NATIONAL RIVERS AUTHORITY

South West Region

RIVER TORRIDGE CATCHMENT MANAGEMENT PLAN

Stage 1

STATEMENT OF CATCHMENT USES AND PROBLEM IDENTIFICATION

NRA

National Rivers Authority

CONSULTATIVE COPY

NATIONAL RIVERS AUTHORITY

SOUTH WEST REGION

RIVER TORRIDGE CATCHMENT MANAGEMENT PLAN

STAGE 1

STATEMENT OF CATCHMENT USES

AND PROBLEM IDENTIFICATION

September 1990

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RIVER TORRIDGE CATCHMENT MANAGEMENT PLAN

STAGE 1

CONTENTS

1. CATCHMENT MANAGEMENT PLANS - INTRODUCTION TO THE CONCEPT

1.1 River and estuarine systems are subject to increasing use by a variety of activities. Many of these interact and some conflicts arise. There is also evidence that human activity is causing damage to the environment. Society's overall objective must be to have an environment which can be used and enjoyed without endangering or compromising the quality of life for ourselves or for future generations.

1.2 In a river system, conditions in one section are affected by circumstances upstream and, in turn, will affect conditions downstream. Land use and the related management practices can affect water quality, even when far removed from the watercourse. It is impossible to separate the management of waters from that of land and the whole drainage basin must be considered as the minimum ecosystem unit for water management.

1.3 The estuary represents a meeting place of river water and the sea. It is characterised by a constantly changing mixture of salt and fresh water and is often dominated by fine sedimentary material carried into the estuary from the sea and from the rivers, resulting in the accumulations known as mud flats. Water quality in an estuary is never static. It is continuously affected by the quality of incoming sea and riverine water, the effluents discharged from towns and industry along the shore, the physical processes of sedimentation and resuspension, the biological processes occurring in the water column and in the muds and the driving forces of riverine flow and tidal action.

1.4 Estuaries support many living organisms although the diversity of species in this continually changing environment is lower than either fresh or sea water systems. Management of estuarine quality requires an understanding of the fate of pollutants arriving from the rivers, the discharges, the land and the sea. This is extremely complex and may be unacceptably costly to achieve. The real goal is to set meaningful controls for discharges to the estuary itself and to the upstream rivers, while working towards clear quality objectives to protect the legitimate uses of the estuarine waters.

1.5 The objective of catchment management must be to predict and reduce conflicts of use and to achieve all use related objectives. The National Rivers Authority (NRA) has decided that the best way of achieving this is through the production of Catchment Management Plans. These are drawn up in consultation with interested parties and represent an agreed strategy for realising the environmental potential of the catchment concerned, within prevailing economic and political constraints.

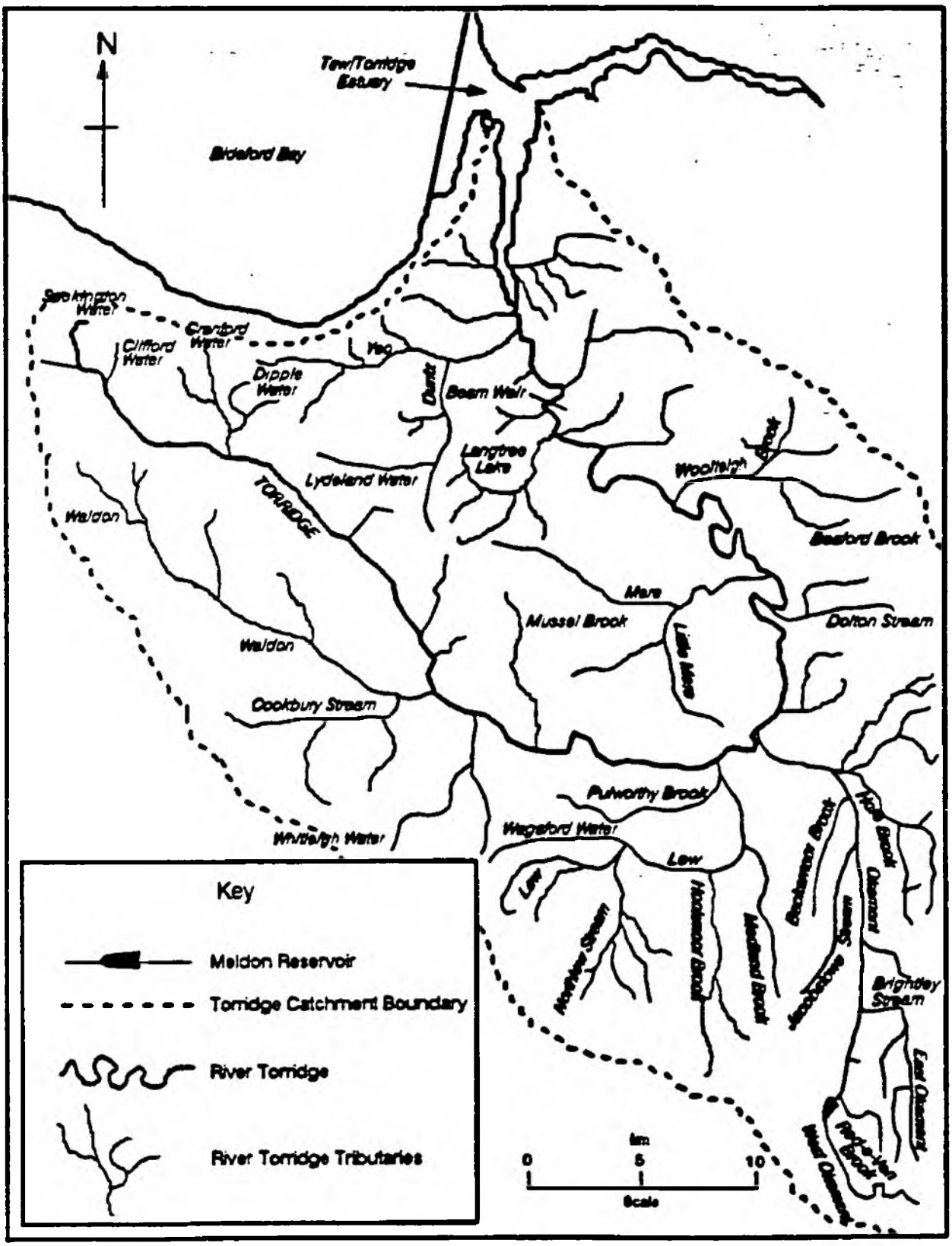
1.6 These plans will be in two stages, the first of which will identify :

- the uses of the catchment;
- the environmental requirements for each use;
- the present state of the catchment when compared with these targets;
- gaps in our knowledge, and known problems and conflicts. Solutions are given where they are easily identifiable but these do not represent the final version of solutions to all identified problems.

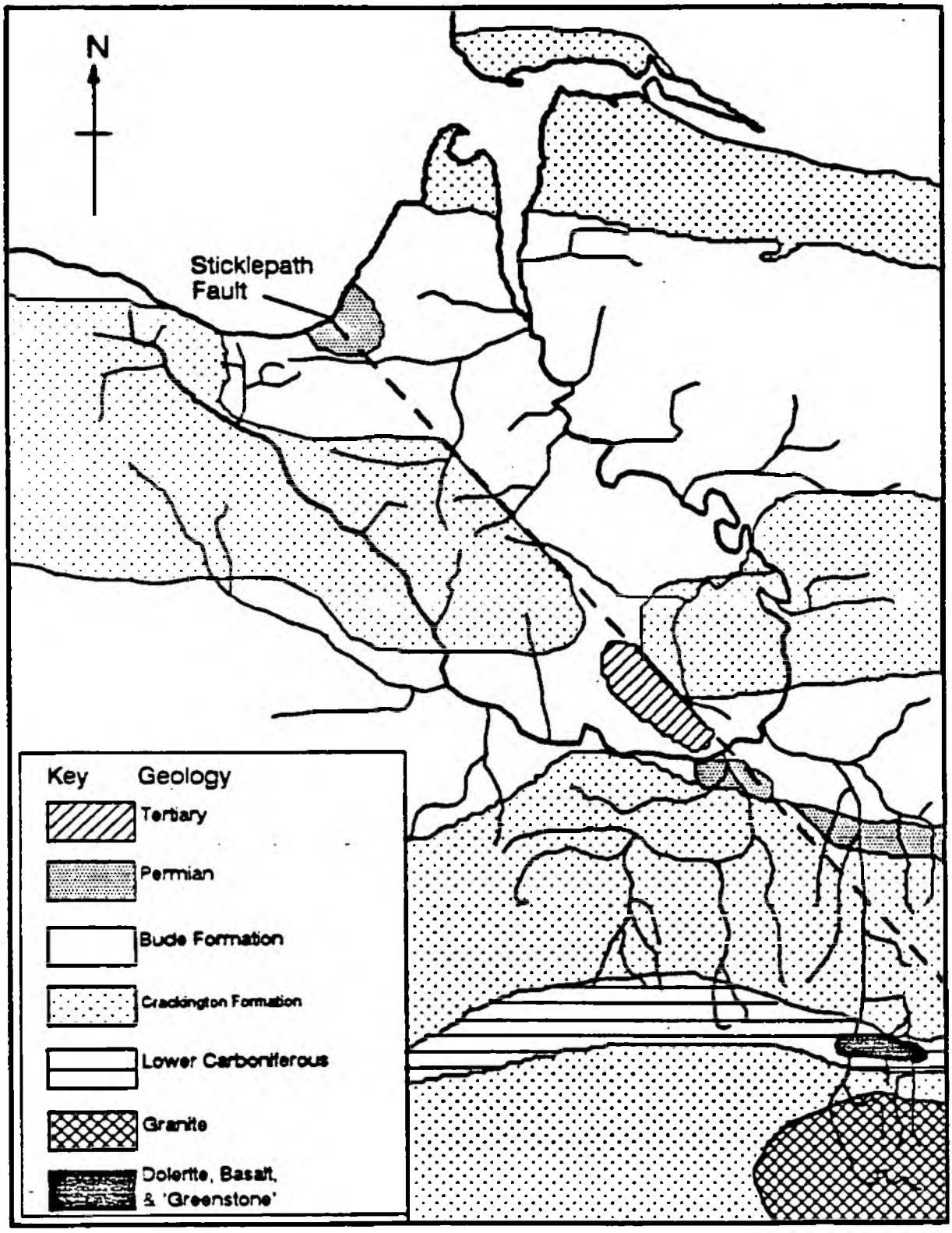
This document is Stage 1 for the Torridge Catchment and is released for public consultation.

1.7 The problems identified in Stage 1 and the agreed solutions will be presented in a Stage 2 plan.

The Torridge Catchment



The Torridge Catchment
GEOLOGY



2 RIVER TORRIDGE CATCHMENT - OVERVIEW

2.1 Introduction

The River Torridge drains a large part of north-west Devon. The main river rises near the coast at Baxworthy Cross (SS 290 224) at a level of 200 m OD. From this point it flows south-east where it is joined by the River Waldon north-east of Bradford (SS 426 079) and further downstream by the River Lew north of Hatherleigh (SS 534 050). It then turns north and begins to flow towards the estuary at Bideford. In this stretch, it is joined by the River Okement (SS 551 072), which rises on Dartmoor, by the River Mere south of Beaford (SS 551 130) and by the River Yeo 2 km south of Bideford (SS 462 245) below the freshwater limit.

The total area drained by the Torridge freshwater catchment is equivalent to 857 km². Major sub-catchments within the Torridge include:

Catchment	Area km²	Percentage of Total Catchment %
Waldon	78	9
Lew	117	14
Okement	141	16

2.2 Geology

Sedimentary rocks of Carboniferous age, known locally as the Culm Measures, predominate in the catchment; although the headwaters of the East and West Okement have their sources on the northern fringes of the Dartmoor granite. Other minor igneous intrusions of doleritic and basaltic rock lie just to the north of the granite, intruded into the sedimentary sequence.

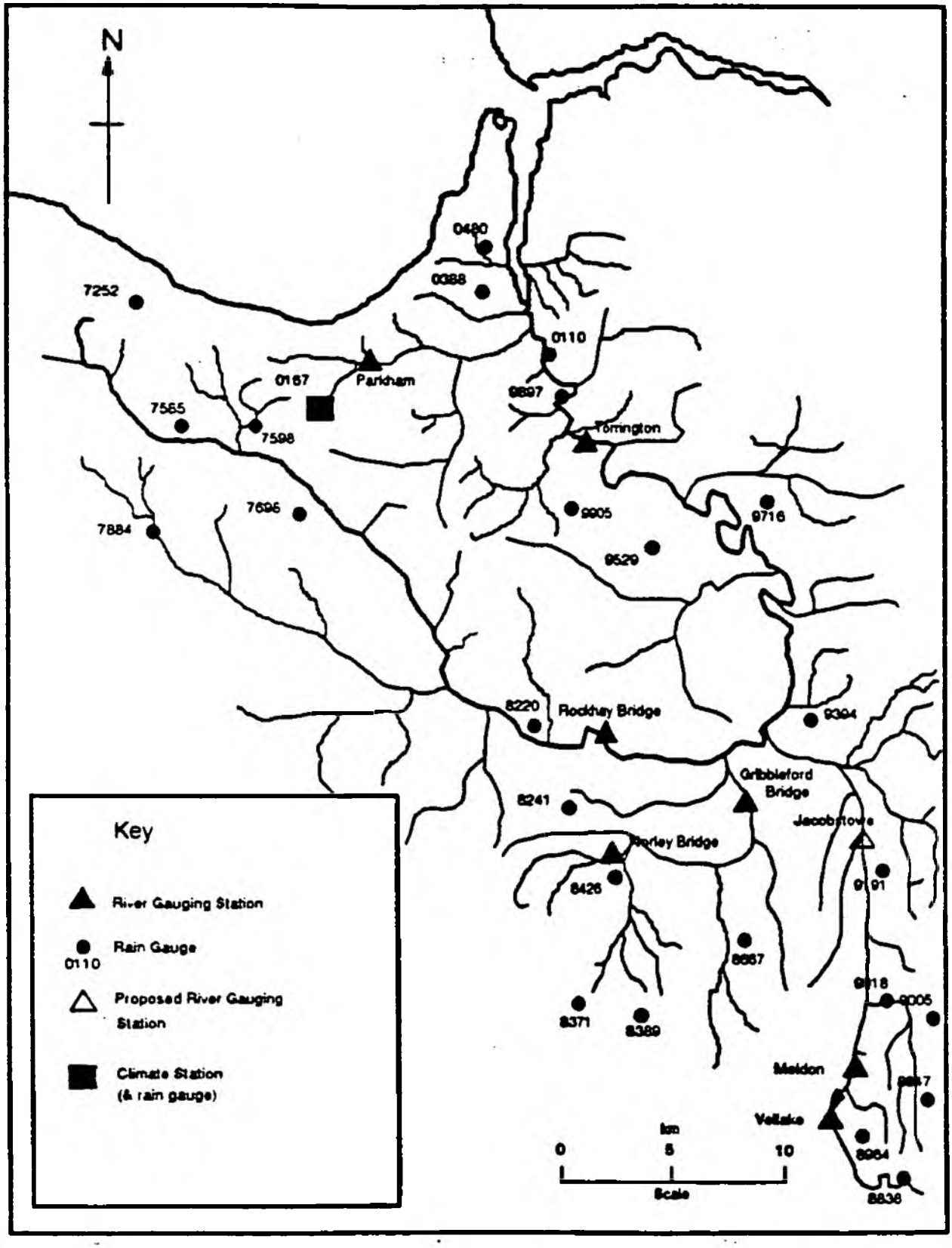
The carboniferous strata are formed of thin alternating layers of shale and turbidite sandstone. Sandstones predominate in the Bude Formation; shales predominate and are separated by thinner sandstone beds in the Crackington Formation.

The strata were folded along E-W axes during the Variscan Orogeny; a period of major earth movements in late Carboniferous times. The Dartmoor granite was also intruded during this period.

Uplift and erosion at the end of the Variscan period gave rise to local deposits of breccia and breccio-conglomerate which were deposited in hollows in the carboniferous landscape near Hatherleigh and east of Clovelly during Permian times.

The carboniferous strata were further displaced by a swarm of minor, and some major, NW-SE dextral wrench faults, of which the Sticklepath Fault is the most important example. Much of this NW-SE faulting occurred during Tertiary times.

The Torridge Catchment
HYDROMETRIC NETWORK



The Alpine Orogeny (tertiary) reactivated the NW-SE faulting and caused local basin subsidence along the line of the Sticklepath Fault. The thick deposits of clay, lignite and sand which form the Petrockstowe basin were accumulated at this time. This deposit is exploited for the extraction of ball clay.

Minor outcrops of boulder clay and related glacial hills are found in the extreme north of the catchment which are periphiral deposits from late stage glaciaton in late Quaternary times. Local outcrops of blown sand and raised beach structures also occur in this area.

2.3 Hydrometric Network

Rainfall is measured at 26 stations within the catchment but the full suite of climatological data is only monitored at Melbury (0167).

There are 7 river flow gauging stations in the Torridge Catchment from which data is recorded every 15 minutes, validated and stored in the Hydrometric Archive.

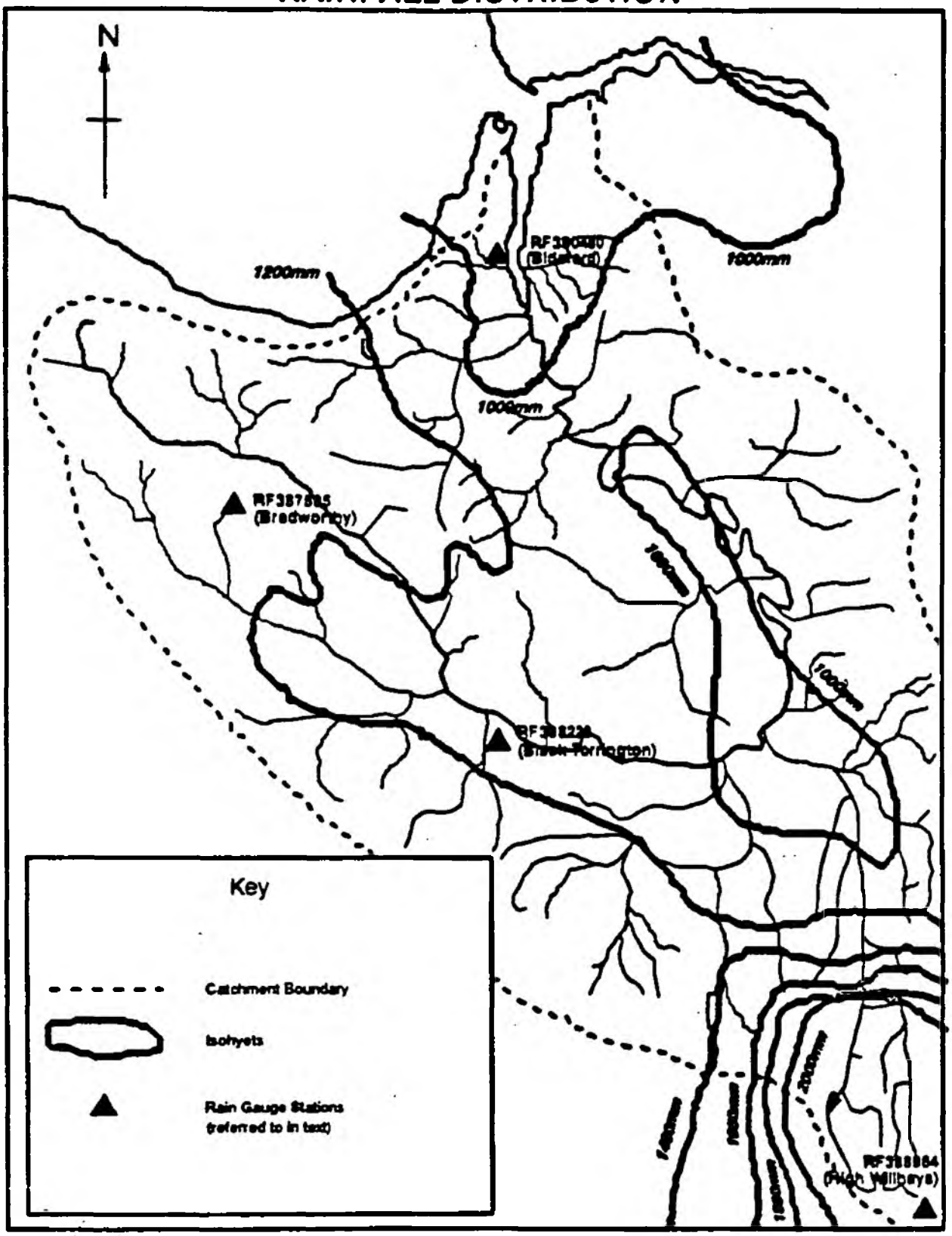
Flow Gauging Stations	River	NGR	No. Years Data Collected
Gribbleford	Lew	SS 528014	1
Meldon	West Okement	SX 563917	14
Norley	Lew	SX 501999	1
Parkham	Yeo	SS 393221	14
Rockhay	Torridge	SS 507070	1
Torrington	Torridge	SS 500185	28
Vellake	West Okement	SX 557903	14

There are also 5 instantaneous water level stations used for flood warning purposes. These are monitored daily and data is stored on hard copy.

