course of a year in an area of this size planning liaison would expect to evaluate over 2,000 planning applications. 10% would require internal circulation or specialist comment. In addition approximately 130 pre or post planning enquiries would be dealt with.

Local land use and planning initiatives

The Agency is currently discussing issues with Cornwall County Council for the new Structure Plan, Waste Disposal Plan and Minerals Local Plan. We are also involved in the emerging Districts' Local Plans. The Environment Agency will seek to influence the allocation of land to ensure that adequate infrastructure exists prior to development and, furthermore, that development does not damage conservation interests or be at risk from, or result in, flooding. All local plans covering the catchment area have incorporated a number of policies for positively protecting the water environment as a result of early discussions with the former National Rivers Authority. Table 18 sets out a number of development proposals and our interest in them.

Table 18: Examples of recent/ongoing development proposals within the catchment in which the Agency has an interest

Location	Description	Environment Agency Involvement/Concerns
Broadclose Farm, Bude	Housing	Surface water drainage concerns. Flooding risk in catchment
Bude Canal	Restoration of canal	See page 36
St Eval	Waste transfer site	Agency involved in discussions with operator
Newquay golf club	Housing	Surface water drainage concerns as there is a flooding risk in the catchment

Tourism

Most of the area is heavily visited and tourism is an important part of the local economy. Seasonal population increases have implications for infrastructure and service provision.

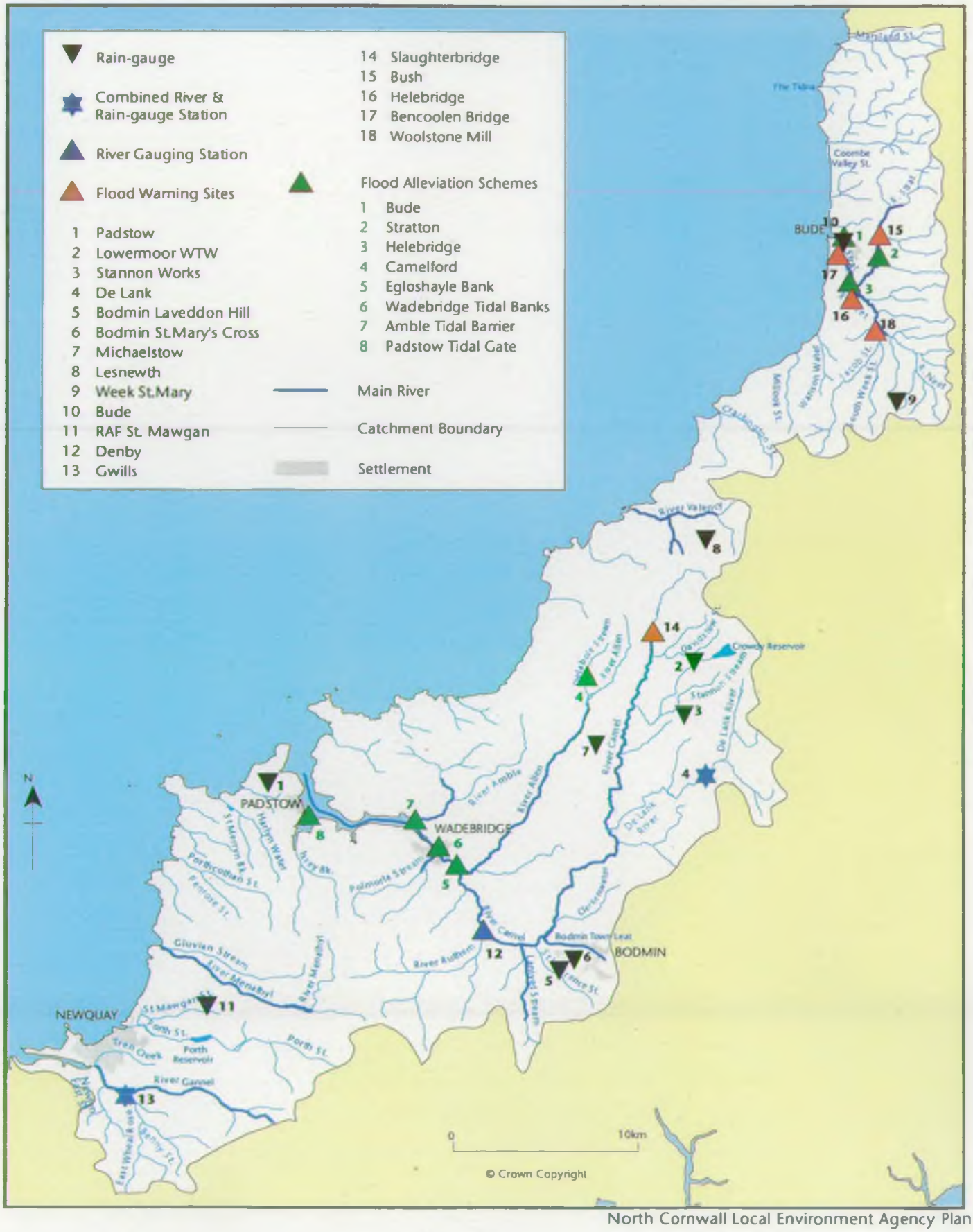
Map 17 - Built Environment

North Cornwall Local Environment Agency Plan

Table 19: Development restraints

Settlement	Reason
Newquay Crantock Pentire Quintrell Downs	The former NRA had agreed a policy of development restraints on any proposal which would increase foul flows to the public foul sewer. This was on the basis that calculated flows exceeded the condition which limited the volume of effluent discharged via the main Newquay sewage outfall of Towan Head. Although there is no recorded evidence of non-compliance against microbial indices with the EC Directive for Bathing Water, the Authority has recorded high aesthetic pollution of Fistral Beach, Newquay. Screening of the Newquay outfall is an interim measure which affords some environmental gain, pending requirements for further treatment under UWWTD in 2001. The screen will provide some capacity for development up to a level of 401 dwellings over base date of mid April 1994
Treloggan Industrial Estate, Newquay	Surface water flooding problems
Camelford	Current environmental effect caused by effluent discharge, any further increase in flow will cause deterioration of water quality. Capacity limited to allocated land in the Local Plan and single plot infilling
Kilkhampton	Current environmental effect caused by effluent discharge, any further increase in flow will cause deterioration of water quality

Map 18 - Hydrometric Network and Flood Defence Schemes



North Cornwall Local Environment Agency Plan

Flood Defence

River flows vary widely and are affected by the weather, geology and land use. We manage flood risk from rivers and the sea using Flood Defence and Land Drainage powers. We manage flood defences and land drainage to balance the needs of all river users with the needs of the environment.

Our statutory flood defence committees make decisions on flood defence. All rivers are classified as either 'main rivers' or 'ordinary watercourses' (sometimes referred to as 'non-main rivers'). We control work (through land drainage consents) and supervise flood defence matters on all watercourses, but have special powers to carry out work on main rivers and sea defences. Local authorities have the same special powers for flood defence on ordinary watercourses and can also promote sea defence schemes.

The catchment includes a number of rivers and streams with quite different characteristics. Map 18 shows the lengths of main river and existing and proposed flood alleviation schemes. The total length of main river is 107.8 km.

The streams and rivers drain land close to the coastal strip, although there are significant local variations in average annual rainfall and in the morphology of the river valleys. The whole area is predominantly farmland, with undulating hills and developed river valleys around and to the south west of the Camel, whilst further north the hills are more pronounced, the valleys steeper and the ground harder.

The North Cornwall coast is historically vulnerable to tidal surges, although what development there has been has usually taken this into account. Both high sea levels and the combination of high river flows with high sea levels have been a factor in the design of the Flood Alleviation schemes in Padstow and around Wadebridge. High sea levels combined with severe weather have caused problems in Mawgan Porth, Polzeath, Boscastle and Bude.

Improvements

Flood alleviation schemes have been constructed at Wadebridge, Padstow, Camelford, Stratton and Bude. Further work is currently in progress at Bude to increase the standard of defence of the scheme, whilst minor local works to relieve flooding have been undertaken at Helebridge and Boscastle (Paradise Stream). There are local walls at Mawgan Porth protecting a few riverside properties.

There are extensive flood embankments on the Camel Estuary and a number of smaller flood alleviation schemes on other rivers in the catchment as follows:

River	Location	Protecting
Camel	Wadebridge	Town centre property, local amenity. Polmorla pumping station is an integral part of the scheme for Wadebridge
Camel	Egloshayle	Property, local amenity
Amble	Amble	Pasture, property
Tidal Camel	Padstow Harbour	Town centre property
Camel	Camelford	Town centre, parkland, trunk road
Neet	Bude	Town centre property, amenity

River	Location	Protecting
Strat	Helebridge	Property, amenity, trunk road
Strat	Stratton	Town centre property
Menalhyl	Mawgan Porth	Property
Paradise Stream	Boscastle	Property in Gunpool Lane

Flood defence schemes are planned for a number of locations in the catchment, see Table below:

River	Location	
Bodmin Town Leat	Bodmin	Work presently planned to commence in 1997/98. The capacity of the watercourse is inadequate for the urbanisation within the catchment
Paradise Stream	Boscastle	A scheme is currently planned to start in 1999. The culvert at Old Road causes a restriction to high flows
River Allen	Sladesbridge	Scheme currently planned for 1999/2000. Flooding occurs from the River Allen and its tributary the Kestle River. This is worse at times of high tide
Polmorla Stream	Polmorla, Wadebridge	Scheme currently planned for 2002. Culverted sections of the watercourse restrict flows through the village

Regulation

The area is predominantly rural but the expansion of existing towns and villages and individual developments could increase the flood risk in some cases to an unacceptable level if the watercourse that receives the runoff has insufficient capacity to cope with the extra flow. Our aim is to identify these problems before they occur and either object to the development or request that compensation works are carried out in advance of the development.

Flood Risk Areas - DoE Circular 30/92 - Section 105 surveys

Local planning authorities and ourselves are required by the Department of the Environment (in Circular 30/92 - Development and Flood Risk) to liaise closely on flooding and surface water runoff matters. The aim is to ensure that flooding risks that might arise from a development are recognised and made an integral part of the decision making process undertaken by local planning authorities. Flooding and drainage issues are also to be taken fully into account during the preparation of land use development plans. In this respect we have responsibility to prepare surveys under Section 105 of the Water Resources Act 1991 to define the nature and extent of flood risks.

The Section 105 survey for main river in this catchment was completed in Spring 1997.

Maintenance

We have permissive powers, on main rivers, to undertake works and exercise our powers in this respect according to available resources and priorities. Regular maintenance is essential if the river system and sea defences are to operate properly at times of high water levels. Such maintenance works include vegetation control, repairs to earth embankments and other floodwalls, obstruction and blockage removal and dredging.

The annual cost of maintenance varies depending on need each year, it is generally in the order of £150,000. Annual conservation liaison meetings are held to outline our maintenance programme to external conservation bodies. Each year within this programme some conservation enhancements and recreational improvements are carried out.

Standards of service for maintenance

A system was developed by the Agency to assess the standard of service needed for Flood Defence maintenance. The system uses the term 'House Equivalents' (HEs) to equate the value of all types of land for different land use features. This methodology is contained in the Flood Defence Management Manual.

The system splits the river into reaches and defines typical land use on either side of the river. It then uses a combination of historic flood data and analysed flood data to determine the number of HEs affected per km per year. The higher the score the greater the need for maintenance or a capital scheme.

A review has shown that current levels of maintenance along river stretches are appropriate.

Flood warning

Absolute flood protection is not possible. Because of this we need to warn people when there is a danger of flooding. We took over responsibility for warning the public and other organisations of likely flooding on 1 September 1996. This role was previously carried out by the Police.

We have developed communication systems aimed at providing flood warnings to those members of the public most at risk. We have a dissemination strategy which details how these systems operate. Where possible we aim to issue a warning at least two hours in advance of flooding.

Flood warnings are provided for the longer rivers in the catchment. There are a number of shorter rivers which respond particularly rapidly to rainfall where it is not possible to give adequate warning from an upstream river level gauge. The area is susceptible to high intensity storms which can cause serious flooding by surface water runoff. It is not possible to issue warnings for this type of flooding at present.

Rainfall information is available from the Agency's gauges and from the Meteorological Office. The passage of flood flows can be monitored using the river level gauges shown on Map 18. Detailed weather forecasts and updates are received from the Meteorological Office. Weather Radar data is also available and is monitored 24 hours a day. The Agency maintains a network of river level gauging stations which automatically alert the flood warning centre when rivers are at critical levels.

Flood Warnings are issued for the following rivers:

River	Location	Warnings Issued
Allen*	Penvose to Sladesbridge	Yellow, Amber, Red
Camel	Camelford to Wadebridge	Yellow, Amber, Red
Neet	Woolstone Mill to Bude	Yellow, Amber, Red
Neet	At Bude	Red
Strat	Bush to Helebridge	Yellow, Amber, Red
Strat	At Stratton	Red
Tidal	North Cornwall Coast	Yellow, Amber, Red

* to be introduced 1998/99

Warnings are issued directly using automatic voice messaging via the telephone and are also broadcast by local radio. Recorded information on current flood warnings is also provided on the 'Floodcall ' system. Leaflets are available from Agency offices which fully explain the flood warning service.

A study into the flood warning level of service provision is currently being carried out and is expected to be completed in 1999. This will identify where it may be possible to improve the current level of service. Residents who live in flood risk areas, and who may benefit from receiving direct warnings are encouraged to contact the Agency.

Recreation and Amenity

Millions of people spend their spare time enjoying our rivers and coasts. Where we can we try to improve facilities for these people but we must always safeguard the environment from the damage visitor pressure might cause. We maintain rivers so that they can sustain angling at an appropriate level and seek to develop the amenity and recreational potential of inland and coastal waters and associated land.

Camel Trail

The part of the trail owned by North Cornwall District Council has been granted a Light Railway Order to turn it back into a railway. This decision is currently under judicial review.

Plans for the stretch owned and managed by Cornwall County Council include a detailed feasibility study on the repair and refurbishment of the Iron Bridge. The bridge requires new decking to allow for the passage of cyclists. The works will need major funding and a bid will be eligible for EU funding. Other repairs and enhancements planned are a new entrance for the trail at Padstow to be linked with an investigation into the management of cycling in the town and replacement of fencing. The County Council have established a new Advisory Group and consultative forum for the running of the trail.

Canoeing

There has in recent years been discussion about setting up a Canoe Access Agreement between the British Canoe Union and riparian owners. The Agency acts as an 'honest broker' under our remit to enhance recreational possibilities on watercourses, but it is felt that progress cannot be made on this issue until the two parties meet each other to explain their case. We continue to recommend such a meeting and would be happy to host it. Further discussion would also include English Nature. There have been concerns that at times there has been excessive use by canoeists of the Bude Canal.

Angling

Within the catchment game fishing in rivers and lakes is available. There are many coarse fishing lakes open to the public and Bude Canal provides the only canal fishing within Cornwall (see Map 19).

Waterside recreation

During summer 1996 we became aware of a number of dams which had been built by people picnicking by the De Lank River. The dams were creating an artificial flow regime for a 300 m stretch of river and were made mostly of granite cobbles and boulders, large sections of turf (from the bankside) and peat.

What may be perceived as an innocent recreation is actually destroying significant stretches of one of Cornwall's most pristine river habitats, see Issue 1.

Bathing waters

The beaches within the plan area are a valuable recreational and economic asset. We monitor and report on the water quality at the most heavily used beaches. The results of our monitoring show where improvements need to be made and are used in targeting expenditure by water companies and private dischargers. See The Quality of Controlled Waters section, page 71.

Cycleways and footpaths

The sustainable transport organisation Sustrans is developing a national cycle network across Britain. They have proposed routes from Bude to Marhamchurch and to Widemouth Bay. We are supportive of this philosophy and will assist wherever possible, for example, providing bridges where they currently do not exist. The Agency provides advice on the appropriate use of walks alongside rivers and canals.

Map 19 - Recreation

North Cornwall Local Environment Agency Plan

Mining and Quarrying

The Environment Agency recognises the economic importance of quarrying, mining, gravel and mineral extraction to the region, however, exploration and extraction can significantly affect surface and groundwaters locally and across catchments. Abandonment of mines and after use of quarries may also pose threats to the environment.

In comparison to other parts of Cornwall the catchment has not been intensively mined although the legacy from historic metalliferous workings still has effects today. There are approximately 190 mines identified in the catchment. Historically, the most important mining areas were East Wheal Rose and lead-silver-antimony mining around the Camel estuary and the coast. Map 20 shows the locations of mines.

Active mineral workings

Cornwall County Council is the mineral planning authority for the plan area. We work with the planning authorities to obtain better standards and working practices and advise them on the effects that proposals for new quarries and workings will have on the environment. We recognise the economic importance of quarrying and mineral extraction to the area, however, exploration and extraction can significantly affect surface and groundwaters locally and across river catchments.

Slate quarries

There are eight slate quarries in the catchment providing materials for a variety of uses. See Map 20.

Granite quarries

There are two active granite quarries in the catchment, De Lank and Hantergantick. Old tips in De Lank quarry cover the De Lank River preventing fish movement.