Flood Warning Stations	River	NGR
Bradworthy	Waldon	SS 319141
Dolton	Torridge	SS 547112
East Okement Farm	East Okement	SX 605913
Sheepwash	Torridge	SS 486057
Weare Giffard	Torridge	SS 472226

There are no groundwater stations in the Torridge Catchment.

The Torridge Catchment
RAINFALL DISTRIBUTION



2.4 Climate and Meteorology

The limited temperature range and high winter rainfall found in the Torridge Catchment basin are typical of Atlantic Britain.

Generally, the climate is of warm and moderately dry summers, with wet and mild winters. However, over the past 15 years, there have been five significant droughts (1975, 1976, 1984, 1989, 1990).

Average annual rainfall varies with altitude from 900 mm near Bideford to over 2000 mm on high Dartmoor. Much of the area receives between 1100 and 1300 mm per annum and the variations are shown below.

Average yearly rainfall (1941-1970)
at specific sites in the Torridge Catchment

Rain Gauging Station	NGR	Position in Catchment	Averages Yearly Rainfall (mm)
RF390480	SS 454271	Bideford, King Georges Fields (Lower Torridge)	912
RF388220	SS 461064	Black Torrington (Middle Torridge)	1100
RF388964	SX 585890	High Willhays, Dartmoor (Okement)	2300
RF387585	SS 337163	Bradworthy, Jasmine Cottage (Upper Torridge)	1300

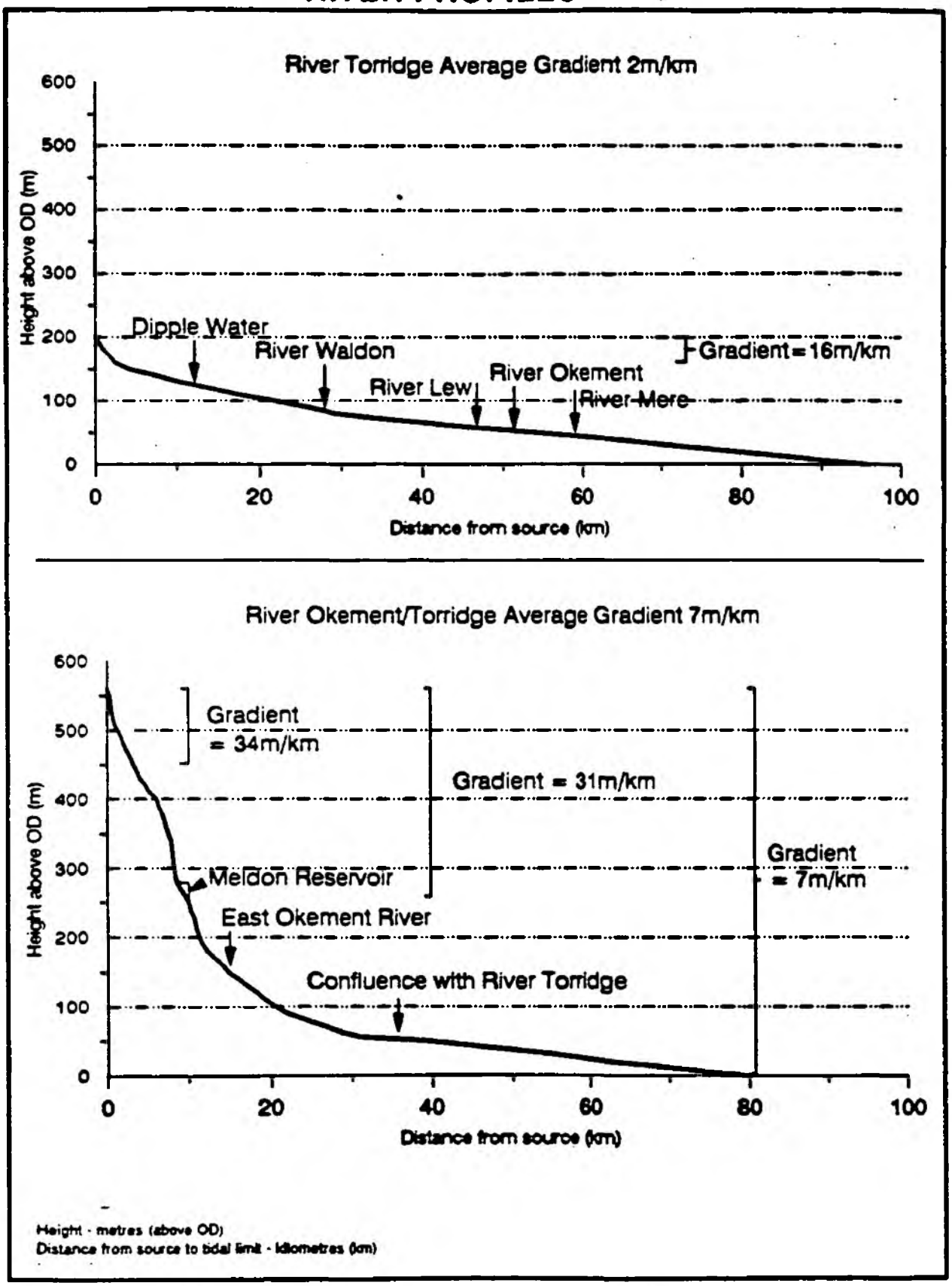
The isohyet map opposite reflects data collected from the 26 rainfall stations in the catchment.

Temperature affects plant growth and the growing season, (that period when temperatures are above 6°C), extends from 175 days on Dartmoor to 300 days near Bideford.

2.5 Hydrology

The Torridge rises at a level of 200 m OD in North Devon, and descends 16 m in the first kilometre. The gradient then declines to 2.95 m/km until the river is joined by the River Waldon. Downstream of this point, the gradient decreases to 1.2 m/km down to the tidal limit at Weare Giffard. The average gradient for the River Torridge is 2 m/km, from the source to the tidal limit.

Torridge Catchment
RIVER PROFILES



In contrast, the River Okement has a steeper profile, falling 34 m/km over the first 3.2 km from the source on Dartmoor at a height of 560 m OD. The West Okement becomes even steeper prior to Meldon Reservoir with a gradient of 80 m/km. The overall gradient of the Okement is 14.5 m/km from the source to the confluence with the River Torridge.

An analysis of the 28 year flow record for the Torrington gauging station indicates a mean daily flow at Torrington of 15.337 m^3/s and a measured Q95 flow (the flow exceeded for 95% of the time, on average) of 0.906 m^3/s, which represents 6% of the mean daily flow.

This percentage is low and reflects the flashy nature of this river system, the soil, subsoil and the groundwater storage availability within the catchment.

The flashy river response is enhanced in the steeper, upper reaches. Floods are characterised by a rapid rise in river levels, high flood peaks and steep recession curves. The maximum daily mean flow at Torrington, 333.787 m^3/s, and the maximum instantaneous flow, 729.998 m^3/s, were both recorded on 28 December 1979.

The minimum flow, recorded on 4 August 1976 was 0.120 m^3/s, less than 1% of the daily mean flow. Though flows fall below the Q95 value for about 18 days per year on average, in the drought years of 1976, 1984 and 1989, flows were below this level for 100, 79 and 69 days respectively.

A compensation flow of 0.045 m^3/s is currently released from Meldon Reservoir to the headwaters of the West Okement River to mitigate its impact. This is obviously beneficial at times of extreme low flow.

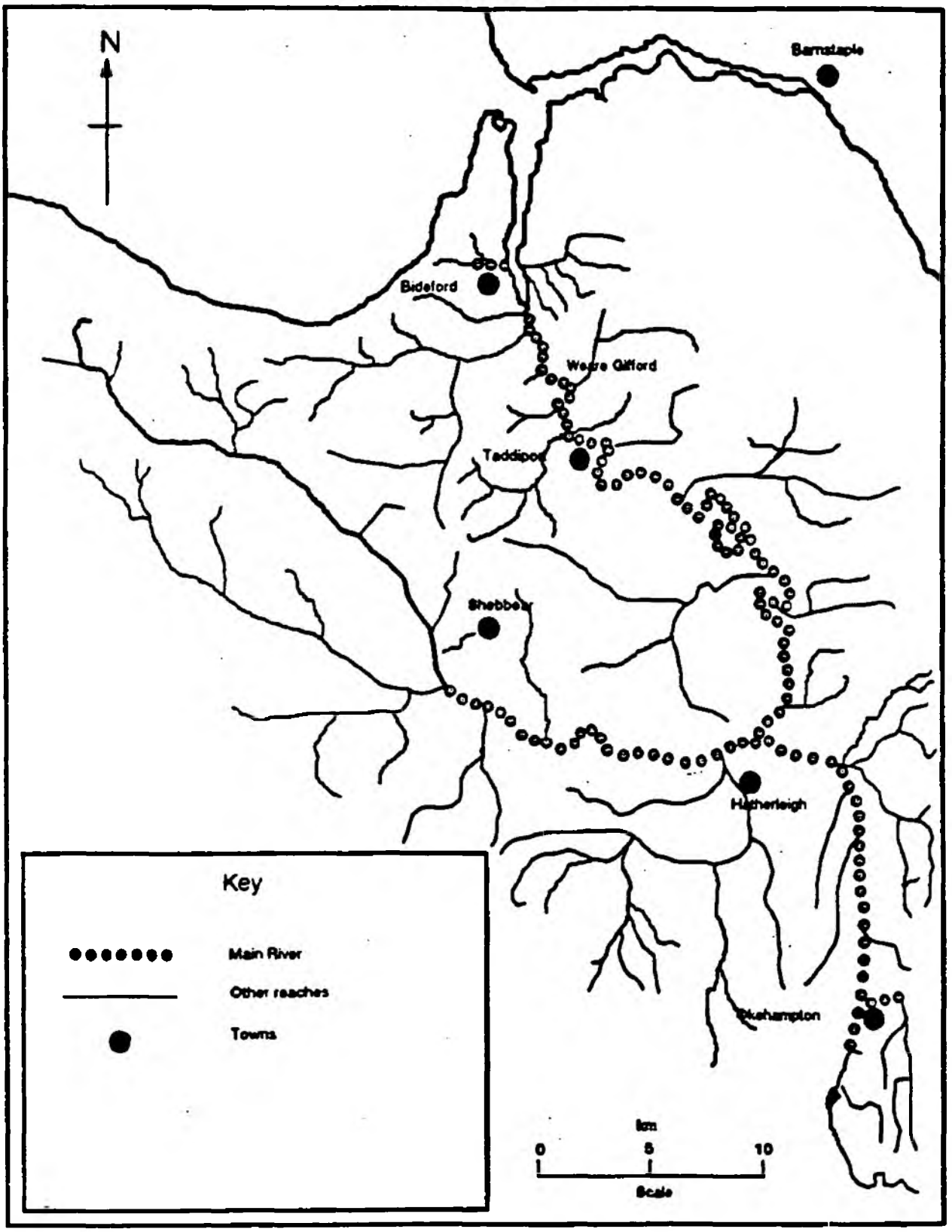
An analysis of the 1963 to 1989 flow record for Torrington river gauging station has not highlighted any significant trend towards an increase in the frequency of low flows, except as reflected by natural droughts. There is, however, some evidence to suggest that the frequency of high flows has increased.

2.6 Hydrogeology

Most of the catchment is underlain by rocks with generally low permeability and porosity. These include the Carboniferous Measures and the Dartmoor Granite. In these rocks, groundwater flow is effectively restricted to rock fractures yielding relatively small amounts of water to boreholes. In spite of their 'tight' nature, groundwater stored within these rocks plays a significant role in the catchment hydrology by providing reserves of groundwater which naturally maintain river baseflow during dry weather.

Groundwater flow through the fracture networks in such rocks can be rapid, and any pollutants can travel over moderate distances in relatively short periods i.e. a matter of months.

The Torridge Catchment
FLOOD DEFENCE



Small areas of strata have the porosity or permeability required for significant groundwater abstraction although their small areal extent limits serious long term development. These include Permian breccias near Exbourne and Hatherleigh, alluvium along the main river valley and wind blown sand near Westward Ho!.

Small-scale abstraction from boreholes, wells and springs for potable and agricultural use is widespread. The size of the abstractions, generally less than 20 m³/day, is limited primarily by poor borehole performance, rather than the availability of groundwater held in storage. Information on groundwater sources is sparse as much of the catchment forms part of an exemption zone within which groundwater abstraction is exempt from licensing.

2.7 River Topography

Flood defence management deals with the containment of water within the river channel, particularly at times of high flow, and with its controlled release to the wider flood plain in order to relieve pressure at more sensitive locations such as towns. Flood flows are described in relation to their return period: the larger the flow, the longer the return period. In built-up areas, flood defences are commonly designed to withstand a flood with a return period of 100 years. Conversely, river defences in agricultural areas upstream and downstream of a town could be designed for overtopping by, say, a five-year return flood.

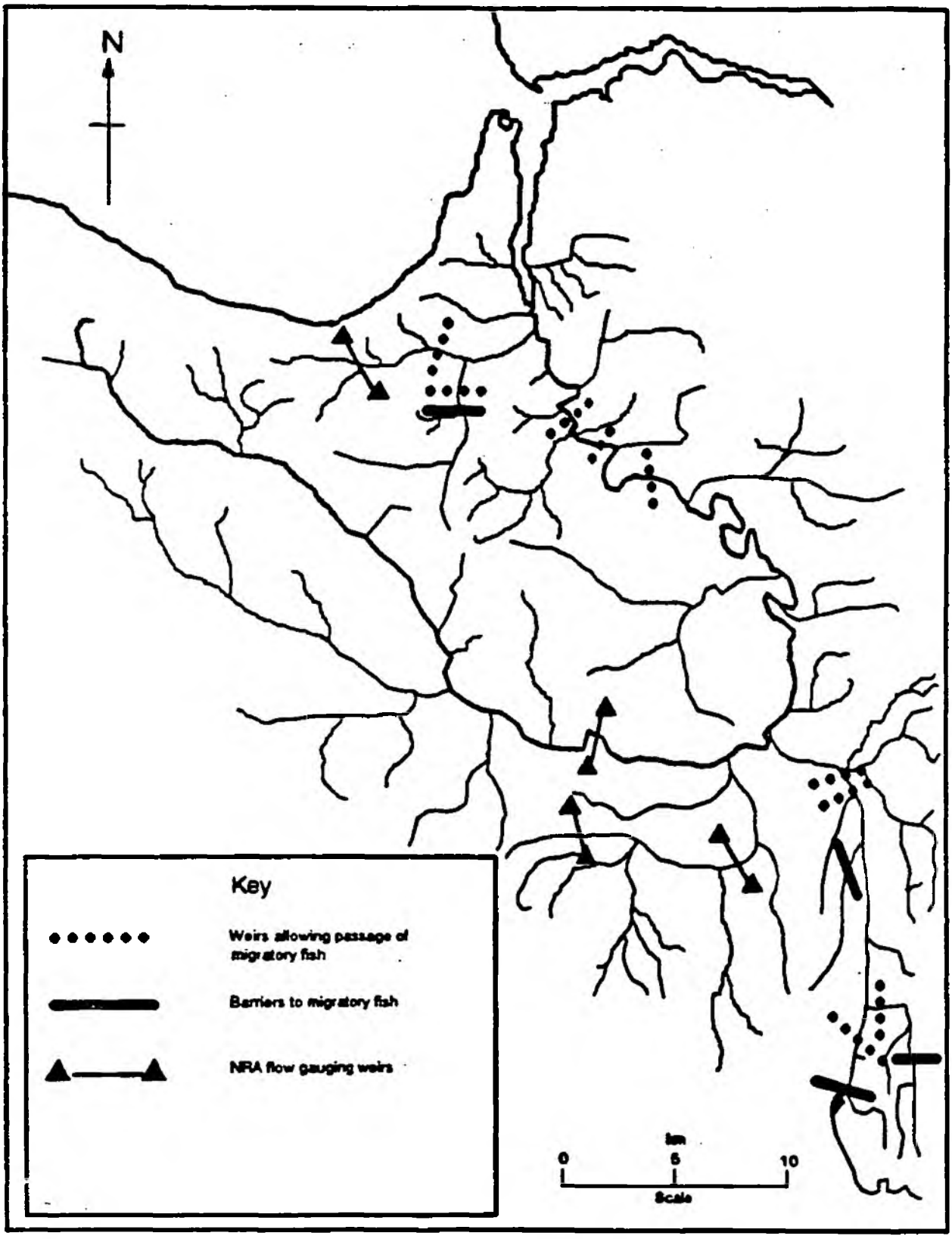
For management purposes, a portion of the catchment is formally designated as the "Main River" where formal consent is required for all proposals to interfere with the bed or banks of the river or obstruct the flow. The NRA also has powers to control actions of others within 7 m of the channel on both sides of the main river and to carry out works on the river if it so desires. The NRA has powers over all other watercourses where persons wish to culvert them, pipe them or erect dams or other obstructions to flow; again, formal consent is required.

The catchment is predominantly rural with few significant locations liable to flooding, apart from the estuary which is covered in a separate report (Reference 1). Schemes are included in the 5 year capital programme to protect Taddiport and Weare Giffard and a major scheme has been carried out to deal with flooding from the Kenwith, Northern and Westcombe Streams in Bideford.

There has been some pioneer clearance work on the main river sections but no arterial drainage schemes are proposed.

In the past, flood defence works have come into some conflict with other river uses - notably conservation and fisheries. However, great progress has been made over the last ten years in achieving hydraulic performance targets without significant impact to the river habitat.