China clay

China clay is worked at Stannon, near Roughtor on Bodmin Moor. It is close to important wetland and acid grassland habitats.

Mining impact on the catchment

The presence of underground mine workings and drainage adits has altered the local hydrology, concentrating groundwater flows along drainage adits, producing major discharge points. Any collapse or blockage within the mine system may alter flow paths, discharge points and quality of water.

The shaft caps and internal mine structures are now reaching the end of their useful life and collapses have occurred. The exact locations of many of the old shafts, adits and trial workings are not known.

High metal levels in water in the catchment drain from old mines via adits.

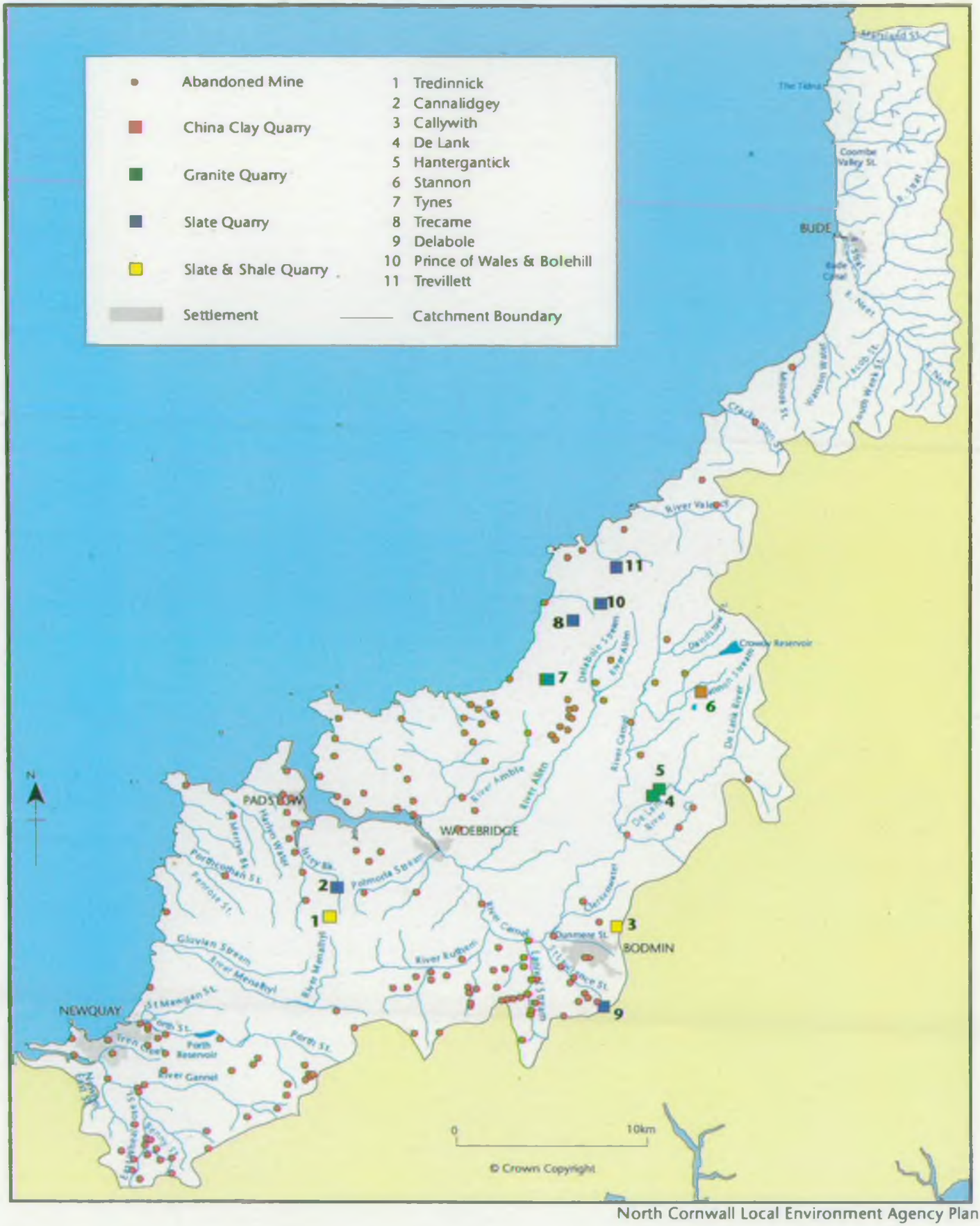
Most of the spoil heaps and adits have been abandoned for approximately 100 years and have stabilised and are re-vegetating. Proposals that involve disturbing the ground can have an adverse impact on water quality in the watercourses.

Historic mining activity

The NRA South Western Region completed the 'Mines Database' project in 1995, set up to compile a systematic database on mines, adits and associated infrastructure. It is an attempt to collate information on the nature and drainage of specific workings. This should help the Environment Agency be more pro-active and forward plan for potential impacts on the water environment as surveying of the internal workings of old mines is impracticable.

Information has been gathered largely as a desktop exercise. Given the extent and historic nature of mining in the catchment, work to date cannot be considered totally comprehensive or accurate, but

Map 20 - Mineral Workings



North Cornwall Local Environment Agency Plan

rather as a first step. Further development of the project could result in verifying results from the desk top study and adding to existing data. Responsibility for the physical dangers posed by shafts and adits lies with the landowner, however, where there is public access and a perceived threat to public health the District council may intervene.

Disposal of mineral waste

Control over the disposal and tipping of mineral waste lies with the Mineral Planning Authority and is addressed through appropriate planning conditions being put upon mineral workings. The Environment Agency does not licence mineral waste tips under waste regulations.

Contaminated Land

The Environment Act 1995 contains new provisions for dealing with contaminated land which will be implemented after April 1998; local authorities will be the key regulators and we will act as a consultee and advisor.

These provisions will define contaminated land as any which appears to a local authority to be in such a condition, because of the substances it contains, that either water pollution is being or is likely to be caused. This interpretation will be 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, and when these have been carried out we have a duty to publish a report on the state of contaminated land periodically.

Some sites may be designated as *special sites* and will become our responsibility. Special sites include those which are likely to cause serious water pollution. The draft Statutory Guidance indicated that contaminated sites should continue to be improved 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 and recover costs 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.

The precise nature and extent of contaminated land is not known within this area 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 this area. Once these sites have been identified, it will be necessary to decide what remedial work is required. We will need to ensure effective collaboration with the local authorities throughout this process.

Oil Pollution Prevention

The Lord Donaldson Inquiry Report highlighted the high level of vulnerability of our southern coast line and its estuaries. During 1993 and 1994 there were 34 maritime incidents in the UK coastal waters with 17 incidents that could have had serious implications for our regions coastline. The report also highlighted the need for improved levels of strategy by all agencies involved with major oil spills.

A previous NRA Policy Implementation Guidance note stated that we should be responsible in preventing, where practicable, the spread of oil inland from estuaries on incoming tides. We need to prepare action plans in consultation with Local Authorities, MAFF, English Nature etc., to protect wherever feasible sensitive areas of coastline and estuaries. All of these bodies are consulted during the survey.

In order to carry this forward we have started a process of sensitivity mapping and oil spill protection surveys. Details of these projects are given below.

Sensitivity mapping

This work which is essentially geographical, has resulted in the production of maps for the Camel Estuary. The maps contain a high level of data relating to the location /area of all the environmental issues currently found in the Estuary, such as: Areas of commercial shellfish harvesting (including periods of greatest environmental sensitivity), Ornithological sensitivity, Amenity value, EC Bathing Waters, Sailing marinas and moorings, Areas of Conservation value, SSSIs, Nature reserves, Heritage coastline, Geological features, Marine conservation importance and Habitat vulnerability along with basic tidal range information.

Oil spill protection surveys

This next phase includes the assessment of practical booming points from the mouth of the Estuary up into the higher tidal reaches, with these boom emplacements being prioritised, access points and other logistical points such as: access, boom types to be used, current and other tidal information, rendezvous points, the report and its accompanying plans are extremely useful should a marine oil pollution occur.

An initiative to develop a comprehensive oilspill response plan is being developed through the Camel Estuary Management Plan, see page 39 .

Controlled Processes

In 1863 the Alkali Act was the first legislation to be introduced to control releases to air from industrial sources in the United Kingdom. Over the years it has been added to but changed little in concept. There have been several changes in the regulations and legislation to separately regulate releases to water and to land. Part I of the Environmental Protection Act 1990 (EPA90) was a significant change in that the releases to all three media (air, land and water) have to be considered in the context of the impact on the environment as a whole, rather than considering single media releases only.

The Environment Agency is the statutory authority in England and Wales for regulating the largest and most complex industrial processes which discharge harmful non-radioactive and radioactive waste to air, water and land. To do this we use a system known as Integrated Pollution Control (IPC). Operators of these controlled processes are required to have an authorisation to discharge waste. The Agency also regulates the release of radioactive substances.

We have duties and powers to:

- regulate processes and stipulate minimum technical specifications for processes following principles of Best Available Techniques Not Entailing Excessive Cost (BATNEEC) to minimise releases whilst having regard to the Best Practicable Environmental Option (BPEO).
- review authorisations every four years.

Two lists of processes have been prescribed by regulations for control:

Part A processes are potentially the most polluting processes and releases to air, water and land are controlled under Integrated Pollution Control (IPC) by the Agency

Part B processes are potentially less polluting and releases to air from Part B processes are controlled at a local level under a system of Local Authority Air Pollution Control. The Environment Agency may be involved with releases to water and land

Part A and Part B processes are defined in The Environmental Protection (Prescribed Processes and Substances) Regulations[xii].

We also have a responsibility to supervise and regulate the spreading of sewage sludges on agricultural land.

Integrated Pollution Control (IPC)

Authorisations are issued under Section 6 of the Environmental Protection Act 1990 to operate a particular manufacturing process. The authorisation comprises of six parts including the operation of the process and keeping records, improvement programmes and releases to air, water and land.

Aspects of the process not regulated by those conditions are subject to a general condition that the person carrying it on must use Best Available Techniques Not Entailing Excessive Cost (BATNEEC);

a for preventing the release of substances prescribed for any environmental medium into that medium or, where that is not practicable by such means, for reducing the release of such substances; and

b for rendering harmless any other substances which might cause harm if released into any environmental medium.

Techniques include (in addition to technical means and technology) the number, qualifications, training and supervision of persons employed in the process and the design, construction, layout and maintenance of the huildings in which the process is carried on. The key part of controlling IPC processes is to try to prevent the release in the first place.

Once an IPC authorisation is issued, the Environment Agency ensures that operators comply with the pollution prevention and control standards laid down in the authorisation. At least every 4 years the Environment Agency reviews these conditions, in consultation with the operator, in case they require updating in the light of experience or new knowledge.

Conditions set out in authorisations included provisions requiring operators to manage, supervise and control their own sites and the process they operate, monitor their release, measure their performance against these parameters and report to the Agency. The Agency examines this feedback at regular intervals and inspectors make subsequent site visits and spot checks to ensure the IPC authorisation is being complied with. The frequency of inspection depends on the operator's performance in terms of compliance and the pollution potential of the process. Any complaint about a particular site is promptly investigated and serious pollution events receive immediate attention.

Sometimes conditions set out in an authorisation are not complied with and standards required by inspectors are not maintained. In most cases we deal with breaches of authorisation requirements by supporting operator's efforts to remedy their own failings. In cases where this approach does not succeed, the Agency has powers to halt a process if a serious pollution risk is imminent or to revoke an authorisation. The Agency aims to help operators put matters right but will use its powers to issue enforcement and probation notices and will prosecute if necessary. Prosecution is sometimes resorted to in cases where operators show persistent or flagrant disregard for public health and safety or cause obvious environmental damage or nuisance.

Table 20 : Controlled processes in the catchment

Operator	Type of Business	Legislation covering regulation
Maybridge Chemical Company, Trevillet, Tintagel	Fine organic chemicals production	IPC Authorisation under the Environment Protection Act 1990

Information is made available to the public via the public register, annual reports and an annual Chemical Release Inventory (CRI). Statutory monitoring information is also held on the public register. The confidentiality of some processes and discharge information can significantly affect the commercial interests of a company if they were made public. We have discretion to withhold such information. Some Government sites, such as Ministry of Defence sites, can also be exempt from the register.

Radioactive Substances

The Environment Agency is the principal regulator in England and Wales under the Radioactive Substances Act 1993. This statute is concerned with the storage, use and disposal of radioactive substances, and in particular, the regulation of radioactive waste. Each site is assessed by the Agency and permission granted on the basis that the use of radioactive substances 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.

There are no authorisations and only one registration in the catchment.

Air Quality

Air quality is an indicator of environmental quality. Air pollution can damage plants and animals, buildings and have significant effect on soils and water. It can also cause serious problems for those with asthma, bronchitis and other respiratory diseases.

The Role of the Environment Agency

The Environment Agency has wide powers, but will need to work closely with others if environmental improvements are to be achieved. We will need to work in partnership with national and local government, business, industry, and environmental and conservation groups to maximise securing environmental improvements. This is particularly important with regard to local air quality, where the Agency is only one of a number of regulatory bodies.

Local Authorities have primary responsibility for local air quality. The Agency has powers to regulate air quality principally by operating a system called Integrated Pollution Control (IPC) for certain industrial processes. The processes that are regulated are potentially most polluting industrial processes including large combustion plant, iron, and steel making, the chemical industry, solvent recovery and incineration plants. (See Controlled Processes, page 108).

The Agency also regulates landfill sites and in particular, landfill gas produced from the chemical and biological breakdown of waste at sites. This gas is principally a mixture of methane, a greenhouse gas which is flammable/explosive when mixed with air, and carbon dioxide, which is an asphyxiant.

The Roles of other organisations

The County Council Structure Plan contains polices 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 thousands of industrial premises generally with a lesser potential to pollute than those the Agency regulates. The processes concerned are known as Part B process 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 cable burning and noise pollution. Many local authorities monitor air quality in their area.

The Health and Safety Executive monitors the nuclear industry and issues site licences etc. The Department of Environment, Transport and Regions (DETR) enforces controls on vehicle manufacturers. The Police are responsible for controlling emissions from vehicles.

National Air Quality Strategy

Under Part 4 of the Environment Act 1995 the Government is 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.

Pilot studies, to review and assess these national guidelines have been set up in 14 areas of the UK. A pilot study is taking place in Cornwall from 1996. Actions that come out of the pilot study, the Cornwall Air Quality Forum, may show the way forward to dealing with air quality issues in the catchment and the county.

Local air quality management areas

Local authorities will be required to review present and future air quality against air quality standards and objectives shortly to be prescribed by the Government. The standards are likely to reflect advice from the Expert Panel of Air Quality Standards (EPAQS), the European Community and the World Health Organisation and will take into account potential risks, costs, and technical feasibility. The Government will set Air Quality targets which should be achieved throughout the UK by 2005. Local authorities will have to carry out periodic reviews of air quality in their areas. This may build upon existing records and reports.

Where standards are not being met or are not likely to be met an air quality management area should be declared (known as a "Designated Area"), and an action plan produced to improve air quality. This will require objective assessments together with appropriate monitoring and modelling studies. The Agency will liaise fully with local authorities and agree any maps or quotients representing air quality.

Cornwall air quality forum

The forum has been formed as one of 14 pilot areas nationwide. It is led by Carrick District Council, and has representation from all local authorities in the county and the Agency. The Forum has been funded by the Government to:

- review and assess government guidance on air quality strategy, its appropriateness, requirements and applicability.
- carry out an assessment of monitoring techniques for PM10s (dust) at a china clay quarry site.

A contract was been let to complete the PM10 survey, at the time of writing, a report is due to be published in November 1997.

Air quality information exists for Cornwall but there is not full knowledge of what is available. Information is held in different places and is not easily accessible as a whole. Members of the Air Quality Forum are working together to identify all available information.