The Torridge Catchment
WEIRS AND OBSTACLES TO MIGRATORY FISH

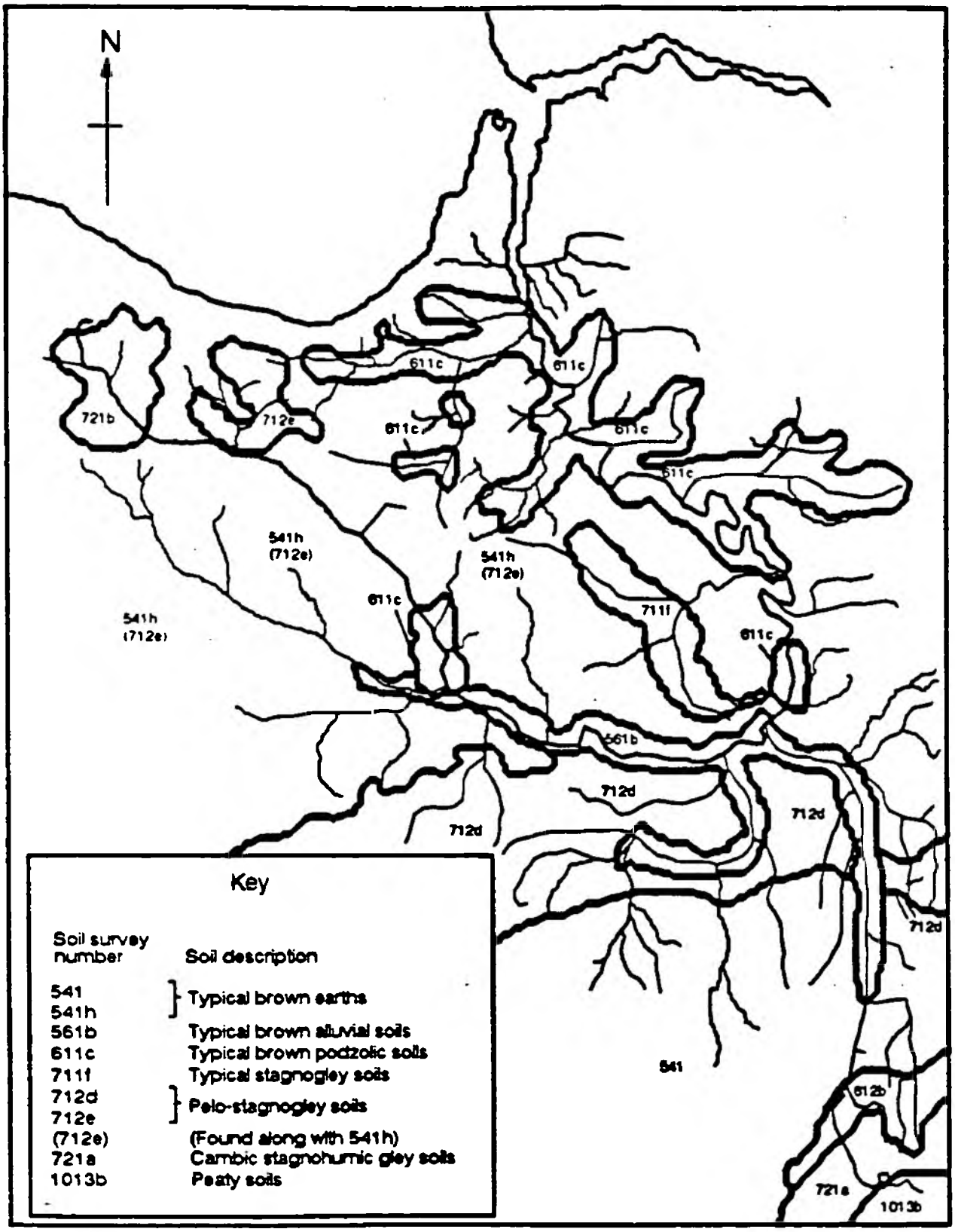


There are seventeen weirs and obstacles on the River Torridge and its tributaries (see map), only four of which are complete barriers to the upstream migration of salmon and sea trout. Nine of these have been associated with leats supplying water for a variety of uses, and the majority have fallen into disuse. The four NRA gauging weirs present no obstacle to upstream migration.

At the request of the owner, the Authority made repairs to the weir at Beam in 1989. Local opinion holds that this work adversely affected the efficiency of the fish pass and hindered upstream migrants. This is contrary to the NRA view and independent advice is being sought. It is proposed to modify the fish pass and trap at Beam to accommodate a fish counter in the pass and to improve the efficiency of the trap.

In low flow periods it has been the practice of the abstractor to put boards in the fish pass notch at Taddiport, thereby impeding fish movement.

The Torridge Catchment
PEDOLOGY



Key

Soil survey number	Soil description
541, 541h	Typical brown earths
561b	Typical brown alluvial soils
611c	Typical brown podzolic soils
711f	Typical stagnogley soils
712d, 712e	Pelo-stagnogley soils
(712e)	(Found along with 541h)
721a	Cambic stagnohumic gley soils
1013b	Peaty soils

2.8 Pedology

Most of the soils in the Torridge Catchment are on the Carboniferous outcrop which is mainly shales or sandstones with lesser areas of slate. In addition, soils which mantle the granite cupola of the Dartmoor uplands are of a peaty nature. Other soils form over the smaller outcrops of Permian breccias and oligocene clays (see map).

Overlying the Bude Formation are brown earths and surface-water gleys. Generally, the former is associated with relatively high, broadly convex ridge crests and flanks, whereas the latter can be found in the shallow basins.

The Crackington Formation is overlain by three major soil groups, the pelosols, brown earths and surface-water gleys. The pelosols mantle most of the gently undulating land for a few kilometres south of Hatherleigh, on the ridges or crests of hills. The brown earths occupy much of the concave ridges below the pelosols, while the surface-water gleys can be found in the basins of the river valleys.

Brown alluvial soils occupy much of the middle reaches of the Torridge between the confluence with the Waldon and the Okement. As the river becomes less steep, the flood plain is formed of typical brown podzolic soils, adjacent to which are found the typical brown earths, which occupy the concave ridges of the river valley.

2.9 Agriculture

Grassland is the primary use in the catchment and supports large numbers of dairy cattle. Grassland increased in the period 1952 to 1982 in all the Torridge sub-catchments. Percentage increases included 33% (Okement), 31% (Upper Torridge), 28% (Waldon), 26% (Lew), 23% (Yeo), 21% (Waldon to Lew confluence on the Torridge), 19% (Okement confluence to Beam on the Torridge) and 14% (Mere). This increase correlates well with increases in dairy farming.

Generally, the most intensive dairy farming areas are centred round the Dipple Water sub-catchment and areas downstream of its confluence with the Torridge to Woodford Bridge. Parts of the Mere sub-catchment are also used for intensive dairy farming.

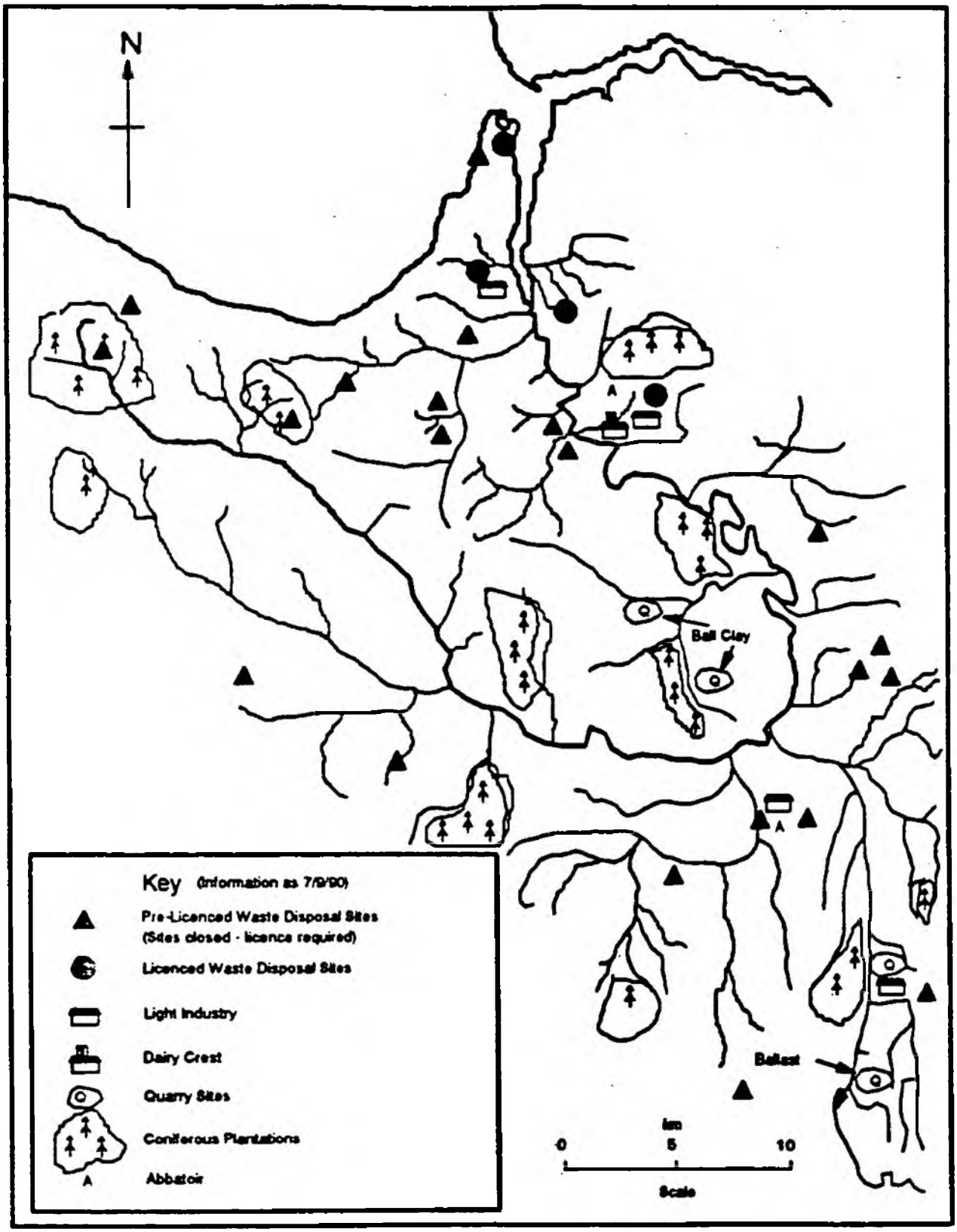
Arable farming is limited in the catchment and has decreased since 1952 along with areas of rough grazing.

Detailed information on land use has been reviewed by T R Harrod (Reference 2).

2.10 Forestry

Woodland and forestry occupy 7% of the area, whilst moorland and heath comprise 6.4%. Woodland and forestry ranges from scrub invading neglected pastures, through to managed deciduous woodlands and coniferous monoculture.

The Torridge Catchment
LAND USE



Coniferous woodland covers 64% of the wooded area of the catchment occupying land of limited agricultural potential, such as steep valley sites and land where soil drainage is impaired due to low permeability. These areas include river valleys and isolated plantations in the upper reaches of the Torridge.

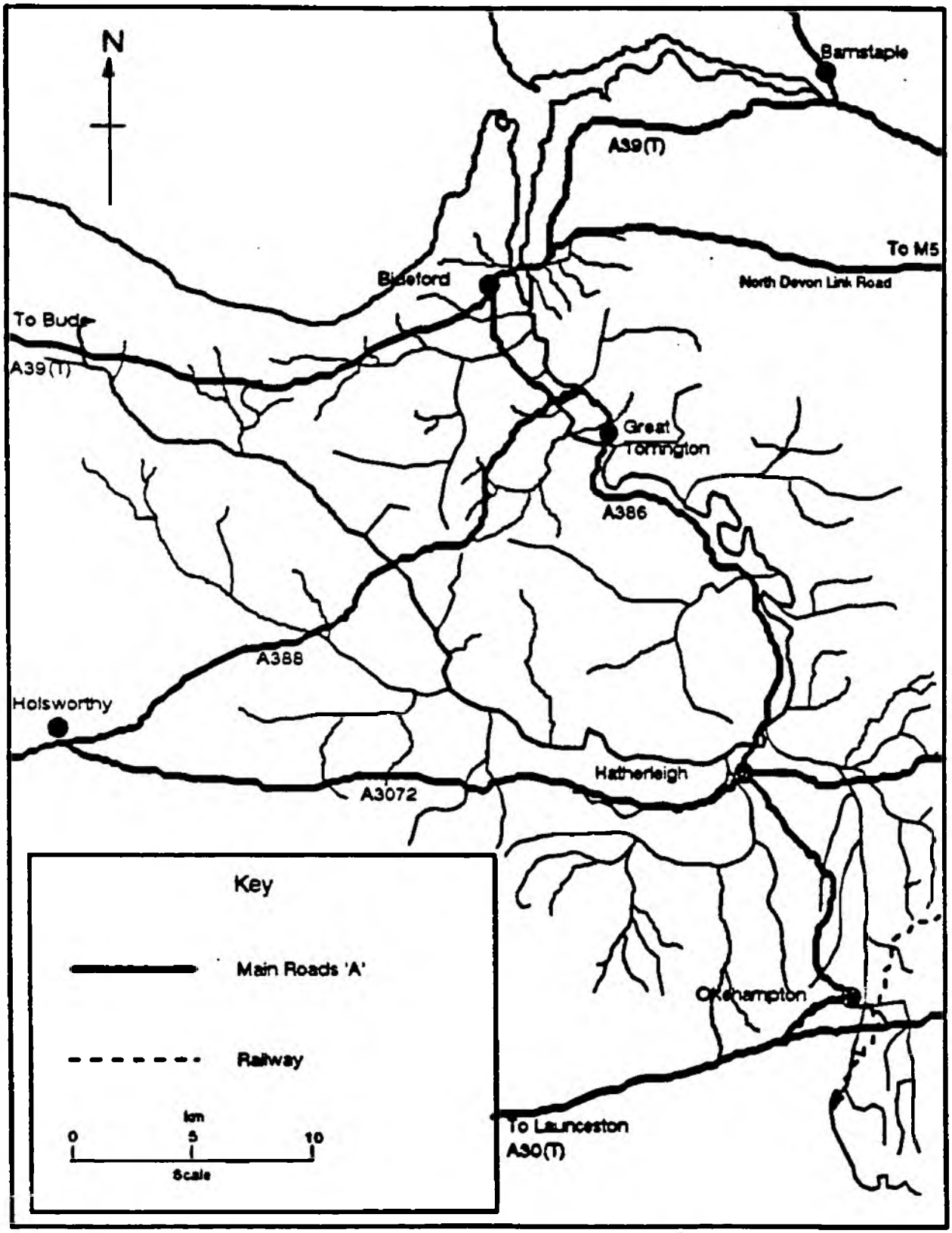
The majority of the upper Torridge is unforested, limiting the capacity of the land to hold water. Indeed, much of the banks of the Torridge and its tributaries remain unforested before the confluence with the River Okement.

2.11 Industry

Industry within the catchment is primarily associated with agriculture consisting of dairy product factories and abattoirs. Quarrying (for ballast and ball clay), forestry, light industry, tourism and recreation are also important.

The disposal of domestic and industrial wastes occurs at sites throughout the catchment and a review of sites has recently been undertaken for the NRA (Reference 3).

The Torridge Catchment
TRANSPORT NETWORK



2.12 Infrastructure and Population

2.12.1 Population

The district is sparsely populated with isolated farmsteads, hamlets, villages and a few small towns. The major urban areas within the freshwater catchment of the Torridge include Great Torrington, Okehampton and Hatherleigh. The most accurate assessment of the population for the Torridge Catchment is the 1981 Census which suggests a total of 25,260 (excluding the Torridge Estuary), giving a density of 30 persons/km^2. The following table gives a breakdown of the population for the Torridge Catchment.

Population Statistics

Sub-Catchment	Populations Census 1961	1981	% Change
Upper Torridge	4135	4685	+ 13%
Waldon	1270	1410	+ 11%
Torridge/Waldon-Lew confluences	1080	1045	- 3%
Lew	3315	2975	- 10%
Okement	6040	6560	+ 9%
Torridge/Okement to Beam	6130	8065	+ 32%[a]
Mere[c]	440	520	+ 18%
Yeo[d]	1690	1755	+ 4%
Sub Total	24100	27015	+ 12%
Estuary	19225	23830	+ 24%[b]
Revised Total	43325	50845	+ 17%

[a] Majority of increase from Great Torrington (1290)
[b] Majority of increase from Bideford & Northam (4375)
[c] Certain parishes include other catchment totals
[d] Includes coastal communities

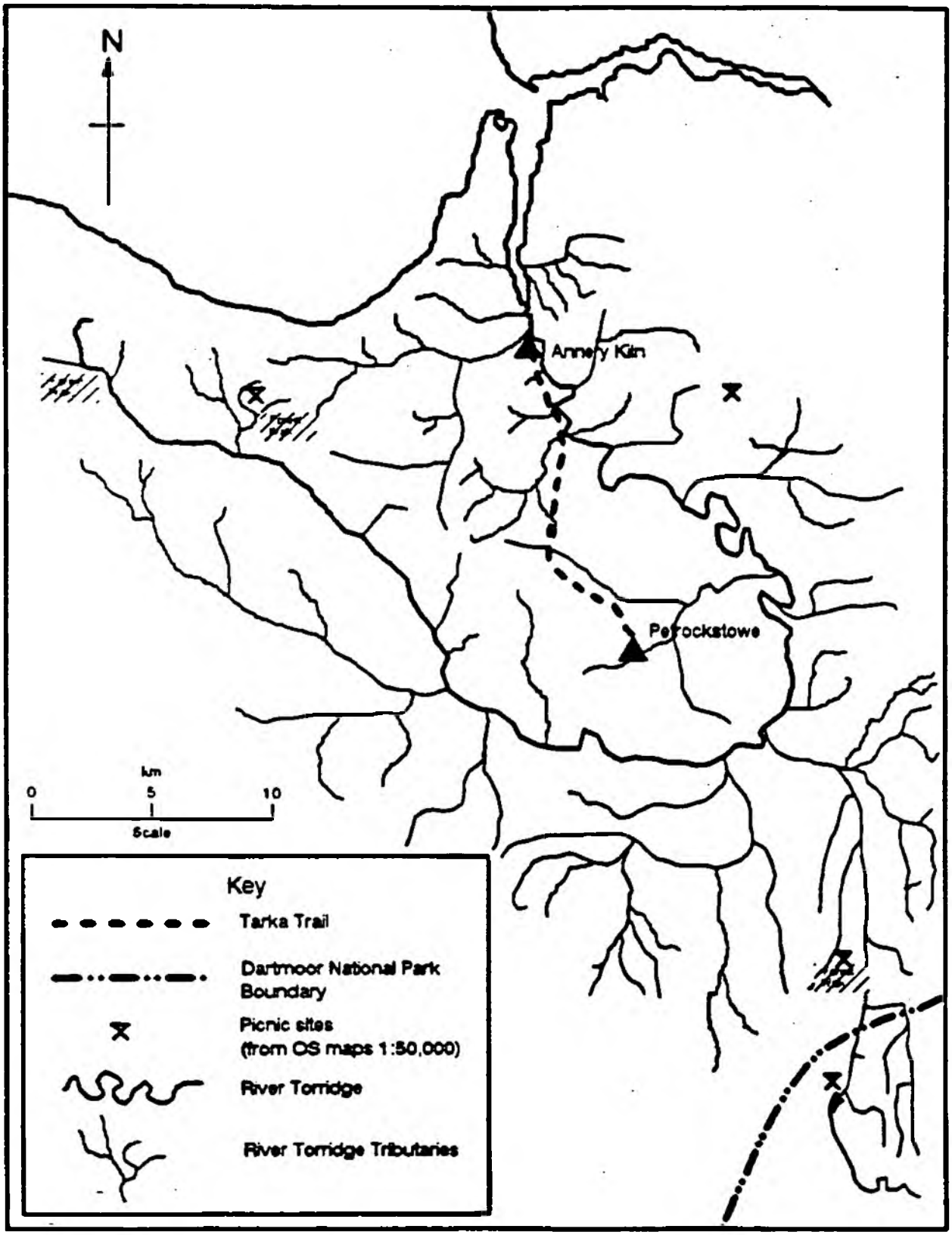
Decreases have occurred in rural areas, with a shift of population to the larger towns within the catchment.

2.12.2 Infrastructure

There are no mainline British Rail services through the area. Rail freight does operate in the southern part of the catchment, transporting much of the ballast for the British Rail network in southern England.

The major roads which service the area include the A386 (Okehampton to Bideford), A388 (Holsworthy to Bideford), A3072 (Holsworthy to Exeter) and the A30(T) (Exeter to Launceston) which transverses the southern part of the catchment. The A386 is the only road in the catchment running parallel to the river for any considerable length; others cross the rivers.

The Torridge Catchment
BASIC AMENITY



3.1 BASIC AMENITY - RIVER TORRIDGE CATCHMENT

3.1.1 General

Activities such as walking, bird watching, boating, sailing, rowing and picnicking bring people into close proximity with the water. The principal concerns are general aesthetic acceptability and access to the watercourse.

3.1.2 Local Perspective

While Meldon Reservoir is the focus of attention for outdoor activities in the headwaters of the River Okement, it is the middle and lower reaches of the River Torridge which present the greatest opportunities.

The Torridge Catchment has a wealth of natural beauty and the public expects high standards to be maintained. The Tarka Trail, a public footpath between Annery Kiln and Petrockstowe, provides a means of public access to the river environment. Other footpaths exist, including some within the Dartmoor National Park.

3.1.3 Environmental Objectives

To maintain water quality so as to prevent public nuisance arising from smell and visual problems.

To provide safe and easy access to the river corridor, in a way which does not impinge unreasonably upon other uses.

3.1.4 Environmental Requirements

Water Quality:

Water Quality Suite 1: Aesthetic Criteria, (see Appendix 9.1.1).

Water Resources:

Abstraction must not reduce the river flow below the Q95 flow.

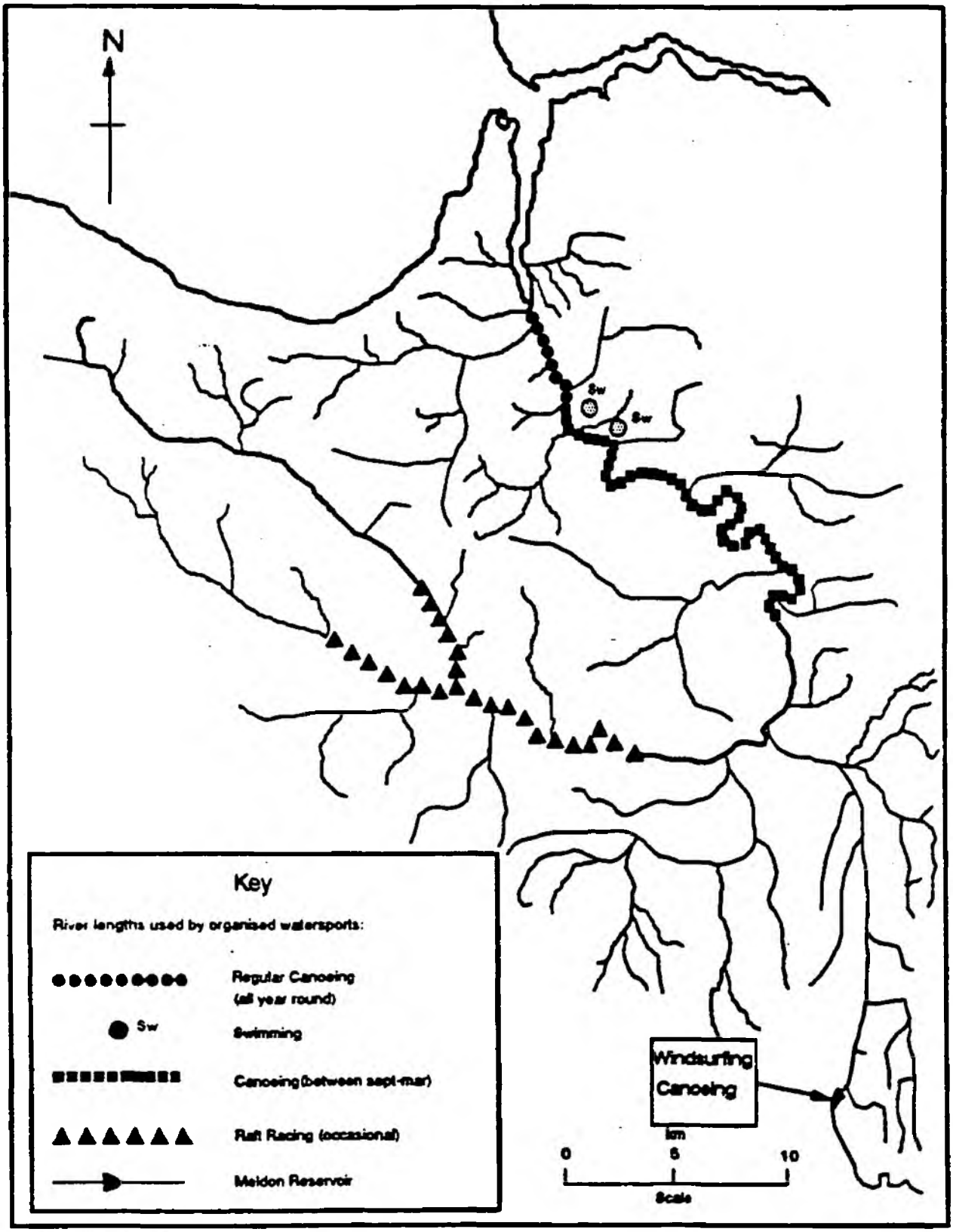
Fisheries:

A healthy fish community.

Catchment Features:

Diverse habitat features necessary to support the natural flora and fauna of the Torridge Catchment.

The Torridge Catchment
IMMERSION SPORTS



3.2 IMMERSION SPORTS - RIVER TORRIDGE CATCHMENT

3.2.1 General

This use deals with those sports such as canoeing and water skiing, where there is a risk of intimate contact with the water.

3.2.2 Local Perspective

There is limited canoeing between 1 September and 1 March downstream of Newbridge on the River Torridge. However, no canoeing clubs operate within the Torridge Catchment. Annual fetes may use the river for raft races, but again these are very limited and occur only around the Sheepwash area. Swimming takes place at Torrington NGR SS 479 196 and SS 475 187. However, there are no specific changing, showering, toilet or lifesaving facilities available at these sites.

3.2.3 Environmental Objectives

To maintain water quality, water resources and river topography so as to:

i) protect those involved in immersion sports;
ii) provide suitable conditions for the activity concerned.

3.2.4 Environmental Requirements

Water Quality:

To protect public health through guidelines which are awaited.

Water Resources:

Abstraction must not reduce the river flow below the Q95 flow.

Fisheries:

Canoeing is controlled by access agreements between Riparian Owners and the British Canoe Union. Canoeing in the upper reaches during the salmonid spawning season is restricted by the NRA under the Salmon and Freshwaters Fisheries Act 1975 to protect spawning fish and their offspring.

Catchment Features:

Safe and easy access to and from the watercourse for participants and equipment.

3.3 GENERAL ECOSYSTEM CONSERVATION - RIVER TORRIDGE CATCHMENT

3.3.1 General

This use relates to the protection of all aquatic flora and fauna and dependent organisms. Dependent organisms are plants and animals which rely, at some stage of their life cycle, on the aquatic environment or associated land. This requires the NRA to influence the management of the environment, either directly through its own functions or indirectly through advising others, to provide the correct aquatic conditions to maintain a balanced ecology.

3.3.2 Local Perspective

The River Torridge Catchment forms a rich and diverse assemblage of aquatic ecosystems which range from Dartmoor streams to lowland meanders with watercourses rich with mammals, birds, insects and plant life. The value of the area is recognised by the large number of nature conservation designations. With a catchment of such importance the maintenance of the existing status is the major conservation concern. However, areas where scope exists for environmental improvement schemes should be identified.

3.3.3 Environmental Objectives

To maintain and, where appropriate, improve the water quality, water resources and water related topography so as to protect all aquatic life and dependent organisms.

3.3.4 Environmental Requirements

To identify the distribution and abundance of particular habitats and species within the catchment by river corridor and related surveys.

Water Quality:

Water Quality Suite 1: Aesthetic Criteria (see Appendix 9.1.1)
Water Quality Suite 2: List I Substances (see Appendix 9.1.2)
Water Quality Suite 3: Sensitive Aquatic Life (see Appendix 9.1.3)
Water Quality Suite 4: Other Aquatic Life (see Appendix 9.1.4)

Ammonia (un-ionised) 21 ugN/l as a 95 percentile

Nickel (dissolved) as Ni

8 ug/l as an annual mean when Total Hardness <50 mg/l $CaCO_3$

20 ug/l as an annual mean when Total Hardness 50-100 mg/l $CaCO_3$

50 ug/l as an annual mean when Total Hardness 100-200 mg/l $CaCO_3$

100 ug/l as an annual mean when Total Hardness >200 mg/l $CaCO_3$

Pollution Control:

To prevent pollution from industry, agriculture and the public by advice, persuasion and prosecution of offenders.

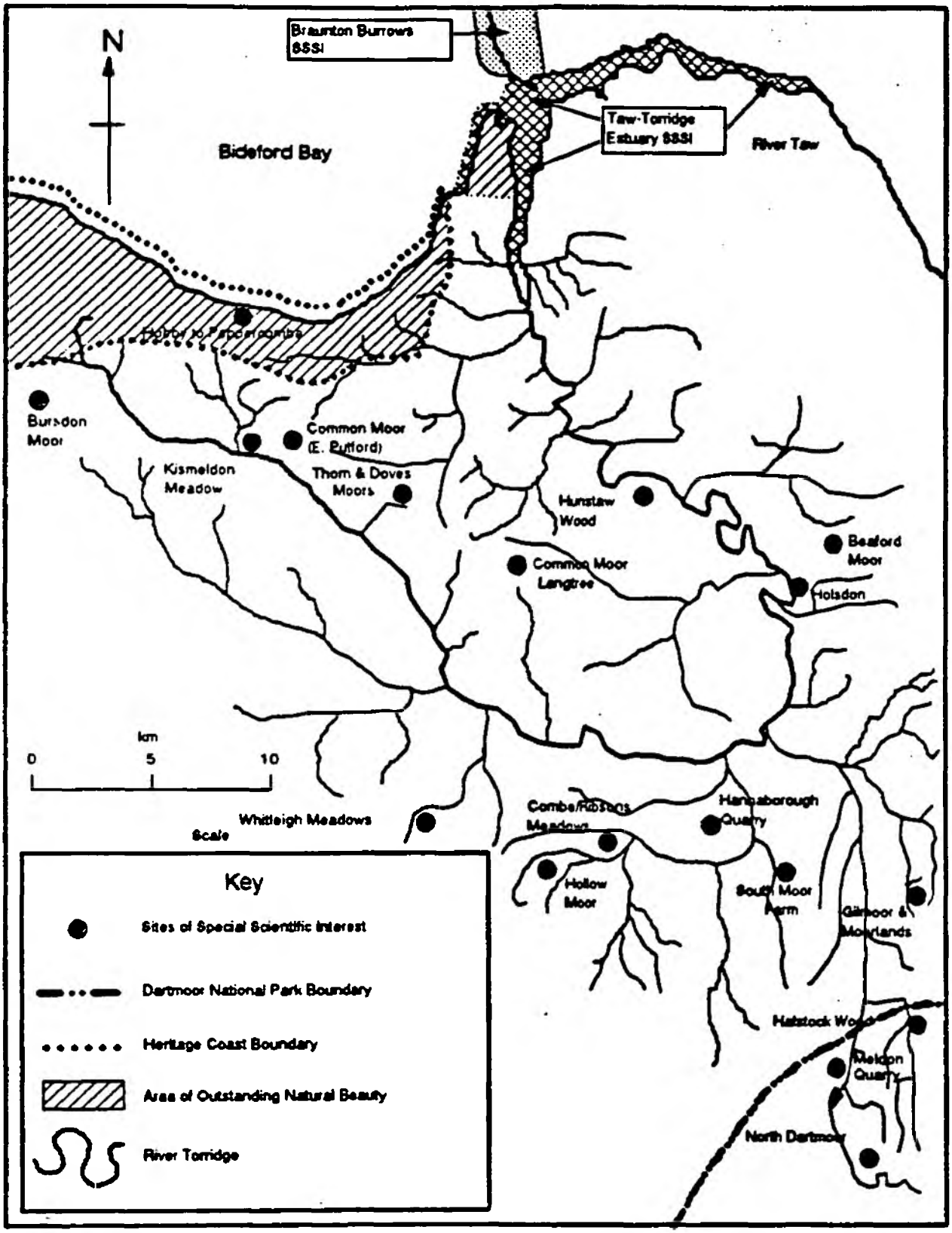
Water Resources:

Abstraction must not reduce the river flow below the Q95 flow.

Fisheries:

To maintain habitat diversity and quality in order to suppport satisfactory fish communities.

The Torridge Catchment
SPECIAL CONSERVATION AREAS



3.4 SPECIAL CONSERVATION AREAS - RIVER TORRIDGE CATCHMENT

3.4.1 General

This use relates to the protection of areas formally designated as being of particularly high conservation value. These include National and Local Nature Reserves and all Sites of Special Scientific Interest (SSSI); National Parks, Areas of Outstanding Natural Beauty (AONB), sites of historical or architectural interest and Ancient Monuments. However, the lack of a specific designation does not remove the responsibility to consider value.

3.4.2 Local Perspective

As with much of the South West region the River Torridge Catchment contains many features of worth in terms of their landscape, wildlife and archaeological heritage. The river rises, in part, within the Dartmoor National Park and flows through scenic valleys of high wildlife importance until it merges with the estuarine waters where SSSI status exists.

3.4.3 Environmental Objectives

To maintain and enhance where appropriate, water quality, water resources, fisheries and river catchment features so as to safeguard the identified special conservation interests.

3.4.4 Environmental Requirements

To identify the particular needs of the designated areas.

Water Quality:

Special conservation areas are likely to have their own specific water quality requirements. As yet, no conservation area in the Torridge Catchment has had specific water quality requirements identified. In some cases the requirements may be in conflict with standards for other uses and, as such, extensive consultation would be required before such standards could be implemented.

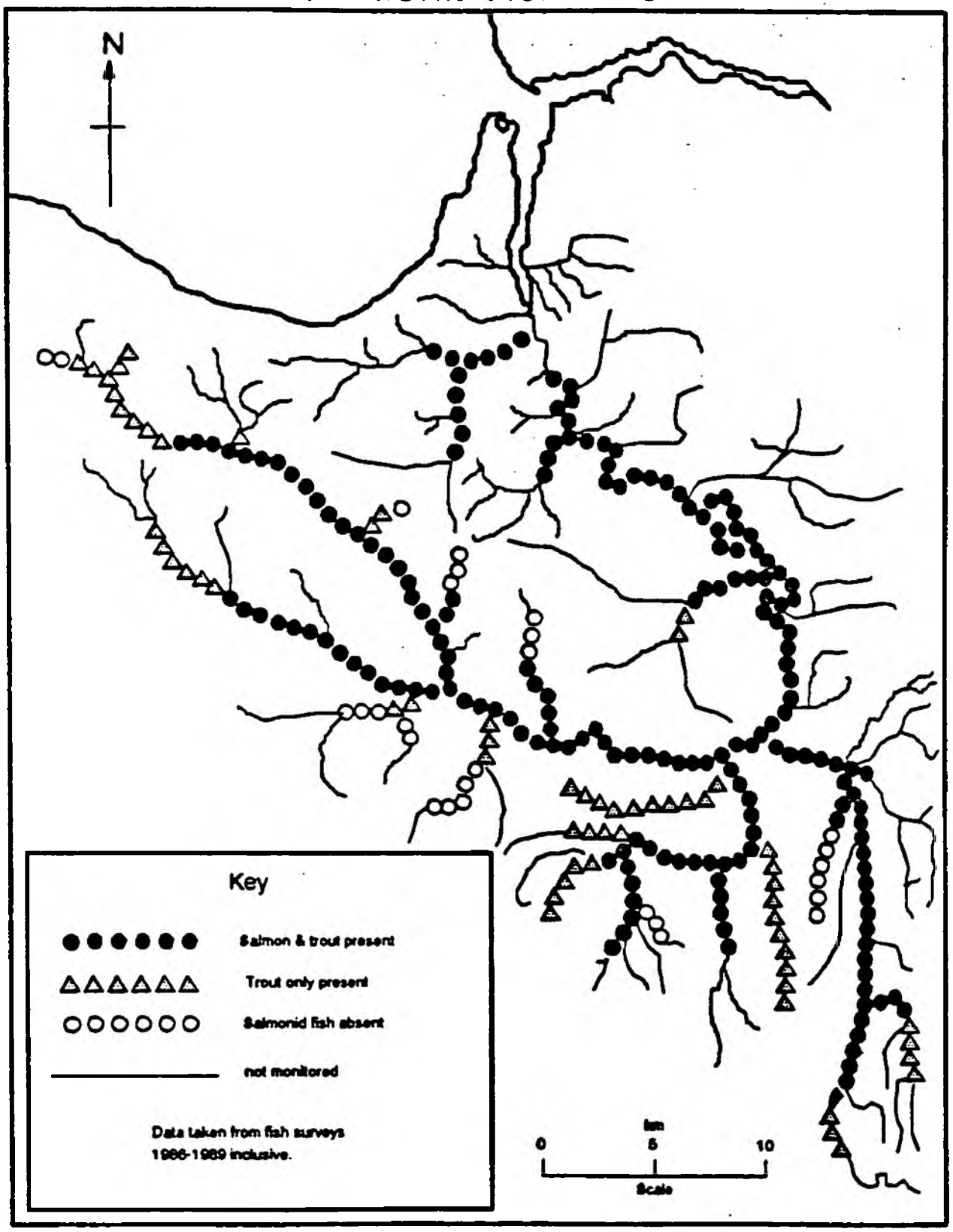
Water Resources:

To limit or regulate licensable abstractions so that detrimental impacts are not caused to conservation interests as a result of reduced flows in watercourses, or reduced groundwater levels.

Fisheries:

Management of the fishery within special conservation areas needs to be undertaken in conjunction with the controlling body for the reserve i.e. Nature Conservancy Council, Dartmoor National Park, Devon Wildlife Trust.

The Torridge Catchment
SALMONID FISHERIES



3.5 SALMONID FISHERY - RIVER TORRIDGE CATCHMENT

3.5.1 General

This use relates to the maintenance of satisfactory populations of salmonids and to the conditions necessary for their successful migration both within freshwater and between the sea and freshwater.

3.5.2 Local Perspective

The decline of the fishery is acknowledged and some of its causes attributed. The decline is not only of concern to the riparian and commercial sport-fishing interests but it is also focused on the net fishery in the estuary. Since 1981 a number of statutory and voluntary measures have been introduced to reduce cropping by licensed nets and anglers.

In 1988 and 1989 voluntary agreements were reached with netsmen prepared not to net, in exchange for compensation, so as to increase spawning escapement. A scheme to test the feasibility of producing juvenile salmon from adults derived from Torridge parr has been carried out. Results show this is not a practical system for parr production. Other methods are being investigated.

To improve salmonid habitat and accessibility, trash dam clearance work has been carried out in the upper River Torridge and River Waldon.

The effect of the statutory, voluntary and fisheries management measures to date has been, at best, to prevent the total decline of the Torridge salmonid fishery. The catastrophic pollution and subsequent fish mortality in the River Okement in 1989 has further emphasised the frailty of the salmonid stock of the river.

3.5.3 Environmental Objectives

To maintain water quality, water resources and catchment features so as to sustain salmonid populations appropriate to a river in such a geographical situation and to protect the migratory passage of salmonids to and from freshwater.

3.5.4 Environmental Requirements

Water Quality

Water Quality Suite 2: List I Substances (see Appendix 9.1.2)
Water Quality Suite 3: Sensitive Aquatic Life (see Appendix 9.1.3)

Ammonia (un-ionised) 21 ugN/l as a 95 percentile

Nickel (dissolved) as Ni

50 ug/l as an annual mean when Total Hardness <50 mg/l $CaCO_3$

100 ug/l as an annual mean when Total Hardness 50-100 mg/l $CaCO_3$

150 ug/l as an annual mean when Total Hardness 100-200 mg/l $CaCO_3$

200 ug/l as an annual mean when Total Hardness >200 mg/l $CaCO_3$

Water Resources:

To limit or regulate licensable abstractions so that detrimental impacts are not caused to the migratory passage of salmonids.

To regulate impoundments to ensure fish passes are installed which meet MAFF specifications.

Fisheries:

Adequate prescribed flows are essential for the maintenance of the migratory fishery with regard to impoundments or abstractions for potable water supplies.