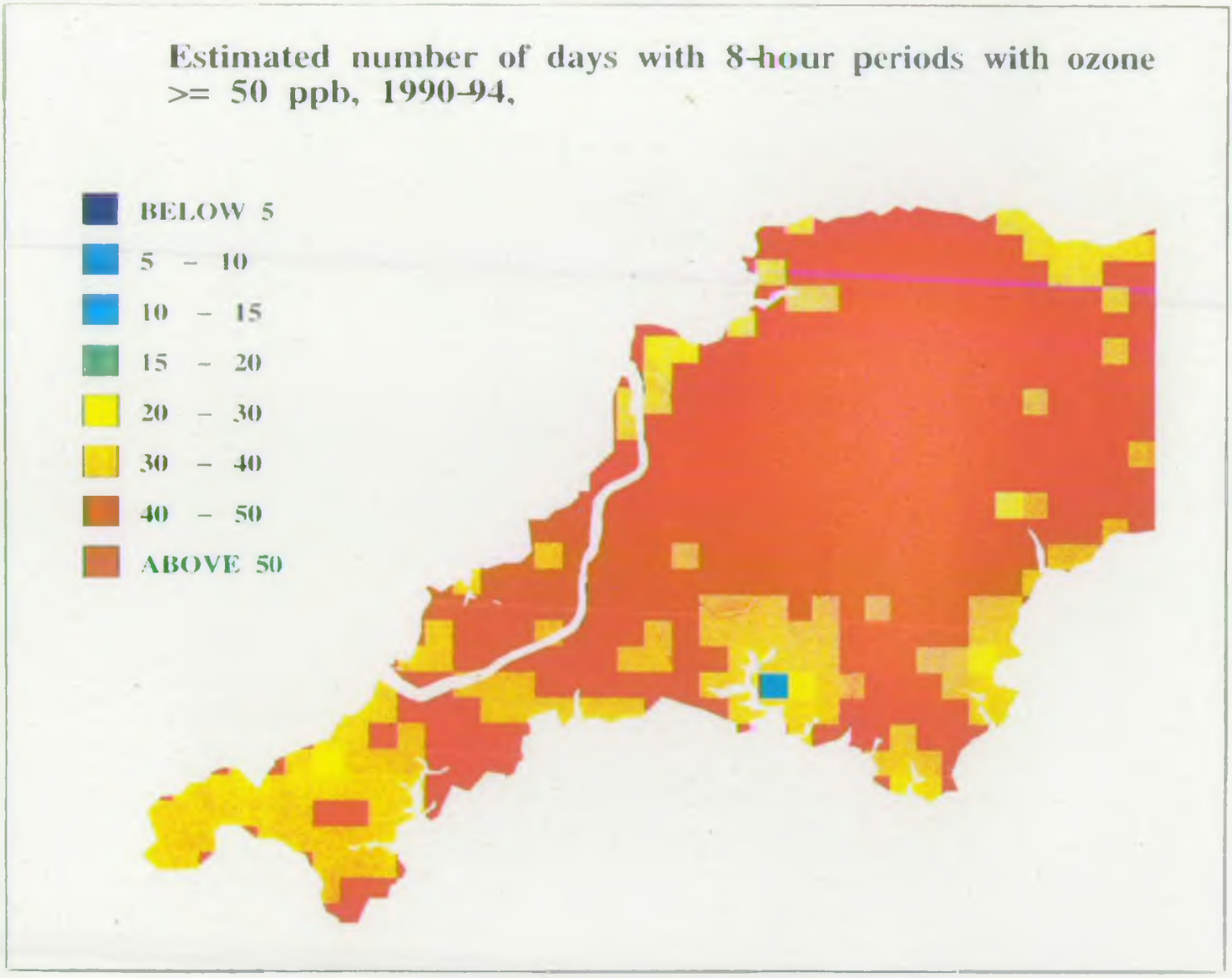
Ground level ozone

Ozone in the upper atmosphere shields the earth from harmful UV radiation. At ground level however, ozone can be a harmful pollutant damaging crops and building materials and causing respiratory difficulties amongst sensitive people. Ozone is not emitted directly from any man-made source in any significant quantities, but arises from complicated chemical reactions in the atmosphere driven by sunlight. In these reactions, oxides of nitrogen and hydrocarbons (derived mainly from vehicle exhausts) react in the atmosphere to produce ozone. 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[xiii]. The Expert Panel of Air Quality Standards (EPAQS) recommend an Air Quality Standard for ozone in the UK of 50 parts per billion (ppb) as a running 8-hour average. Figure 3, page 112 shows the estimated number of days in the South West over which this recommendation would be exceeded.

The Department of the Environment has published a UK strategy on the reduction of emissions that can produce ozone[xiv]. Nationally the Environment Agency will have an input into the reduction of volatile organic compounds (VOCs) and oxides of nitrogen (NOx), both of which are precursors in the formation of ground level ozone. VOC and NOx releases from IPC processes are controlled by limits in authorisations. These limits will be reduced over time as operators move towards new plant standards.

Figure 3: Ground level ozone



Acid rain

The term 'Acid Rain' is loosely used to describe wet or dry deposition of acidic compounds from the atmosphere. It is popularly used to mean rain, mist or snow which contains acid compounds predominantly of sulphur and nitrogen. The main sources of these acid gases are power stations and other large industrial combustion plants which burn fossil fuels (coal, oil and gas) and (particularly in the case of oxides of nitrogen) motor vehicles. Ammonia which arises from agriculture may under some soil conditions also lead to acidification. Natural sources of sulphur dioxide such as volcanoes and marine algae account for only a few percent (less than 5%) of the acid deposition received in the UK.

In some parts of the UK, natural ecosystems have a significant capacity to neutralise acidity and acid deposition has little impact on them, but in acid sensitive areas, acid rain causes damage to plants and soils in which they grow. In these areas substances can be released from soils which runoff into water bodies and are toxic to water life. Acid deposition can also alter the acid balance in water bodies and this too has an effect on the life they support; it can also corrode buildings. Acid rain components which contain nitrogen have the effect of acting as a fertiliser; this can change the make up of communities of land and water plants and affect animals that live on them.

The control of acid rain has been underpinned by the concept of critical loads. The concept of a critical load is a simple one - it is the threshold at which the pollutant load causes harm to the environment and has been defined by the United Nations Economic Commission for Europe as:

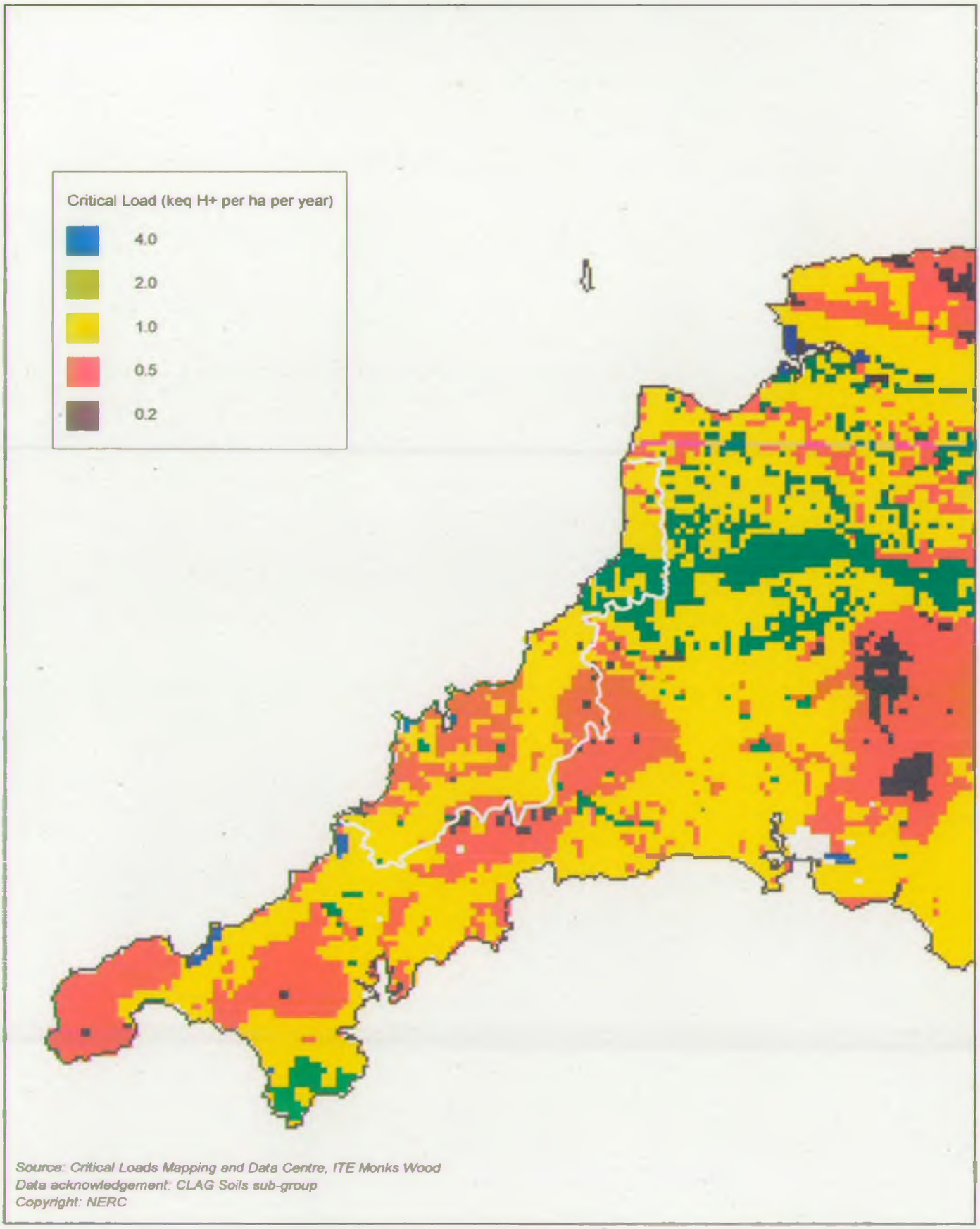
> a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on sensitive elements of the environment do not occur according to present knowledge.