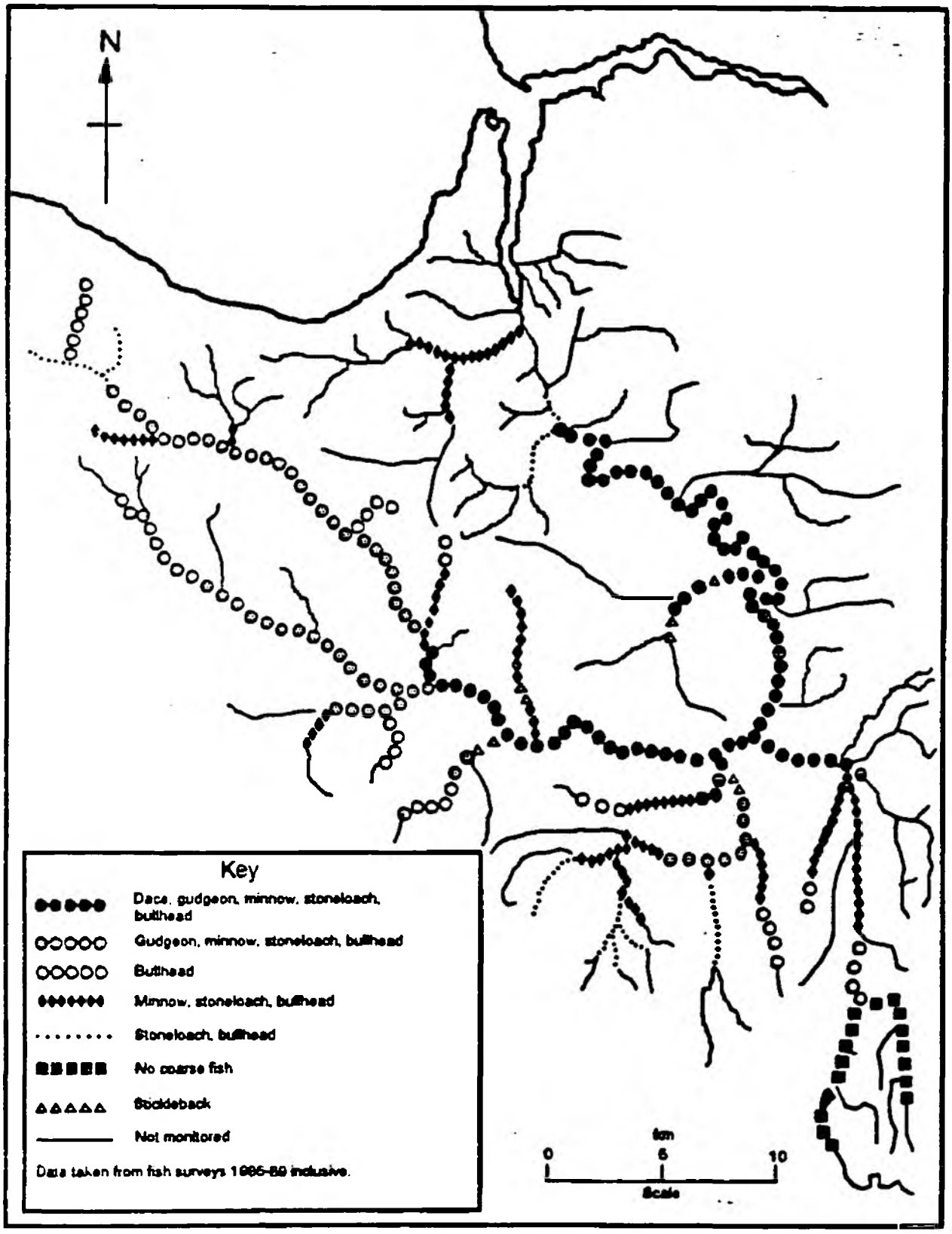
Additional spate sparing or releases may be necessary to aid migration or adults.

Screening of inlets is needed to prevent the ingress of smolts.

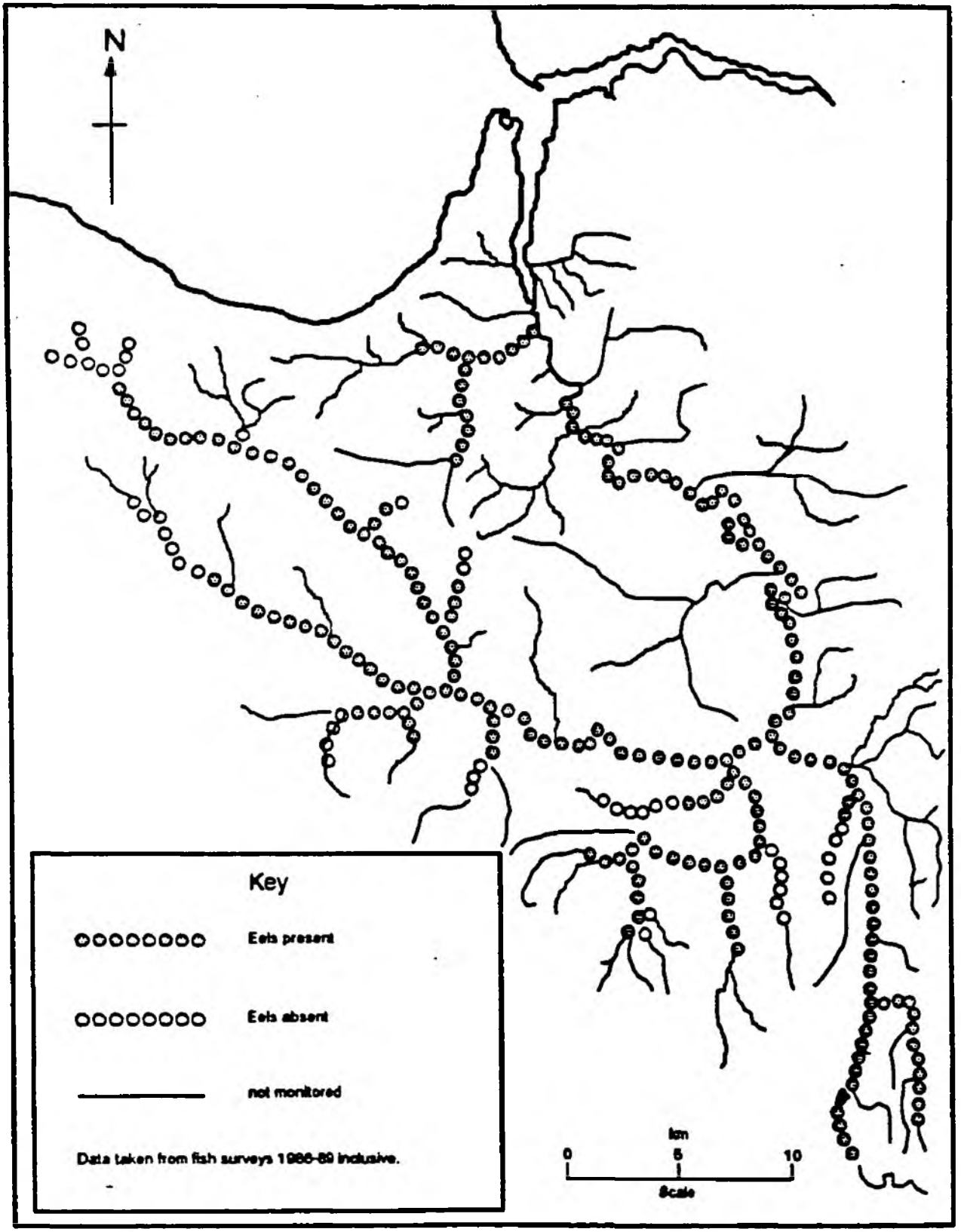
Catchment Features:

Spawning areas should be sufficient to maintain the fishery and artificial barriers should be passable at all flows.

The Torridge Catchment
FRESHWATER FISHERIES



The Torridge Catchment
EEL FISHERIES



3.6 FRESHWATER AND EEL FISHERIES - RIVER TORRIDGE CATCHMENT

3.6.1 General

This use relates to the maintenance of river conditions for the support of populations of freshwater fish and eels (ie non-salmonid fish), the former as sport fish and the latter as a commercially exploited food source.

3.6.2 Local Perspective

The freshwater fishery is localised in extent and little exploited in this predominantly salmonid fishery. The level of exploitation of the eel fishery is low and confined to the estuary. Minimal fishing effort is directed to the apparently small elver run.

The distribution of freshwater fish and eel species are shown in the diagrams. No management effort is applied to the freshwater fishery and its extent satisfies local demand. 2 eel fishing licences and no elver licences have been issued in 1990.

3.6.3 Environmental Objectives

To maintain water quality, water resources and catchment features so as to sustain a natural freshwater and eel fish population appropriate to a river in such a geographical situation.

3.6.4 Environmental Requirements

Water Quality:

Water Quality Suite 2: List I Substances (see Appendix 9.1.2)
Water Quality Suite 4: Other Aquatic Life (see Appendix 9.1.4)

Ammonia (un-ionised) 21 ugN/l as a 95 percentile

Nickel (dissolved) as Ni

50 ug/l as an annual mean when Total Hardness <50 mg/l $CaCO_3$

100 ug/l as an annual mean when Total Hardness 50-100 mg/l $CaCO_3$

150 ug/l as an annual mean when Total Hardness 100-200 mg/l $CaCO_3$

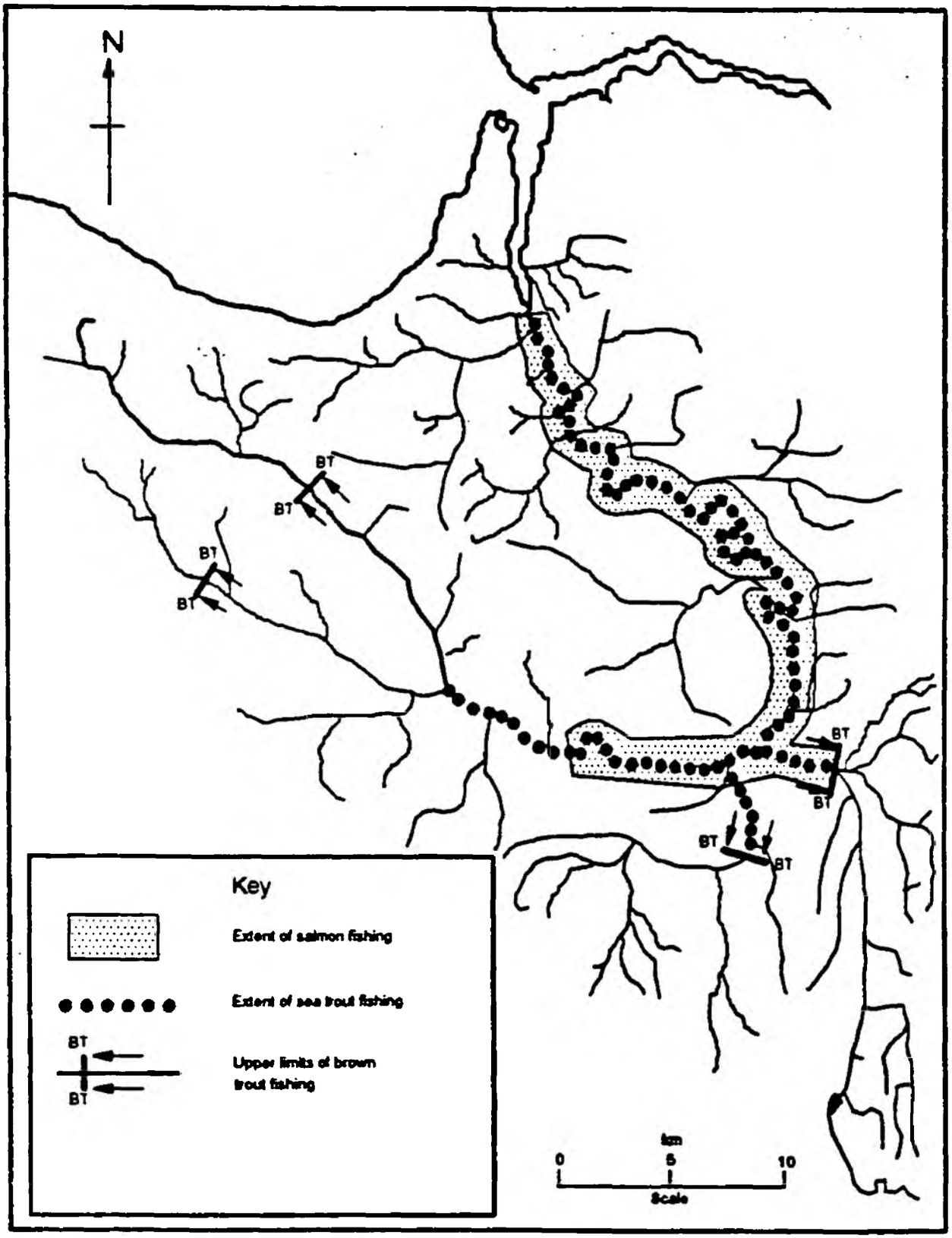
200 ug/l as an annual mean when Total Hardness >200 mg/l $CaCO_3$

Water Resources:

To limit or regulate licensable abstractions so that detrimental impacts are not caused to freshwater and eel fisheries.

To regulate impoundments to ensure their design and construction will allow for the passage of migratory species.

The Torridge Catchment
ANGLING



3.7 ANGLING - RIVER TORRIDGE CATCHMENT

3.7.1 General

This use relates to the maintenance of river conditions to allow for salmonid, freshwater and eel fishing by recreational fishermen. The fish and other organisms are protected under the uses:-

General Ecosystem Conservation, Salmonid Fishery, Freshwater and Eel Fishery.

3.7.2 Local Perspective

Fishing in freshwater is mainly for salmon, sea trout and brown trout; freshwater fish and elvers are lightly exploited.

Fishing pressure on salmon, sea trout and brown trout is light, the long term annual average rod catches of salmon and sea trout are 299 and 922 respectively but there has been a marked decline in catch of both species in the last 10-15 years.

A modest quantity of brown trout is stocked by riparian and fishery owners. The net fishery for salmon and sea trout in the joint estuary is currently suspended by agreement and the 14 licensed netsmen are being compensated as part of the rehabilitation measures. The long term annual average catch is 2529 salmon and 3954 sea trout.

3.7.3 Environmental Objectives

To maintain water quality, water resources and catchment features so as to provide suitable conditions for successful angling and netting.

3.7.4 Environmental Requirements

Water Quality:

Water Quality Suite 1: Aesthetic Criteria (see Appendix 9.1.1)

Water Resources:

Abstraction must not reduce the river flow below the Q95 flow.

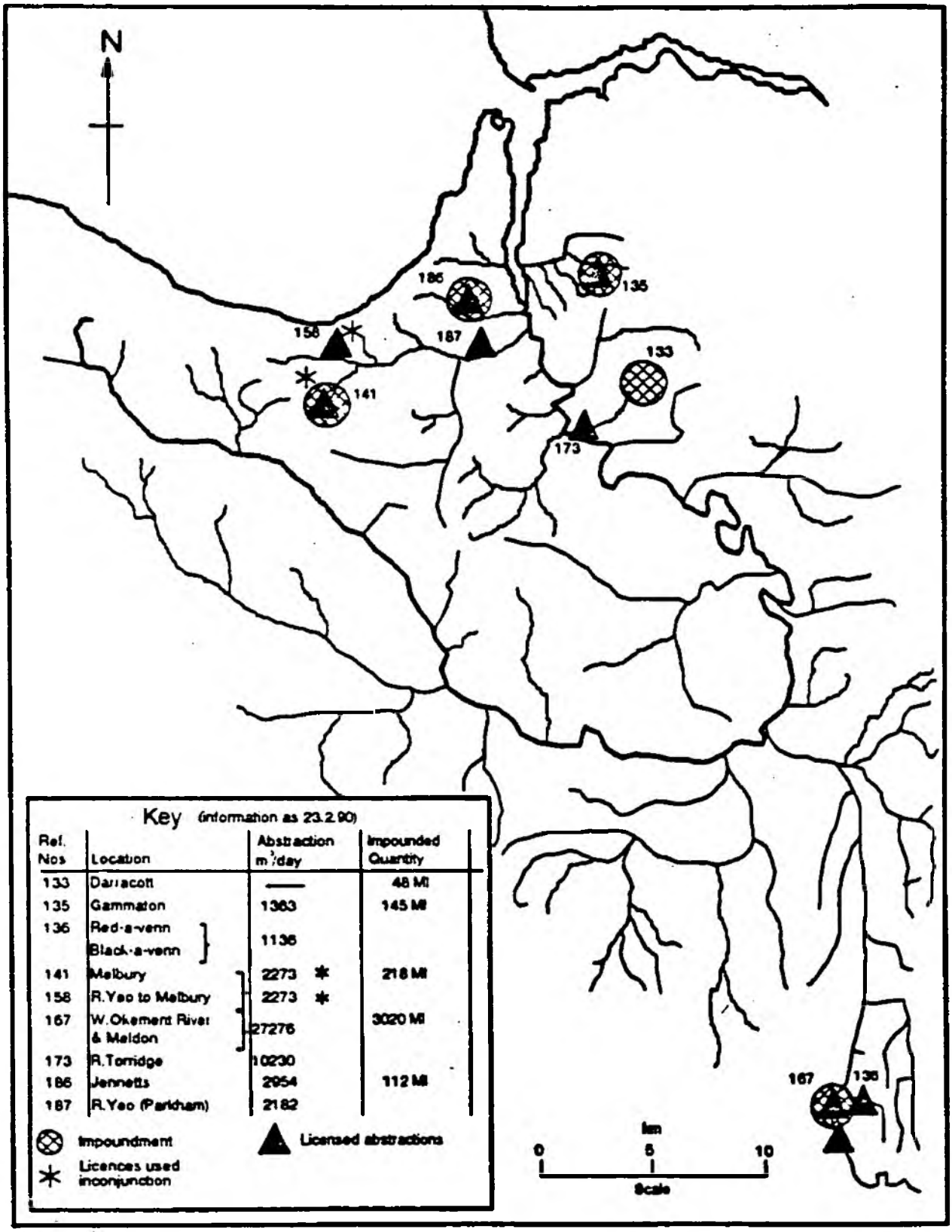
Fisheries:

Adequate stocks of migratory fish are required.

Catchment Features:

Maintenance of holding pools, shade, lies, adequate flows and areas for casting are all requirements of a successful fishery.

The Torridge Catchment
LICENSED POTABLE WATER ABSTRACTIONS



Key (information as 23.2.90)

Ref. Nos	Location	Abstraction m³/day	Impounded Quantity
133	Darracott	—	48 Ml
135	Gammaton	1363	145 Ml
136	Red-a-venn	1136	
	Black-a-venn		
141	Melbury	2273 *	218 Ml
158	R.Yeo to Melbury	2273 *	
167	W.Okement River & Meldon	27276	3020 Ml
173	R.Torridge	10230	
186	Jennetts	2954	112 Ml
187	R.Yeo (Parkham)	2182	

⊗ Impoundment

▲ Licensed abstractions

* Licences used inconjunction

3.8.1 General: Public Water Supplies and Water Resources Strategy

The provision of potable supplies is a fundamental requirement. The catchment lies in Taw District of South West Water Services Ltd (SWWSL), which provides the mains supply. The majority of premises are mains connected, though a large number of small private potable supplies exist in the inland rural area.

SWWSL abstracts surface water from rivers and reservoirs. When restricted by prescribed flow conditions or the lack of storage, supplies will be augmented by importing water from Roadford Reservoir, which is in an adjacent catchment.

Small, private abstractions including wells, boreholes and springs are also used for potable supply.

3.8.2 Local Perspective

The distribution works which will enable water from Roadford Reservoir water to augment supplies in this area are scheduled for completion later in 1990. This will minimise the need for Drought Orders detrimental to river flows.

SWWSL have undertaken works to enable water from Roadford Reservoir to be discharged into the River Lew Catchment. This was under an emergency Drought Order to ensure that the transferred water could support the abstraction at Torrington during 1990, if low flows occurred and if the water main to North Devon was delayed. It is unlikely to be used by the company now the water main has been completed.

The company's future strategy includes increased abstraction from the Torrington Intake. Investigations will be required to establish appropriate licence conditions.

The most significant abstractions for potable water and supporting impoundments are from the headwaters of the West Okement River (SX 560 898) and Meldon Reservoir (SX 563 917) from which up to 27.3 Ml/day can be abstracted (subject to prescribed flow and compensation release conditions). The main river abstraction for potable water at Torrington (SS 482 191) is licensed for up to 10.2 Ml/day (subject to prescribed flow conditions and supportive augmentation releases from Meldon Reservoir at times of low flow).

A reservoir operating agreement has been drawn up between the NRA and SWWSL for Meldon Reservoir to ensure that the method and timing of releases meet environmental protection requirements. Other minor impoundments and abstractions are licensed for public supply purposes within the catchment. These are shown on the accompanying map.

In rural areas with low population density there may be difficulties in supplying mains water at reasonable cost. In these circumstances small scale groundwater supplies provide a useful alternative.

The majority of groundwater abstractions in the catchment are exempt from licensing by virtue of the Devon River Authority (Exemption from Control) Order 1970 (see Section 3.14.2 and map). The effect of these abstractions cannot, therefore, be evaluated although it is known that groundwaters in this area can be closely inter-connected with surface water.

3.8.3 Environmental Objectives

To maintain water quality, water resources and river topography so as to safeguard potable abstractions.

3.8.4 Environmental Requirements

Water Quality:

Water Quality Suite 5: Potable Abstraction (see Appendix 9.1.5)

Pollution Control:

To ensure the protection of potable water sources through effective communications and actions to prevent pollution and mitigate pollution events.

Water Resources:

To limit additional abstractions to ensure continued security of existing sources.

3.9 INDUSTRIAL AND AGRICULTURAL ABSTRACTION - RIVER TORRIDGE CATCHMENT

3.9.1 General

The quality of water required for industrial use depends on the process involved. Where industrial abstractions include some potable usage the supply must meet potable standards.

Agricultural uses include watering of livestock, washing down yards and dairy areas, and irrigation of crops. These often include potable use at the farmhouse and related properties. Spray irrigation has the most intensive impact and new abstractions are only permitted subject to prescribed flow conditions or winter filling of off-stream storage ponds.

3.9.2 Local Perspective

There is only a limited degree of industrial abstraction in the catchment and most businesses derive their water supply from the mains.

It is not possible to determine the impact of agricultural abstractions on river flows because many of these are exempt from licencing control and are not known to the NRA.

Following the Water Act 1979, only abstractions of 20 m^3/day or less will now be exempt from licensing control except where Licences of Entitlement have been granted.

Part of the catchment is subject to a Water Resources Act 1963 Section 25 Order excluding groundwater abstractions from licensing control unless they are within gravel deposits. This was obtained by the former Devon River Authority because yields are low and such minor abstractions as could be obtained would have no significant impact on water resources. This is still believed to be the case.

An aspect which may need study is the combined impact on low flows of the large number of agricultural and domestic abstractions in the rural area which have exempt status under the legislation.

3.9.3 Environmental Objectives

To maintain water quality, water resources and river topography so as to safeguard industrial, agricultural and, where relevant, domestic abstractions.

3.9.4 Environmental Requirements

Water Quality:

The uses of industrial and agricultural abstractions are largely unknown and, as such, specific water quality standards have not been identified. Once the uses are identified, the appropriate Water Quality Suite below will be applied.

Water Quality Suite 5: Potable Abstraction, A3 Treatment (see Appendix 9.1.5)
Water Quality Suite 6: Irrigation of Crops (see Appendix 9.1.6)
Water Quality Suite 7: Watering of Livestock (see Appendix 9.1.7)

Pollution Control:

To ensure the protection of raw water sources through effective communications and actions to prevent pollution and mitigate pollution events.

Water Resources:

To limit additional abstractions to ensure continued security of existing sources.

3.10 EFFLUENT DISPOSAL - SEWAGE - RIVER TORRIDGE CATCHMENT

3.10.1 General

The disposal of effluent is a recognised use of receiving waters which includes both groundwater and surface water. Controls for the quality and quantity of discharges are implemented through consenting procedures detailed in Schedule 12 of the Water Act, 1989.

The aim is to limit the discharge of pollutants so that after mixing with the receiving waters, the concentrations comply with prescribed water quality standards appropriate to identified water uses.

For discharges to groundwater where water quality objectives have not been set, no deterioration in groundwater quality should occur after allowance has been made for the attenuation processes that occur between the soil and water table.

3.10.2 Local Perspective

There are three principle categories of discharges which enter the network of watercourses within the catchment. These are continuous discharges of sewage and trade wastes (see map), intermittent discharges from storm and emergency sewage overflows and diffuse inputs from land run-off.

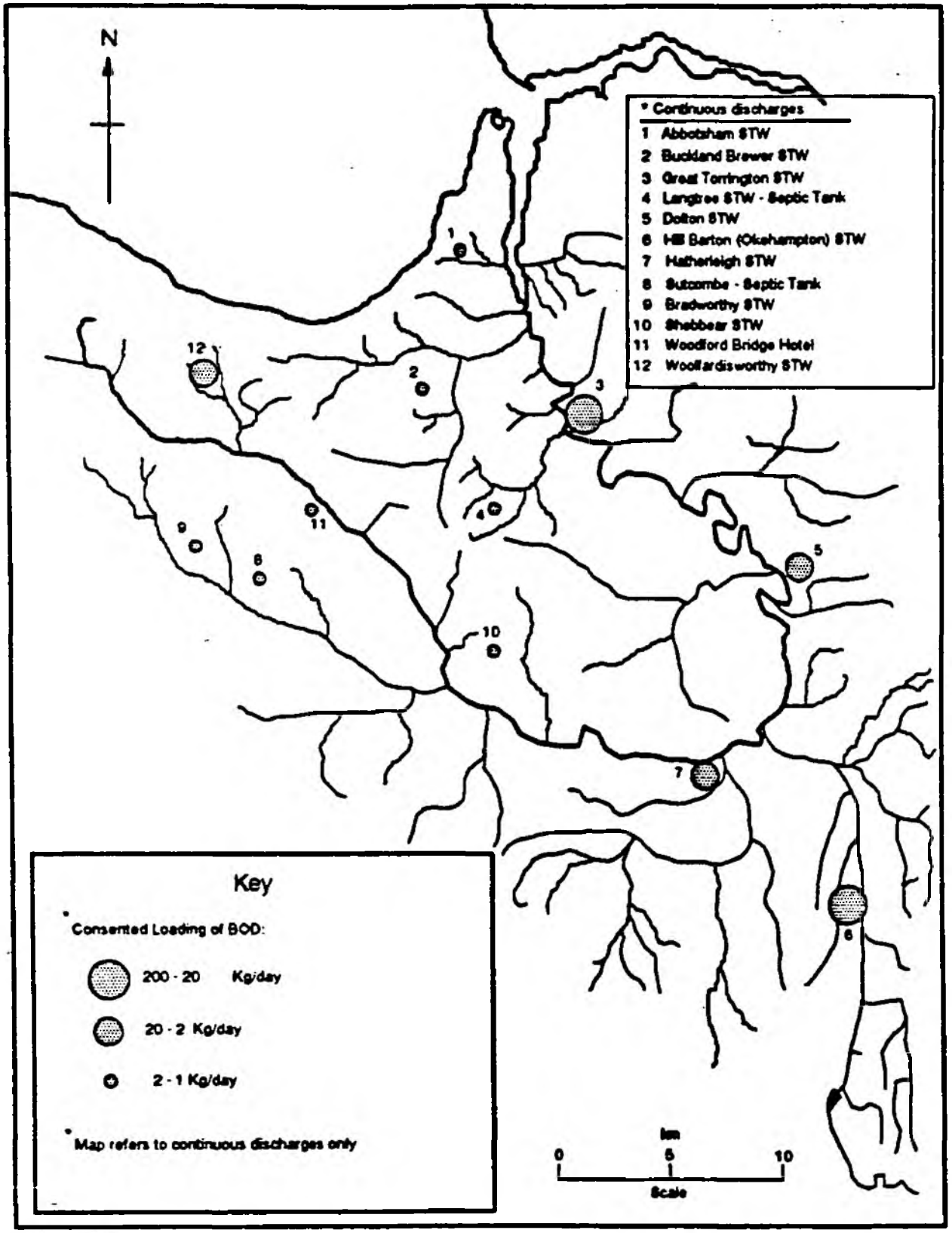
It is estimated that the total organic load (expressed as Biochemical Oxygen Demand, BOD) discharged from the 254 sewage and trade premises is 240 kg per day. Although these discharges are located evenly throughout the catchment, more than 95% of the load enters from just thirteen sites. Two sewage treatment works (Okehampton and Great Torrington) account for more than 50% of the total input. The majority of the 254 discharges are biologically treated to a standard better than Royal Commission (20 mg/l BOD: 30 mg/l Suspended Solids). There are seven effluents from septic tank installations.

Very few of the consented discharges contain conditions which are applicable currently to limit concentrations of ammonia in the discharge.

There are at least 38 storm sewage overflows which discharge within the catchment and at least seven of these are considered to operate frequently. These are located mainly in the Great Torrington area.

Data collected by SWWSL in 1978 indicates that 54% of the catchment population are not connected to sewer. Many properties use soakaway systems which have only recently become subject to discharge consents; consequently, historic information is sparse.

The Torridge Catchment
EFFLUENT DISPOSAL - SEWAGE



3.10.3 Environmental Objectives

All discharges must be regulated by control levels so that environmental quality standards set for receiving waters are achieved and maintained.

3.10.4 Environmental Requirements

Water Quality:

No discharge should cause aesthetic nuisance.

The assimilative capacity for each discharge must be available in the receiving water. It is implicit that the quality of the receiving water complies with established quality standards.

The minimum dilution used in the calculation of consent conditions must not be derogated.

The associated mixing zone must be agreed on a site specific basis.

Pollution Control:

To promote improvements to unsatisfactory sewage treatment.

To prevent pollution and to prosecute those who pollute, in accordance with national policy.

Water Resources:

Abstraction must not reduce the river flow below the Q95 flow.

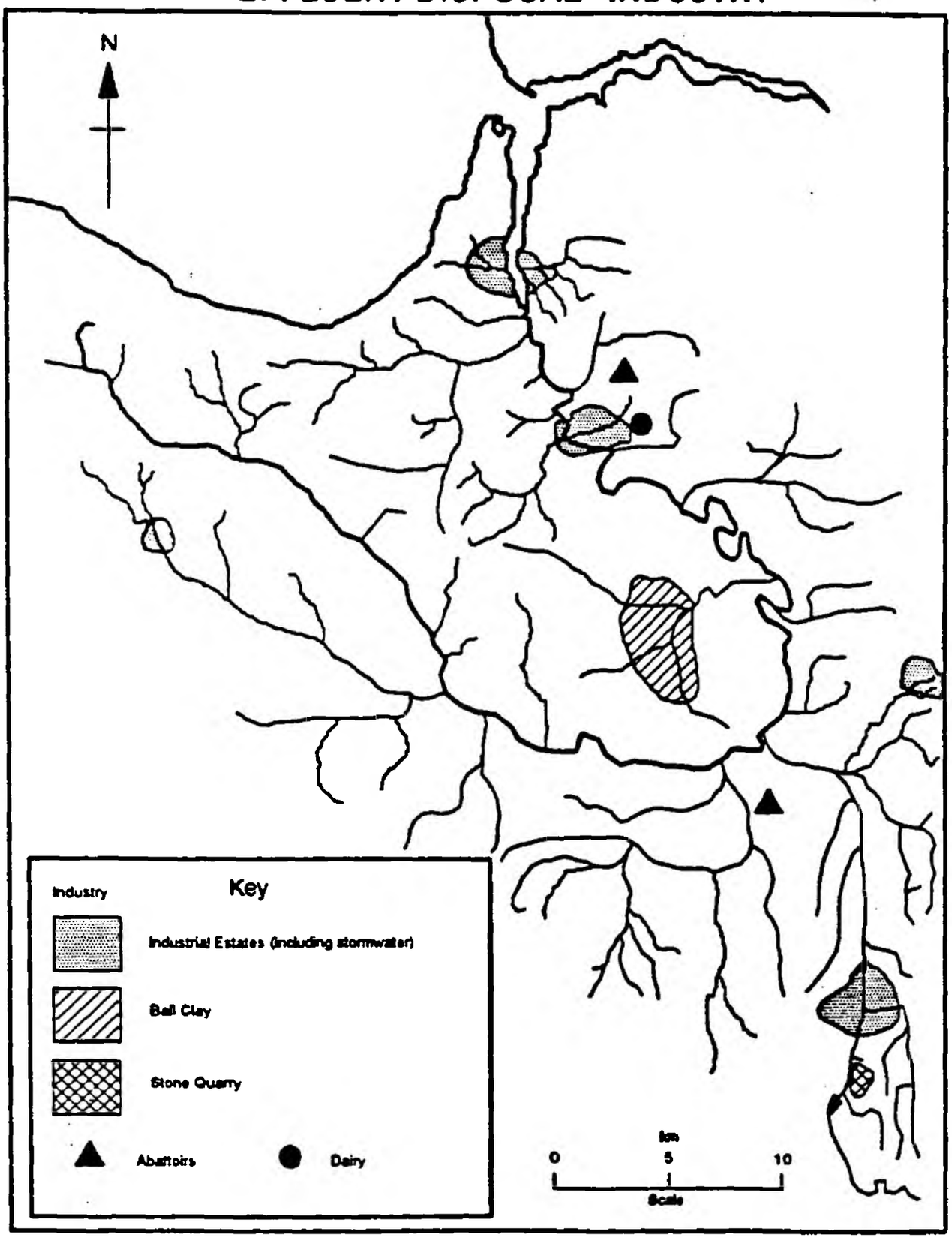
Fisheries:

Special protection zones are to be established in the Okement and Lew tributaries initially to protect juvenile salmon from pollution risks. Later it is planned to extend to the Upper Torridge and Waldon.

Catchment Features:

Outfalls must be situated so as to achieve a specified degree of effluent mixing with the river contents, within a specified distance, the precise terms to vary for different consents.

The Torridge Catchment
EFFLUENT DISPOSAL - INDUSTRY



3.11 EFFLUENT DISPOSAL - INDUSTRY - RIVER TORRIDGE CATCHMENT

3.11.1 General

There are several significant industrial influences in the catchment including quarrying of stone and the extraction of ball clay which have been exempt from legal discharge controls. Consenting procedures are now in progress with regard to the stone quarry. Abattoirs and dairies, which have been subject to controls on discharges have also affected other uses of the catchment in recent years.

3.11.2 Local Perspective

Agricultural expansion in the past twenty years has increased pressure on the catchment with greater volumes of liquid waste products from abattoirs at Great Torrington and Hatherleigh and the dairy at Great Torrington. In recent years significantly improved control of effluents has been achieved in Great Torrington.

The ball clay extractive industries at Meeth and Merton are subject to good housekeeping agreements, with the installation of settlement lagoons. This has resulted in a reduction in the amount of suspended solids discharged, resulting in fewer complaints of turbid conditions in the receiving waters.

Similar agreements resulting in good housekeeping practices are being sought from the management of the stone quarry at Meldon.

Light industrial sites at Bradworthy, Okehampton, Winkleigh, Torrington and Bideford are mainly connected to sewerage systems, but stormwater is discharged directly to watercourse in the catchment.

Twenty-five waste disposal landfill sites are known within the catchment. These rely on dilution, dispersion and attenuation of leachates to limit pollution of the groundwater environment. It is known that serious pollution of groundwater and surface watercourses has been encountered in other areas following this system although local groundwater quality data is not available.

However, since groundwater systems are "local" in character, any significant pollution is likely to be evident in emergent springs draining landfilled areas.

3.11.3 Environmental Objective

The discharge of industrial effluents must be regulated by control levels so that environmental quality standards set for receiving waters are achieved and maintained.

3.11.4 Environmental Requirements

Water Quality:

No discharge should cause aesthetic nuisance.

The assimilative capacity for each discharge must be available in the receiving water. It is implicit that the quality of the receiving water complies with established quality standards.

The minimum dilution used in the calculation of consent conditions must not be derogated.

The associated mixing zone must be agreed on a site specific basis.

Pollution Control:

To promote good practices and improvements to unsatisfactory effluent treatment plants.

To prevent pollution and to prosecute those who pollute, in accordance with national policy.

Water Resources:

Abstraction must not reduce the river flow below the Q95 flow.

Fisheries:

The migration of salmonid fish should not be adversely affected. Spawning and nursery areas should be protected.

3.12 EFFLUENT DISPOSAL - AGRICULTURE - RIVER TORRIDGE CATCHMENT

3.12.1 General

Agriculture is the major industry and dairy farming the main activity. It is estimated that 84,000 cattle and 140,000 sheep are held within the catchment and their wastes and by-products require disposal to land. Few farms hold relevant discharge consents and this use of the catchment is constrained by the need to protect other users from the effects of agriculture.

Poor containment of agricultural slurry and silage liquor may cause widespread seepage into groundwaters often polluting over considerable distances. Compared to disposal by spreading to land, pollutants are not reduced by dilution, dispersion and plant uptake within the soil.

3.12.2 Local Perspective

During 1983 local surveys revealed the significant influence of agricultural activity on water quality. Concern became action in 1984 with the farm campaign "Pollution Together We Can Beat It". The campaign was completed in 1989 with the following results:-

Total number of farms visited = 989

	Polluting (RED) farms	% of total
First visit	232	23
Second visit	113	11
Third visit	21	2

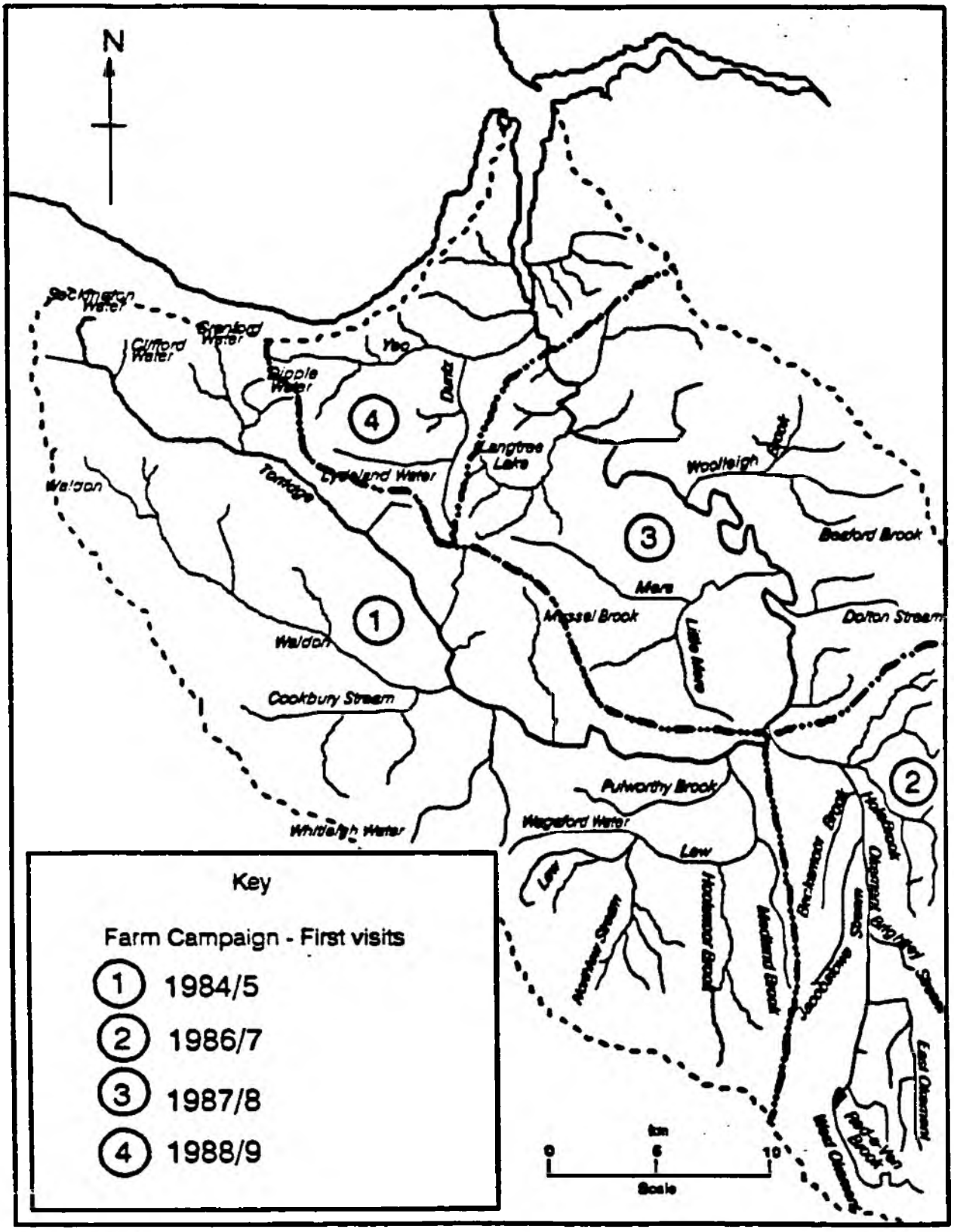
The inspection visits were made over several years as indicated by the map and there remain several key sub-catchments which require special attention; Dipple Water, Lower Waldon and Hookmoor Brook where farm drainage continues to affect water quality. The Yeo/Duntz sub-catchment has been subject to the Farm Campaign most recently and it is likely that improvement works have not been completed. Thus improvements in river quality have not yet been recorded in this sub-catchment.