In the case of soils the critical load has been calculated on the basis of the rate of production of acid neutralising compounds a part of natural weathering. Different soils will weather at different rates and hence will be more or less sensitive to acid deposition. Rocks such as granite are relatively slow to weather and therefore are sensitive to acid deposition.

Figure 4 shows the distribution of critical loads of acidity for soils and an estimate of the current deposition of sulphur calculated on a 20 km grid. Figure 5 shows the exceedence of the critical loads for soil. The critical loads are particularly exceeded over moorland in the north of the catchment.

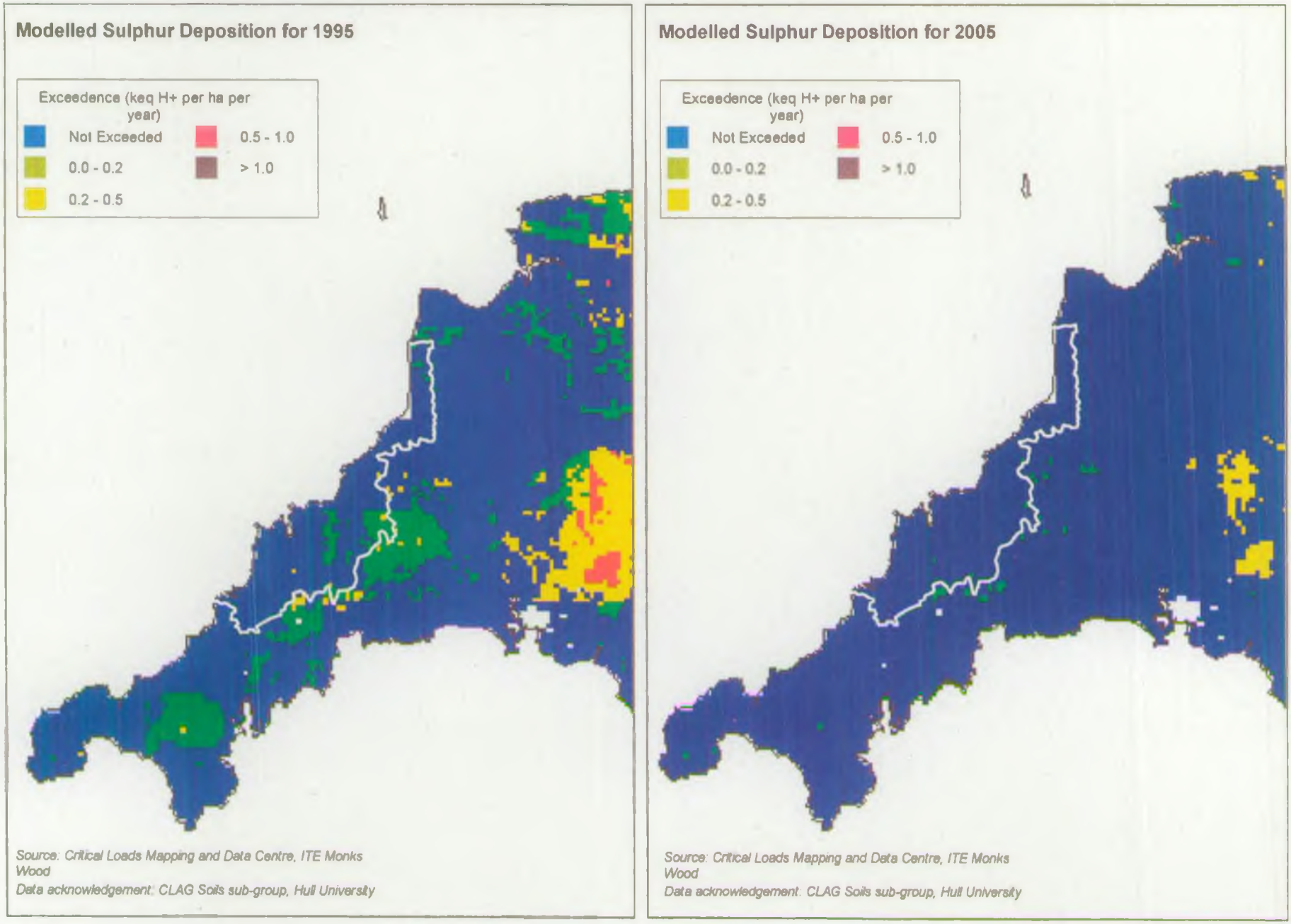
In England and Wales, typically 49% of acid deposition arises from large combustion sources such as power stations or refineries, 32% from European sources, 11% domestic, other industry and natural sources 4-5% each. It is expected that action at a national level by the Agency will significantly reduce the input from the major UK combustion sources. Figure 5 also shows the anticipated level of exceedence in 2005 once the controls announced in March 1996 on power station emissions have been fully implemented. By 2005 it is likely that European sources will be the largest contributor (40%) with large combustion sources and domestic emissions contributing approximately 25% each.

Figure 4 - Critical Loads of Acidity for Soils



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

Figure 5 - Exceedences of Critical Loads of Acidity for Soils



APPENDIX A -Sites of Special Scientific Interest

Bedruthan Steps and Park Head, Trebetherick Point, Pentire Peninsula, Tintagel Cliffs, Boscastle to Widemouth and **Steeple Point to Marsland Mouth** are coastal sites which support a mix of maritime grassland, maritime heath, scrub and rocky shore communities. Many locally distributed plants and animals occur in these extreme conditions, a number of which are listed in the Red Data Books. Parts of some of these sites are of national geological importance also.

Trevose Head and Constantine Bay, and **Rock Dunes** support species-rich sand dune communities, along with other maritime vegetation types. The former site holds what is thought to be England's only population of White Sandhill Snail.

Borlasevath and Retallack Moor, Rosenannon Bog and Downs, Retire Common and **Bodmin Moor North** are inland sites comprising a variety of heathland and wetland habitats including dry heath, valley mire and blanket bog. They are home to specialised and uncommon species of plant and animal. Bodmin Moor is the most southerly upland in the UK and is an important area for breeding and wintering birds more commonly found in Wales and the north.

Amble Marshes is a wetland site in an arm of the Camel Estuary. It is noted as an important haven for wintering wildfowl and waders, and is developing into a valuable dragonfly site also.

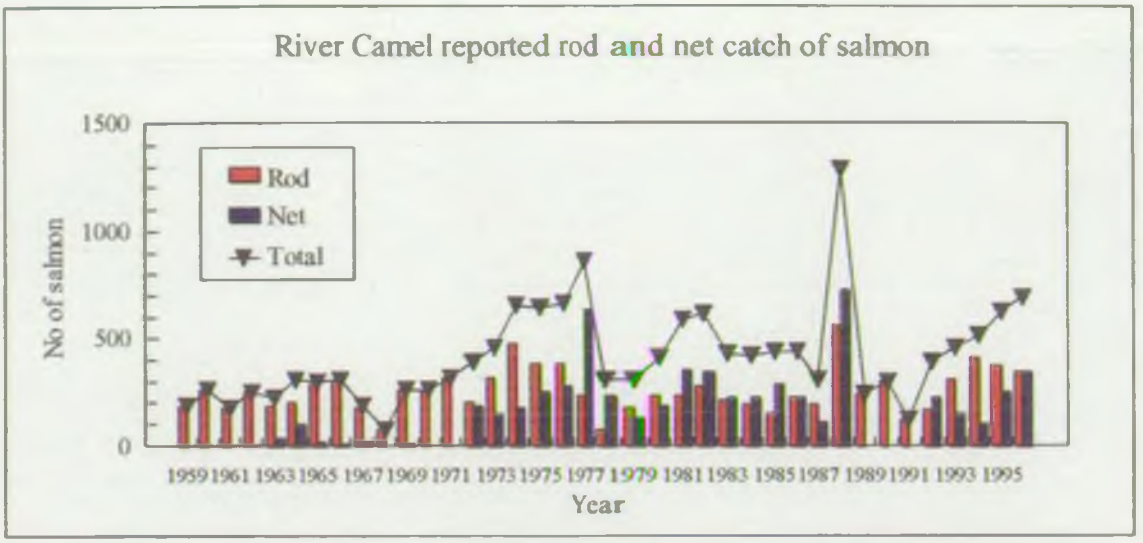
St Nectan's Glen is a humid woodland/stream site with a rich moss and liverwort community, including a species listed on Schedule 8 of the Wildlife and Countryside Act.