There has been a significant reduction in serious pollution incidents from farms and a hardening of enforcement:-

	Total Incidents	Serious Incidents	Prosecutions
1987	70	49	5
1988	85	31	10
1989	77	15	11

All farms have received appropriate advice on pollution prevention and have been urged to maintain and manage effluent systems effectively. Those individuals causing pollution in future will be considered for prosecution in line with the widely publicised national policy.

The Torridge Catchment
FARM CAMPAIGN



3.12.3 Environmental Objectives

To prevent the release of agricultural byproducts into the aquatic environment.

To promote good agricultural practices in respect of the disposal of waste products.

3.12.4 Environmental Requirements

Water Quality:

The discharge of agricultural waste and other associated products must be regulated by control levels so that environmental quality standards set for receiving waters are achieved and maintained.

Pollution Control:

To promote good agricultural practices to prevent pollution through the "Pollution - together we can beat it" farm campaign and to influence national agricultural strategy.

To prosecute those who pollute, in accordance with national policy.

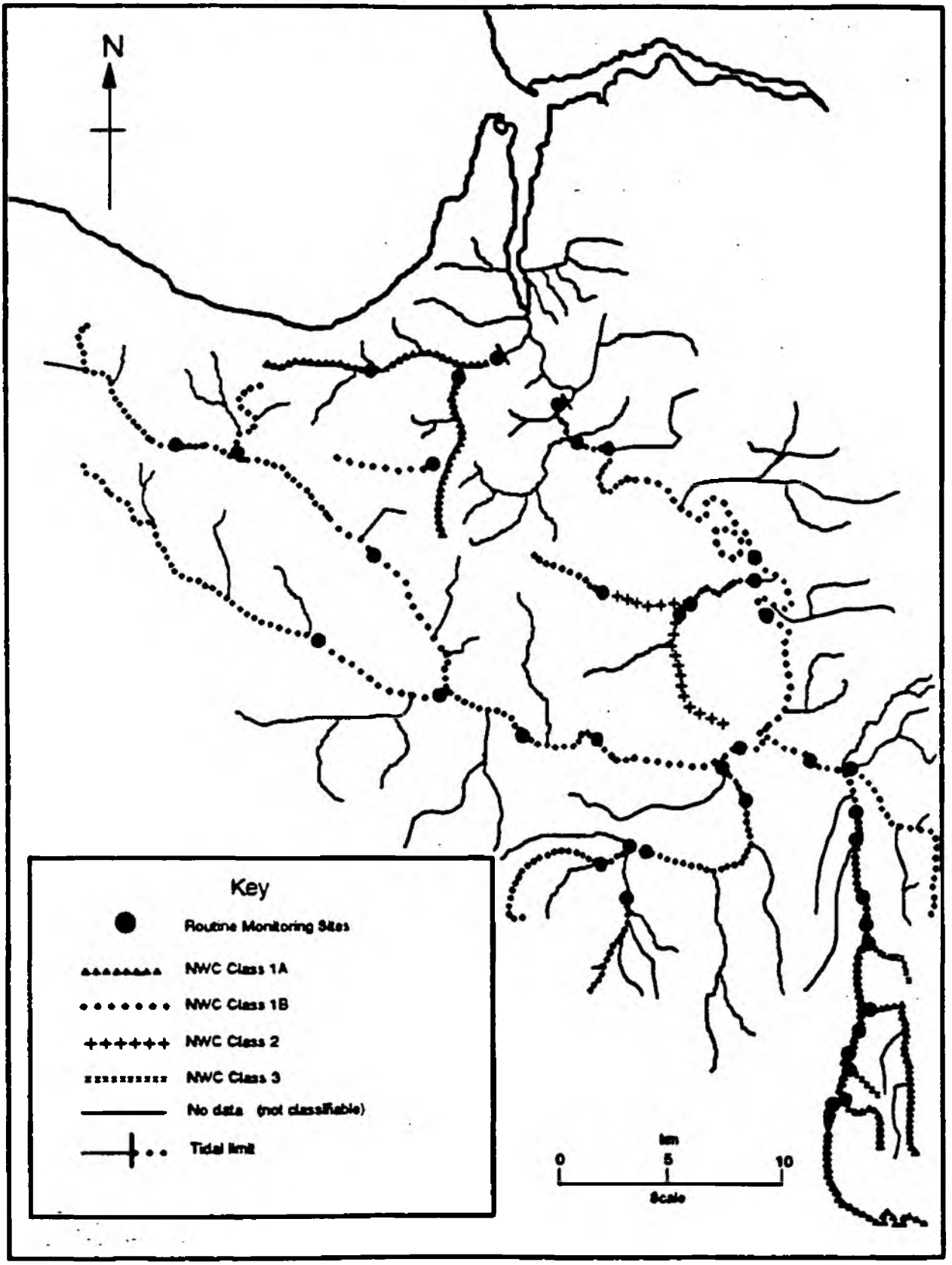
Water Resources:

Abstraction must not reduce the river flow below the Q95 flow.

Fisheries:

The control of agricultural effluent disposal within the River Torridge catchment is of paramount importance for the recovery of the salmonid fishery. Juvenile stocks are particularly vulnerable to agricultural effluent discharges into watercourses.

The Torridge Catchment
RIVER QUALITY OBJECTIVES



3.13 RIVER QUALITY OBJECTIVES - RIVER TORRIDGE CATCHMENT

3.13.1 General

In 1979 River Quality Objectives (RQO's) were set for rivers throughout England and Wales using the classification system developed by the National Water Council (NWC) (Appendix 2). This system was based on appropriate water uses such as its suitability for potable abstraction, fish and amenity value. The five quality classes are shown below.

National Water Council - River Classification System

Class	Description
1A	Good Quality
1B	Lesser Good Quality
2	Fair Quality
3	Poor Quality
4	Bad Quality

The NWC recommended that Water Authorities should implement a review of river water quality management. This included:

i) the setting of RQO's, as far as practicable, for all rivers, canals and major streams;

ii) setting RQO's which have regard to the uses of those waters and environmental considerations based on values of quality criteria;

iii) identification of long-term objectives where the water involved is currently adequate for the identified uses, (ie. for the immediate and long term protection of water quality).

3.13.2 Local Perspective

RQO's set in the River Torridge Catchment were based on an assumed knowledge of existing quality at the time and the uses made of the river catchment. Only the Rivers Okement and Yeo (Bideford) and their major tributaries were assigned RQO's of Class 1A. The RQO of Class 1A for the River Okement is reasonable on the grounds that it is a moorland derived river with little industry or farming in the catchment and, as such, should be able to achieve pristine conditions. However, the reason for assigning the River Yeo system as Class 1A is not clear, other than the fact that there is a potable water abstraction on this river. The majority of the catchment with a quality objective to protect salmonid fish was assigned an RQO of Class 1B.

Some of the slower flowing sections of the River Mere Catchment were assigned an RQO of Class 2, due to their unsuitability as salmonid fisheries and the effects of the ball clay extractive industry which were considered to be uncontrollable by legislation at the time.

Two small tributaries within the River Okement Catchment, the Brightley Stream and the Meldon Stream, have been assigned RQO's of Class 3 as they are not suitable to support fish. Water quality changes have resulted in low pH values and high metal concentrations being recorded. Investigations have shown that the origins of the changes are related to the local geology.

The table below shows the total reach lengths assigned to each NWC Class in the Torridge Catchment.

Existing RQO's - Torridge Catchment

NWC Class	RQO's (km)	RQO's (%)
1A	59.0	26.7
1B	152.0	68.7
2	7.0	3.2
3	3.0	1.4
4	0.0	0.0
Total	221.0	100.0

To assess compliance with RQO's, rivers are monitored routinely for a number of different determinands which may affect water quality. The number of determinands and the sampling frequency are subject to two main conditions:

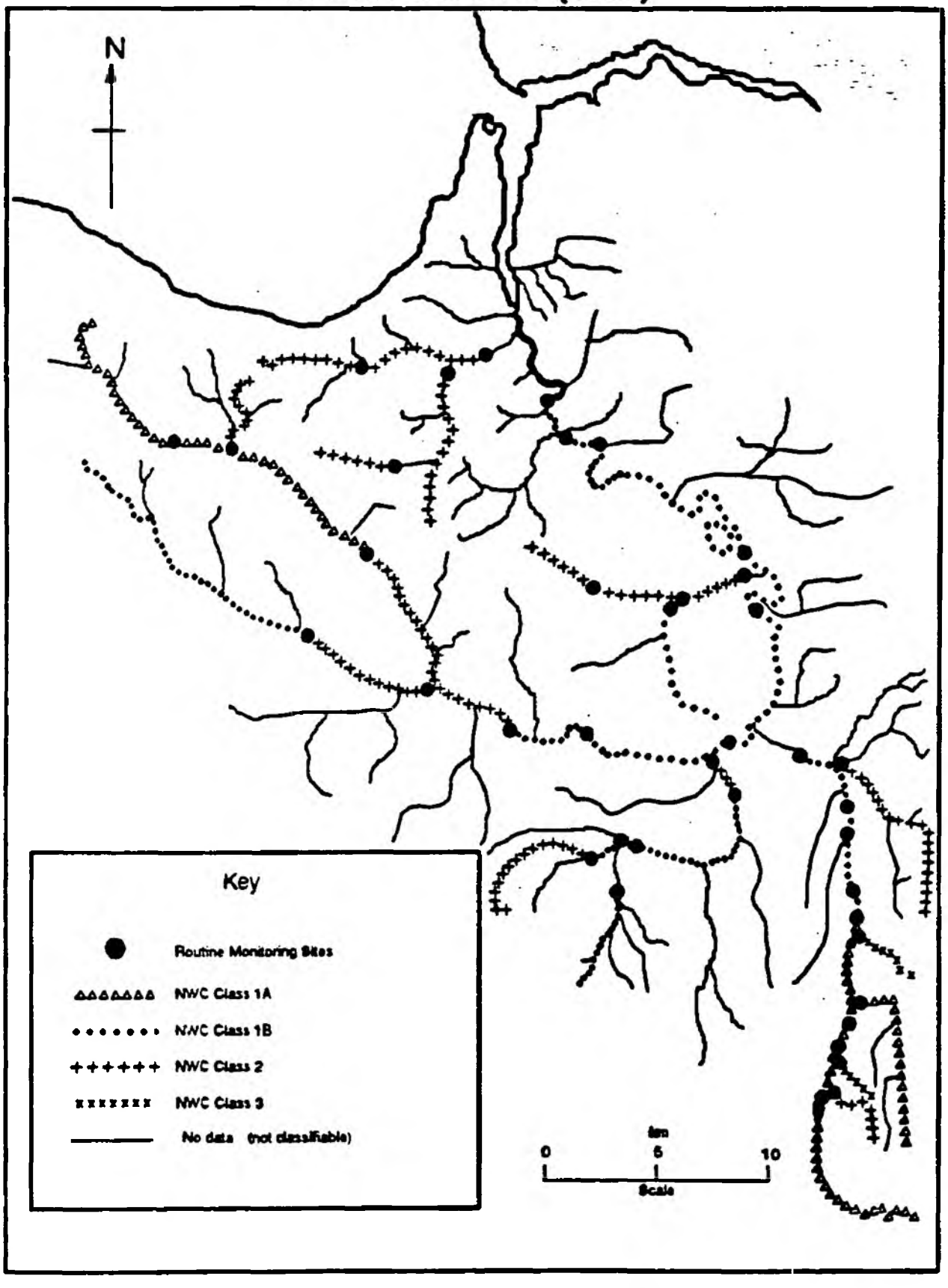
i) the extent of water quality problems e.g. whether there are problems with metals, pesticides or organic substances;

ii) the resources available to undertake effectively the tasks required for routine or special sampling of the determinands.

During 1989 chemical water quality was monitored routinely at 40 sites within the Torridge Catchment. However, a more detailed routine sampling programme has been drawn up for the 1990 National Quality Survey being organised by the NRA. This will give the most comprehensive coverage of chemical and biological monitoring the catchment has ever received.

The 1990 Survey will continue through 1991 and will be the precursor to the setting of statutory water quality objectives (WQO's) by the Secretary of State.

The Torridge Catchment
WATER QUALITY (1989)



Only 38 of the 40 sites routinely monitored in 1989, have been classified due to insufficient data/samples to enable 95-percentile values to be calculated.

Actions being taken to overcome these problems include:

i) reviewing and improving sampling frequencies for future monitoring programmes;

ii) improvements in the computerised reporting of quality.

3.13.3 Environmental Objectives

To achieve the designated quality objective for each river reach, so that identified water uses are protected.

3.13.4 Environmental Requirements

Water Quality:

The NWC classification of river water quality is based on the concentrations of certain determinands, (principally ammonia, biochemical oxygen demand (BOD) and dissolved oxygen), which are expected to be achieved by 95% of samples results. The classification procedures operated in the NRA SW Region requires the use of three years' data, in order to calculate 95-percentile values. Therefore the 1989 classification comprised data from 1987, 1988 and 1989.

Principal Environmental Requirements for each NWC Class

Determinands	NWC Class 1A	1B	2	3	4
Dissolved Oxygen (5P)	>80%	>60%	>40%	>10%	-
BOD (ATU) mgO/l (95P)	<3.0	<5.0	<9.0	<17.0	-
Ammonia (Total) - mgN/l (95P)	<0.31	<0.7	-	-	-

5P = 5 percentile; 95P = 95 percentile

A number of other classifications have been developed to assess river water quality. However, none are used regularly throughout England and Wales, except for in-house reporting and for supporting NWC Classifications.

Water Resources:

Abstraction must not reduce the river flow below the Q95 flow.

Fisheries:

The Torridge fishery is dependant on RQO's being achieved. The maintenance of adequate river water quality is critical for the continuing survival of fish, particularly of juvenile stages.

3.14 GROUNDWATER QUALITY OBJECTIVES - RIVER TORRIDGE CATCHMENT

3.14.1 General

The Water Act, 1989, specifies groundwater as a controlled water and allows for the development of a groundwater classification system with associated groundwater quality objectives. This approach is being considered by the NRA. The NRA have a general duty to monitor all controlled waters whether classified or not.

Given these circumstances, the NRA is setting up a groundwater quality monitoring programme to establish a baseline from which to assess any future quality changes. These data will enable the simple objective of no deterioration of groundwater quality to be applied.

3.14.2 Local Perspective

An Exemption from Control Order, 1970, granted to the Devon River Authority under Section 25 of the Water Resources Act 1963, allows groundwater to be abstracted without a licence within certain areas of the catchment (see map). The NRA have no information on the numbers of abstractors or the quantity of water abstracted from groundwater within the Exemption Area. No assessment has been made of the impact of this Order on the NRA's ability to manage groundwater quality.

Groundwater abstractions within small areas of valley gravels in the Exemption Area are still licensable because of the likelihood of higher yields and the direct impact on river flows.

3.14.3 Environmental Objectives

To maintain and, where necessary, improve groundwater quality in order to meet specified objectives and standards. To maintain groundwater resources.

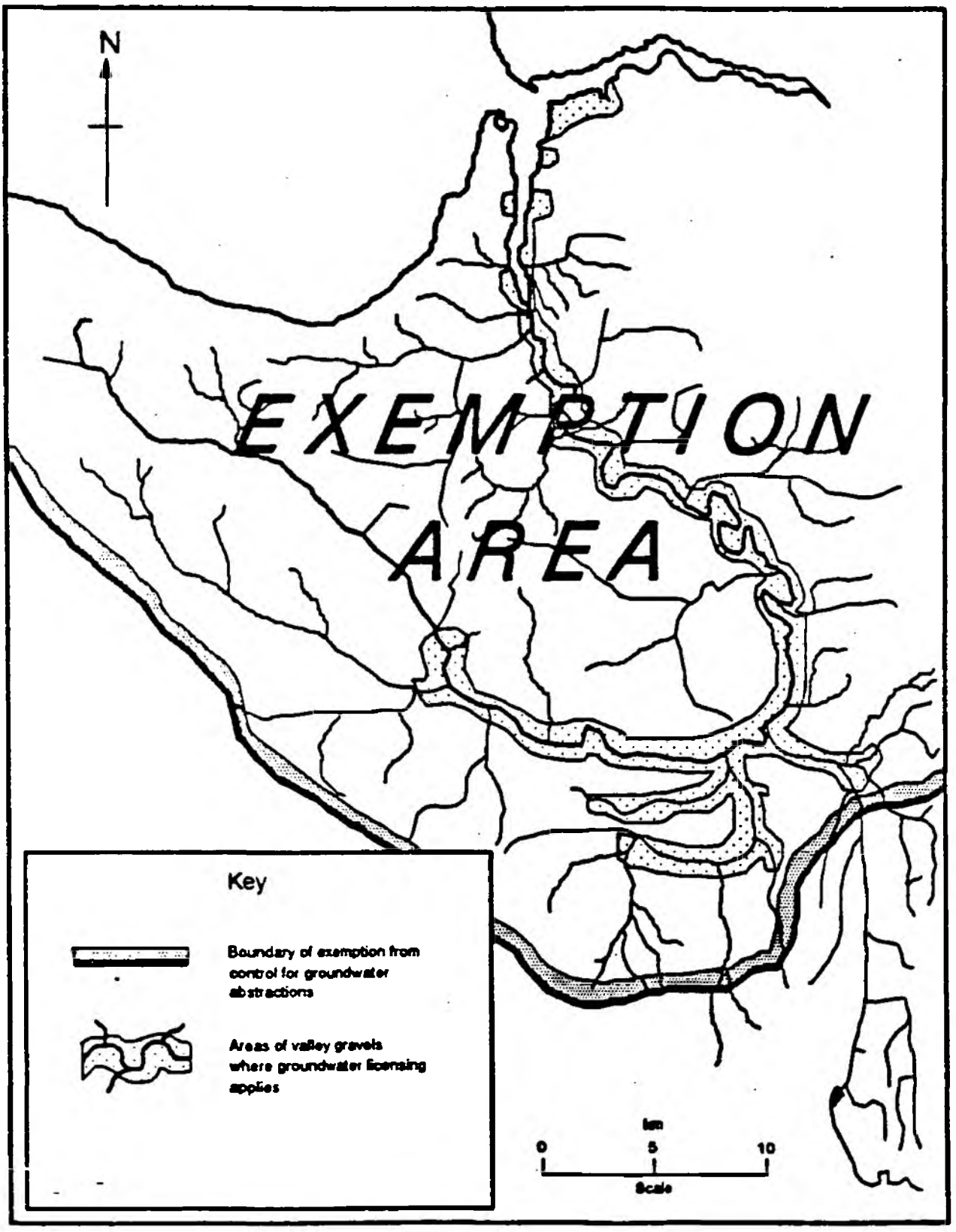
3.14.4 Environmental Requirements

Water Quality:

To implement a groundwater monitoring network to enable realistic assessments of quality to be made. Where appropriate, protection zones will be formally identified to ensure groundwater quality is protected or improved.