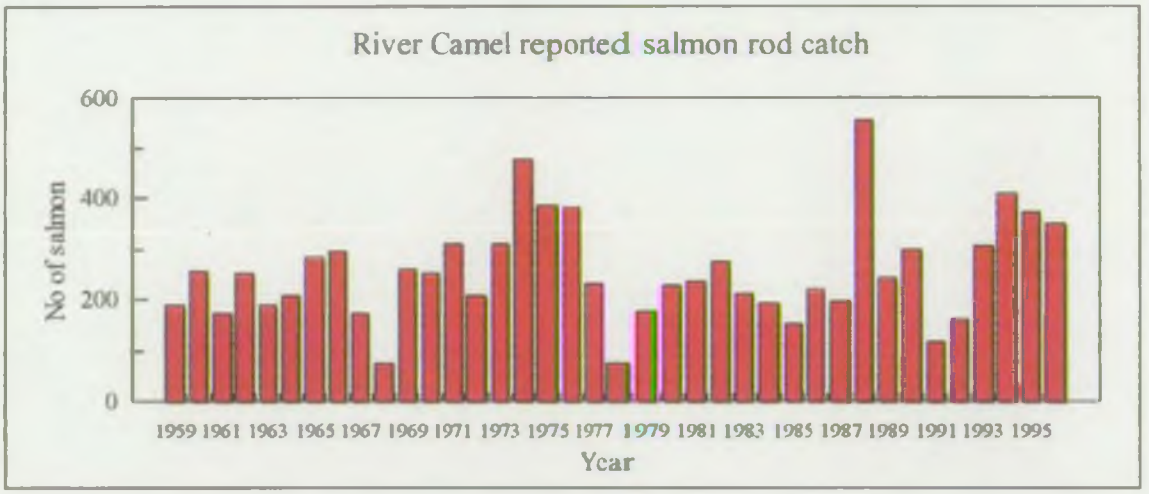
The remaining 8 SSSIs in the site -**Trevone Bay, Stepper Point, Harbour Cove, Belowda Beacon, Mulberry Downs Quarry, Bude Coast, Duckpool to Furzey Cove** and **De Lank Quarry** -have been designated for their national geological value. Most of them reflect the extremely visible exposures along the coast which greatly aid our understanding of the formation of the south west peninsula.

Table 21: 'Set Aside' data

River	Stretch Name	Stretch Ref No	Set Aside
Benny Stream	Trewerry Mill-Gannel Confluence	6	Zinc
East Wheal Rose Stream	Source-East Wheal Rose Bridge	7	Zinc, pH
	Benny Bridge-Benny Stream Confluence	8	Zinc
Allen (Camel)	Source-Knightsmill Bridge	28	Zinc
De Lank River	Source-Bradford Bridge	34	pH

APPENDIX B


River Camel reported rod and net catch of salmon
No of salmon
1500
1000
500
0
Rod
Net
Total
1959 1961 1963 1965 1967 1969 1971 1973 1975 1977 1979 1981 1983 1985 1987 1989 1991 1993 1995
Year


River Camel reported salmon rod catch
No of salmon
600
400
200
0
1959 1961 1963 1965 1967 1969 1971 1973 1975 1977 1979 1981 1983 1985 1987 1989 1991 1993 1995
Year

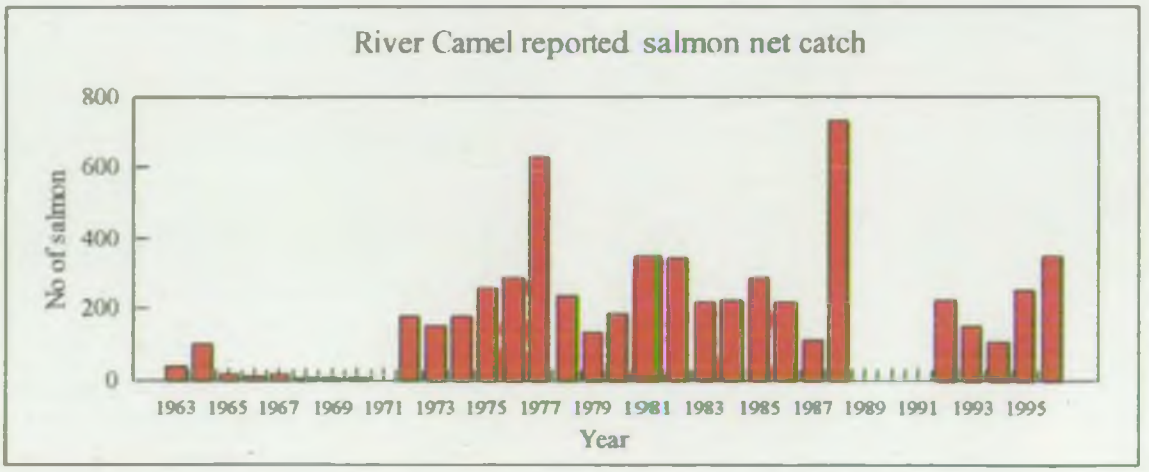

River Camel reported salmon net catch
No of salmon
800
600
400
200
0
1963 1965 1967 1969 1971 1973 1975 1977 1979 1981 1983 1985 1987 1989 1991 1993 1995
Year

Table 22: Level One National Fisheries Classification abundance classes for salmonids

	Abundance classes (Fish/100m²)					
Age class	A	B	C	D	E	F
Salmon 0+	>86	>45-86	>23-45	>9-23	9	0
Salmon >0+	>19	>10-19	>5-10	>3-5	3	0
Brown / sea trout 0+	>38	>17-38	>8-17	>3-8	3	0
Brown / sea trout >0+	>21	>12-21	>5-12	>2-5	2	0

Table 23: National Fisheries Classification abundance classes for the Camel Catchment

% survey sites (1994) in juvenile abundance classes (number of sites)						
Age class	A	B	C	D	E	F
Salmon 0+	10 (3)	7 (2)	3 (1)	13 (4)	20 (6)	47 (14)
Salmon >0+	7 (2)	23 (7)	20 (6)	10 (3)	20 (6)	20 (6)
Brown / sea trout 0+	26 (9)	34 (12)	17 (6)	9 (3)	14 (5)	0
Brown / sea trout >0+	69 (24)	31 (11)	0	0	0	0

Table 24: National Fisheries Classification abundance classes for the Allen Catchment

% survey sites (1994) in juvenile abundance classes (number of sites)						
Age class	A	B	C	D	E	F
Salmon 0+	8 (1)	25 (3)	8 (1)	25 (3)	17 (2)	17 (2)
Salmon >0+	8 (1)	17 (2)	34 (4)	8 (1)	25	8 (1)
Brown / sea trout 0+	50 (6)	34 (4)	8 (1)	8 (1)	0	0
Brown / sea trout >0+	92 (11)	8 (1)	0	0	0	0

Both rivers have improved juvenile recruitment since the Lowermoor pollution incident. This is likely to be attributed to the mitigation measures undertaken after this incident as reported by D.J.Solomon (1993).

The Rivers Camel and Allen are extremely productive for trout, in particular the latter, this also is evident in previous surveys. The 1994 surveys on the Camel recorded 47%, of sites (14) without salmon fry, this is higher than the previous survey during 1991, when 30% (9) sites were recorded without salmon fry. These figures only include sites that are considered accessible to salmon. However, the electric fishing surveys are limited to the middle and upper reaches of the Camel, because of the limitations and practicalities of electric fishing in wide swift flowing watercourses. In general salmon spawn lower down stream than brown and sea trout.

APPENDIX C

Table 25: Standards for the Five River Ecosystem Use Classes

Use Class	DO% sat 10% ile	BOD (ATU) mg/l 90% ile	Total Ammonia mg N/l 90% ile	Un-ionised Ammonia mg N/l 95% ile	pH 5% ile & 95% ile	Hardness mg/l CaCo,	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 & ≤ 50 >50 & ≤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 & ≤ 50 >50 & ≤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 & ≤ 50 >50 & ≤100 >100	5 22 40 112	300 700 1000 2000	Water of fair quality suitable for high class coarse fish populations
4	50	8.0	2.5		6.0-9.0	≤10 >10 & ≤ 50 >50 & ≤100 >100	5 22 40 112	300 700 1000 2000	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

Table 26: Proposed River Quality Objectives

River	Stretch Name	Stretch Ref No	RQO	LTRQO
Gannel	Source-Perrose	1	3	2
	Perrose-Gwills Gauging Stn	2	1	
	Gwills Gauging Station-Normal Tidal Limit (NTL)	3	2	
Trencreek	Source-Boating Lake	4	3	2
Newlyn East Stream	Source-Gannel Confluence	5	1	
Benny Stream	Benny Mill Bridge-Gannel Confluence	6	2	1
East Wheal Rose Stream	Source-East Wheal Rose Bridge	7	1	
	East Wheal Rose Bridge-Benny Stream Confluence	8	3	1
Porth Stream	Porth Reservoir-Melancoose	9	2	1
	Melancoose-Normal Tidal Limit	10	2	1
Menahyl	Source-St. Columb Major Bridge	11	1	
	St. Columb Major Bridge-Below St. Columb Stw	12	2	
	Below St. Columb Stw-St. Mawgan Bridge	13	2	1
	St Mawgan Bridge-Normal Tidal Limit	14	2	

Camel	Source-Slaughterbridge	15	1	
	Slaughterbridge-Camelford Bridge	16	1	
	Camelford Bridge-Pencarrow	17	2	1
	Pencarrow-Gam Bridge	18	2	1
	Gam Bridge-Wenford	19	1	
	Wenford-Below Wenford Driers	20	2	1
	Below Wenford Driers-Above Scarletts Well Stw	21	1	
	Upstream Scarletts Well Stw-Upstream Nanstallon Stw	22	1	
	Upstream Nanstallon Stw-Nanstallon Bridge	23	2	
	Nanstallon Bridge-Grogley	24	1	
	Grogley-Normal Tidal Limit	25	1	
Issey Brook	Source-Normal Tidal Limit	26	2	
Amble	Source-Normal Tidal Limit	27	2	
Allen (Camel)	Source-Knightsmill Bridge	28	2	1
	Knightsmull Bridge-Normal Tidal Limit	29	1	
Ruthern	Source-Camel Confluence	30	1	
St. Lawrence Stream	Source-Above Pendewy Bridge	31	1	
	Above Pendewy Bridge-Camel Confluence	32	1	
Dunmere Stream	Source-Camel Confluence	33	1	
De Lank River	Source-Bradford Bridge	34	1	
	Bradford Bridge-Camel Confluence	35	1	
Stannon Stream	Upstream Stannon China Clay-Downstream Stannon China Clay	36	1	
	Downstream Stannon China Clay-Camel Confluence	37	1	
Crowdy Stream	Crowdy Reservoir	38	1	
Davidstow Stream	Source-Camel confluence	39	1	
Valency	Source-Mean High Water	40	2	1
Wanson Water	Source-Mean High Water	41	2 (2000)	
Strat	Source-Hele Bridge	42	2	
	Hele Bridge-Normal Tidal Limit	43	2	
Bude Canal	Source-Normal Tidal Limit	44	3	
Neet	Source-Langford Bridge	45	2 (2000)	
	Langford Bridge-Strat Confluence	46	2	
Jacob Stream	Source-Neet Confluence	47	2	
Combe Valley Stream	Source-Normal Tidal Limit	48	1	
Marsland Water	Source-Normal Tidal Limit	49	1	

(2000) - indicates objective must be complied with by the year 2000.

APPENDIX D

Waste spreading to land

Spreading of controlled wastes to land

i) The spreading of controlled wastes onto land used for agriculture is classified as a waste disposal operation and is regulated through the Waste Management Licensing Regulations 1994.

ii) Wastes which can be spread without the need for a Waste Management Licence are listed in Table 2 Paragraph 7 of Schedule 3 to the regulations:

iii) TABLE 2

PART 1

- Waste soil or compost
- Waste wood, bark or other plant matter

PART II

- Waste food, drink, or materials used in or resulting from the preparation of food or drink
- Blood and gut contents from abattoirs
- Waste lime
- Lime sludge from cement manufacture or gas processing
- Waste gypsum
- Paper waste sludge, waste paper and de-inked paper pulp
- Dredgings from any inland waters
- Textile waste
- Septic tank sludge
- Sludge from biological treatment plants
- Waste hair and effluent treatment sludge from a tannery.

For wastes other than septic tank sludge, a detailed analysis is required in order to ascertain both the nutrient or the adverse characteristics of a particular waste. These results are compared with soil analysis data from the site in order to determine that there is a crop requirement for the additional nutrients and that benefit to agriculture will result from the spreading of the wastes.

GLOSSARY

ABSTRACTION
Removal of water from a surface or groundwater source of supply.

ADIT
Gently sloping passage from mine workings into valley areas to allow water to drain out of the working (the downstream entrance is called the adit portal).

ALGAL BLOOMS
A visible, often seasonal occurrence of very large numbers of algae floating in fresh water or sea.

ANTHROPOGENIC
Resulting from or influenced by man's activities.

ARISINGS
Quantities of waste being generated.

AQUIFER
Layer of porous rock able to hold and transmit water. Often classified as major, or minor, depending on the extent to which they support higher yielding borehole systems.

BASEFLOW
The flow in a river comprising emergent groundwater sources. In dry conditions river flows comprise entirely of baseflow.

BIOCHEMICAL OXYGEN DEMAND (BOD)
A measure of the amount of oxygen consumed in water, usually as a result of organic pollution.

BRYOPHYTES
Mosses and liverworts.

BUFFER ZONE
Strip of land 10-100m wide, alongside rivers which is removed from intensive agricultural use and managed to provide appropriate habitat types. Benefits include potential reduction of inputs into the river such as silt, nutrients, livestock waste, as well as improving habitat diversity and landscape.

COMPENSATION FLOW
A defined release from a reservoir to compensate for the impact of the impoundment by maintaining a minimum flow in the river downstream.

CONSENT
A statutory document issued by Environment Agency under Schedule 10 of Water Resources Act 1991 to indicate any limits and conditions on the discharge of an effluent to controlled water.

CONTROLLED WASTE
Is waste from household, commercial or industrial sources, it may be solid or liquid. It does not have to be hazardous or toxic.

CORNWALL WASTE MANAGEMENT FORUM
The Forum consists of representatives from the six District Councils, as the waste collection authorities, County Council, as the waste disposal authority and planning authority, and the County Councils waste disposal contractor, and the Agency.

CULM MEASURES
A distinct area of North East Cornwall, extending into Devon, characterised by poor soils and rushy pastures, the Culm measures contain many important habitats and species.

CULVERT
Channel or conduit carrying water across or under a road, canal etc.

DETERMINAND
That which is to be determined or measured.

DROUGHT ORDER
Drought Orders are 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 and Sch 22 S139 of the Environment Act 1995. Drought Orders are sub-divided into 'Ordinary' and 'Emergency' Drought Orders. A Drought Order could contain provisions such as; to authorise abstraction from an unlicensed source, override the conditions on an existing abstraction licence, limit the amount of water which may be taken from a source, vary discharge conditions or might allow the prohibition of use of water for particular purposes, to allow a ban on non-essential use of water (for example in car washes) or to introduce the use of stand-pipes.

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

FLUVIAL
Pertaining to river flow and its erosive activity.

GRILSE
Atlantic salmon that have remained in the sea for only one winter.

LICENCE OF ENTITLEMENT
Licence granted under Schedule 26 of the Water Act 1989 in respect of a previously exempt abstraction greater than 20m^3/day which required a licence by virtue of an amendment to Section 24(2) and (3) of the Water Resources Act 1963. (This only covered particular domestic and agricultural uses, including fish farming and flows to domestic amenity ponds).

MAIN RIVER
Some, but not all, watercourses are designed as 'Main River'. 'Main River' status of a watercourse must first be approved by MAFF. Statutory (legally binding) maps showing the exact length of 'Main River' are held by MAFF in London and the Environment Agency in Regional Offices. The Environment Agency has the power to carry out works to improve drainage or protect land and property against flooding on watercourses designated as 'Main River'. The Environment Agency do not have the legal power to spend public funds on drainage or flood protection works on watercourses not designated as 'Main River'.

NATURAL AREA
The whole of England has been described as a series of ecologically distinct areas following survey work by English Nature.

NUTRIENT
Conveying, serving as, or providing nourishment.

PARR
Juvenile salmonoids aged one year and older.

PAYBACK
The consultancy service of Groundwork Trust for Devon & Cornwall. They carry out waste audits for business.

PERMEABILITY
A measure of the ease at which liquids (or gases) can pass through rocks or a layer of soil.

PRESCRIBED FLOW (pf)
Flow below which a river must not be reduced as a result of licensed abstraction.

REDD
Hollow created in river bed gravels by spawning salmonid fish into which the female deposits ova.

RIPARIAN OWNER
Owner of riverbank and/or land adjacent to a river. Normally owns riverbed and rights to at least midline of channel.

RIVER CORRIDOR
Land which has visual, physical or ecological links to a watercourse and which is dependent on the quality or level of the water within the channel.

SALMONID
Game fish of the salmon family e.g. salmon, brown trout and sea trout.

SMOLTS
Young salmonids migrating to sea for the first time and adapted to life in salt water.

SPECIAL WASTES
These are the most hazardous wastes, they include hazardous or toxic wastes. Some common special wastes are; acids, alkaline solutions, oil fly ash, industrial solvents, oily sludge, pesticides, pharmaceutical compounds, photographic chemicals, waste oils and wood preservatives.

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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.

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