Water Quality Suite 2: List I Substances (see Appendix 9.1.2)
Water Quality Suite 5: Potable Abstraction (see Appendix 9.1.5)
Water Quality Suite 6: Irrigation of crops (see Appendix 9.1.6)
Water Quality Suite 7: Watering of Livestock (see Appendix 9.1.7)

The Torridge Catchment
GROUNDWATER QUALITY OBJECTIVES



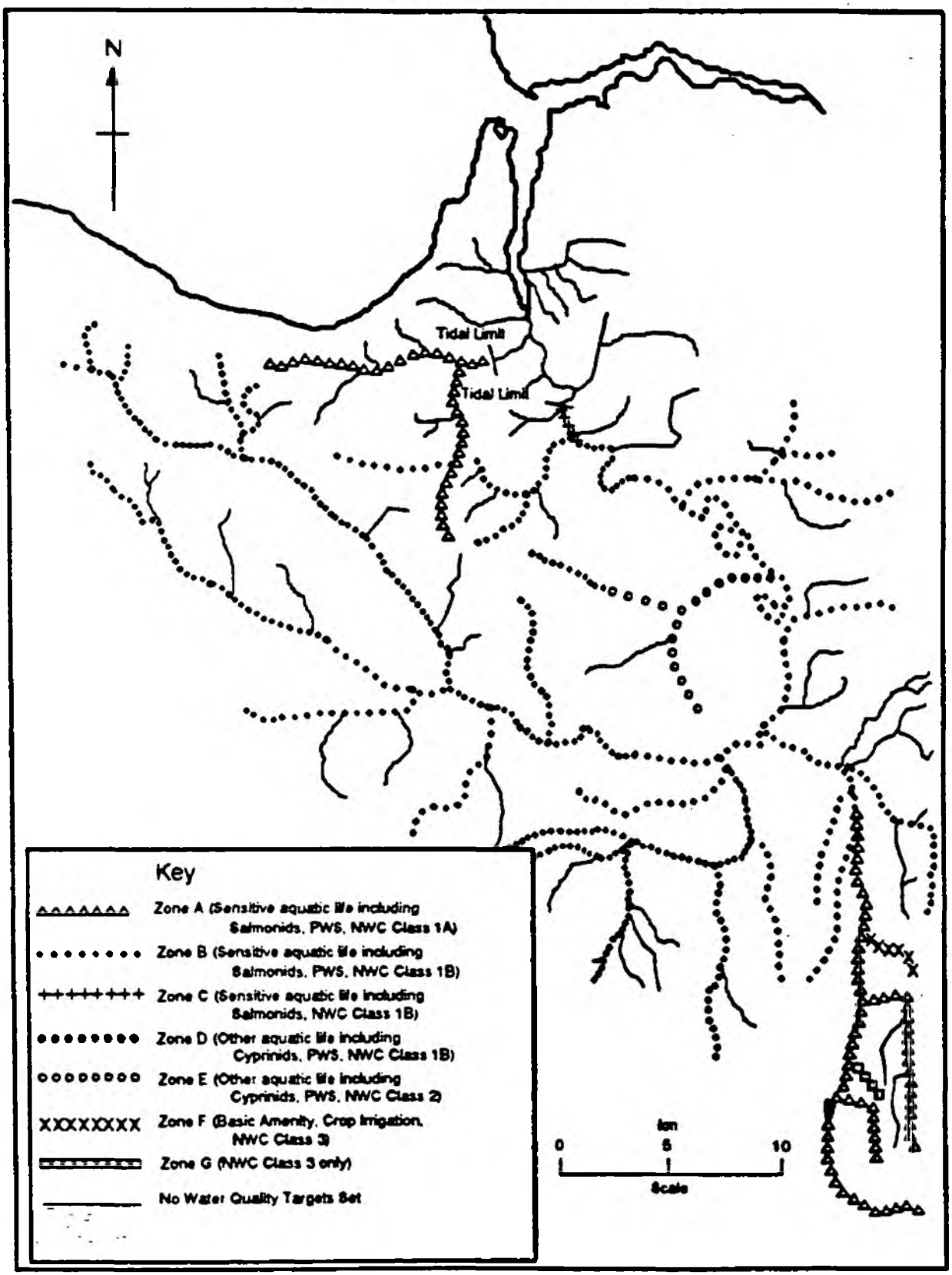
Pollution Control:

To investigate and remedy, where practicable, groundwater pollution to protect legitimate water use and to enforce the pollution law in accordance with national policy.

Water Resources:

To implement appropriate groundwater protection policies to ensure water quality is protected from contamination and designated uses of groundwater quality can be maintained.

The Torridge Catchment
WATER QUALITY TARGETS



4.1 WATER QUALITY TARGETS - RIVER TORRIDGE CATCHMENT

4.1.1 General

The water quality requirements for all the uses can now be combined to give a map representing the targets for the whole catchment. Clearly, the quality requirement that applies for any given determinand in a particular stretch is equal to the strictest use-related requirement that applies.

4.1.2 Local Perspective

Surface Water:

Consideration of the seven different uses in the River Torridge Catchment generates a number of zones where the different water quality requirements apply. The requirements (or Environmental Quality Standards) to achieve the water quality targets are included in Appendix 9.

	WATER QUALITY ZONE						
	A	B	C	D	E	F	G
Water Quality Suite 1 Aesthetic Criteria	*	*	*	*	*	*	
Water Quality Suite 2 List I Substances	*	*	*	*	*	*	
Water Quality Suite 3 Sensitive Aquatic Life	*	*					
Water Quality Suite 4 Other Aquatic Life			*	*	*		
Water Quality Suite 5 Potable Abstraction	*	*			*		
Water Quality Suite 6 Irrigation of Crops						*	
Water Quality Suite 7 Watering of Livestock	*	*	*		*	*	
Nickel (dissolved) ugNi/l (see + overleaf)	*	*	*	*	*		
Ammonia (un-ionised) ugN/l	15(AA) 21(95P)	15(AA) 21(95P)	15(AA) 21(95P)	15(AA) 21(95P)	21(AA) 42(95P)		
Ammonia (total) ugN/l	310 (95P)	700 (95P)	700 (95P)	780 (95P)	780 (95P)		
Dissolved Oxygen mgO2/l	>9(50P) >7(Min)	>9(50P) >7(Min)	>9(50P) >7(Min)	>9(50P) >7(Min)	>7(50P) >3(Min)	>7(50P) >5(Min)	
Dissolved Oxygen % sat.	>80(5P)	>60(5P)	>60(5P)	>60(5P)	>40(5P)	>10(5P)	>10(5P)
BOD (ATU) mg/l	3(95P)	5(95P)	5(95P)	5(95P)	9(95P)	17(95P)	17(95P)

* Water Quality Suite applies; (AA) = Annual Average; (95P) = 95 percentile (Min) = All Values to exceed this number; (5P) = 5-percentile; (50P) = 50-percentile

The water quality target zones (or Environmental Quality Objectives) are shown on the accompanying map and reflect the potential use of the river system.

Nickel (dissolved) as Ni

8 ug/l as an annual mean when Total Hardness <50 mg/l $CaCO_3$

20 ug/l as an annual mean when Total Hardness 50-100 mg/l $CaCO_3$

50 ug/l as an annual mean when Total Hardness 100-200 mg/l $CaCO_3$

100 ug/l as an annual mean when Total Hardness >200 mg/l $CaCO_3$

Groundwater :

Discussions are underway at national level to determine the approach the NRA should take on groundwater quality objectives. Until these have been established, targets cannot be set.

4.1.3. Pollution Control Targets

In advance of national targets, regional targets have been adopted.

To reduce the number of serious pollution incidents affecting underground and surface waters by the development of pollution prevention campaigns such as the farm campaign.

To enforce the pollution law in accordance with the national guidelines for prosecution.

To assess and promote protection zones and Nitrate Sensitive Areas in consultation with MAFF and relevant interested parties.

4.2 WATER RESOURCES TARGETS - RIVER TORRIDGE CATCHMENT

4.2.1 General

Objectives are to manage water resources to achieve an acceptable balance between protecting public water supplies and safeguarding existing water rights, uses and the water environment.

Two prime targets are:

i) that abstraction should not reduce the river flow below the Q95 flow;

ii) that total abstraction over the period April to September should not exceed a given multiple of the daily Q95 flow.

Criteria should be developed to maintain the natural hydrological characteristics of the catchment through limited abstractions.

4.2.2 Local Perspective

Water resources targets will be set in Stage 2:

(i) To regulate abstractions and impoundments in accordance with NRA policy;

(ii) To ensure river flow does not fall below the Q95 flow except as a result of natural effects;

(iii) To develop a routine visit programme to enforce abstraction and impoundment conditions and manage licenced abstractions;

(iv) To develop maximum licensable volume criteria to limit the artificial extension of low flows;

(v) To promote a development strategy to ensure public water supplies are maintained within the catchment;

(vi) To investigate the locations of low flow difficulties and priority rate them for remedial schemes, where feasible;

(vii) To assess the full impact of all proposals and ensure sufficient protection conditions are included in licences and agreements. This is particularly applicable to the SWWSL proposal for increased abstraction from the Torridge Intake;

(viii) To review the use of Meldon Reservoir and promote operating agreement conditions with SWWSL in line with NRA water resources strategy statements;

(ix) To investigate possible storage of a reservoir bank of water in SWWSL reservoirs to assist in the achievement of NRA objectives;

(x) To consider the benefits of river augmentation arrangements which are available to SWWSL to assist in the achievement of NRA objectives;

(xi) To monitor and document the status of water resources on a regular basis including availability, usage and demand;

(xii) To develop and implement appropriate drought arrangements;

(xiii) To develop and review the Catchment Management Plan to secure proper conservation and use of water resources.

Priority Actions:

Many of the above are part of the continuing work being carried out by the NRA through its normal duties.

Specific aspects recommended for priority attention within the Torridge Catchment are:

(iii), (iv), (vi), (vii), (viii), (x) and (xii)

The Stage 2 Plan will develop specific targets in relation to these aspects.

4.3 FISHERIES TARGETS - RIVER TORRIDGE CATCHMENT

4.3.1 General

The overall objective for the Torridge fishery can be summarised as the recovery of the game fishery to a suitable level that will support the commercial and sport fishery interests and allow sufficient escapement for natural production. Appropriate targets for salmon, sea trout and brown trout populations need to be set. Parr production levels are seen as the most meaningful indicators of stock recovery.

4.3.2 Local Perspective

Targets will be set for fisheries in more detail in Stage 2 including:

(i) Establishing levels of parr and fry production for different parts of the catchment based on the 1964 survey levels;

(ii) Ensuring the provision of adequate spawning areas and nursery territory;

(iii) Maintaining access for migratory fish to spawning territory by the establishment and maintenance of fish passes and the removal of trash dams;

(iv) Establishing adequate enforcement measures to protect migratory fish;

(v) Proposing cropping levels for the commercial and rod fisheries;

(vi) Maintaining adequate monitoring of fish stock levels;

(vii) Ensuring flows provide sufficient dilution for effluents, particularly in spawning and nursery areas;

(viii) Ensuring barriers to the movements of migratory fish are not formed by sewage effluent outlets.

(ix) Controlling agricultural effluent disposal to protect juvenile salmonid stocks which are particularly at risk from this source of pollution.

4.4 FLOOD DEFENCE TARGETS - RIVER TORRIDGE CATCHMENT

4.4.1 General

Because of the predominantly rural nature of the catchment there are limited flooding problems.

It is intended to investigate all urban locations shown as liable to flooding under the Section 24(5) survey carried out under the Water Act 1973, and to promote schemes for flood defence where these are economically justified. Promoting of schemes within the capital programme is determined by the Regional Flood Defence Committee according to a points rating system.

4.4.2 Local Perspective

In protected areas, the river bank should not be breached by a flood flow with a specified return period: generally 100 years for built-up areas.

In flood plains, the river bank should be breached by a flood flow with a specified return period.

A national system for evaluating levels of service for flood defence is in preparation. When completed, the catchment will be assessed against the national standards to determine any works necessary to reduce frequency of flooding of agricultural land. Because of the generally low grade of the land involved, it is unlikely that any works will be required and present flooding is likely to be considered acceptable.

5.1 STATE OF THE CATCHMENT: WATER QUALITY - RIVER TORRIDGE CATCHMENT

5.1.1 General

Having set surface water quality targets, it is now possible to assess the state of the catchment against these targets. Problems are simply identified in Stage 1 and possible causes and solutions are proposed in Stage 2 of the Catchment Management Plan for future attention.

Due to the sparse data available for groundwater, potential problem areas can only be outlined in general terms.

5.1.2 Problems Identified

There is widespread failure to achieve BOD standards throughout the catchment. Resulting from the 1989 classification, none of the monitored lengths in the River Yeo (Bideford) sub-catchment achieved its BOD target and non-compliance also occurred in the Dipple Water sub-catchment the upper reaches of the River Lew, the mid reaches of the River Okement, the upper reaches of the River Mere and the lower parts of the River Waldon. The only non-compliant main river stretch was for 6½ kilometres downstream of the River Waldon confluence.

Ammonia non-compliance was also widespread, although to a lesser degree than for BOD. Nearly all ammonia non-compliance coincided with reaches that had also failed to achieve BOD criteria. Again, the whole of the River Yeo sub-catchment was non-compliant, also the River Torridge below the River Waldon confluence and the River Torridge upstream and downstream of the River Mere confluence.

Dissolved oxygen non-compliance only occurred in the lower reaches of the River Yeo sub-catchment.

Failure to achieve metal standards was restricted to the River Okement catchment below Meldon Dam and the Red-a-Ven Brook, a tributary of the West Okement River draining Dartmoor.

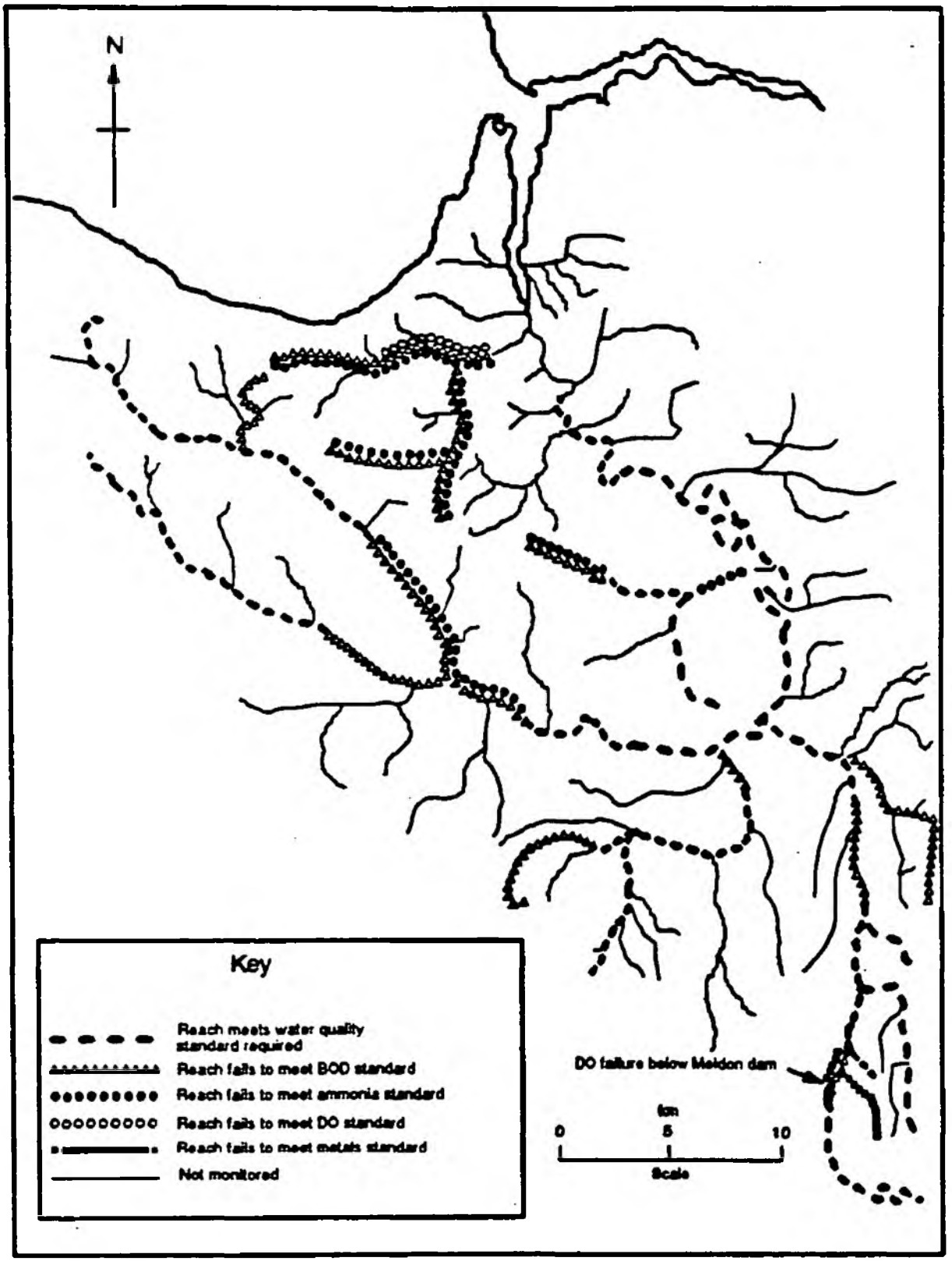
The table below summarises the state of the catchment in terms of surface water quality.

Compliance with RQO's, 1989

NWC Class	Reach Length (km)	(%[a])	RQO's (km)	(%[b])	% difference (a-b)
1A	44.4	20.1%	59.0	26.7%	- 6.6%
1B	77.7	35.2%	152.0	68.7%	- 33.5%
2	95.9	43.4%	7.0	3.2%	+ 40.2%
3	3.0	1.3%	3.0	1.4%	- 0.1%
4	0.0	0.0%	0.0	0.0%	0.0%
Total	221.0	100.0%	221.0	100.0%	0.0%

RQO's - River Quality Objectives (targets)

The Torridge Catchment
STATE OF THE CATCHMENT - WATER QUALITY



Information on Historical Water Quality 1981-1989 is given in Appendix 9.3.

Groundwater:

No systematic data on groundwater quality has been collected within the catchment but evidence is available from analysis of river water quality obtained during periods of low flow. This provides a good indication of the likely characteristics of groundwater quality. The evidence suggests the chemistry of most groundwaters is determined primarily by contact with carbonate minerals. Exceptions to this are found in water draining off Dartmoor Granite areas which are poorly buffered and susceptible to acid deposition. Elsewhere high iron and sulphate groundwaters, which are often acidic, are locally associated with sulphide rich strata within the Carboniferous Culm Measures. High concentrations of trace metals and of arsenic may well occur locally, particularly where mining has exposed fresh reactive minerals to percolating groundwater.

Surveys undertaken in other parts of the country with similar hydrogeological settings have shown that a sizeable proportion of small scale groundwater supplies for potable use are polluted with bacteria or other contaminants. It is likely that the position is similar within the Torridge catchment.

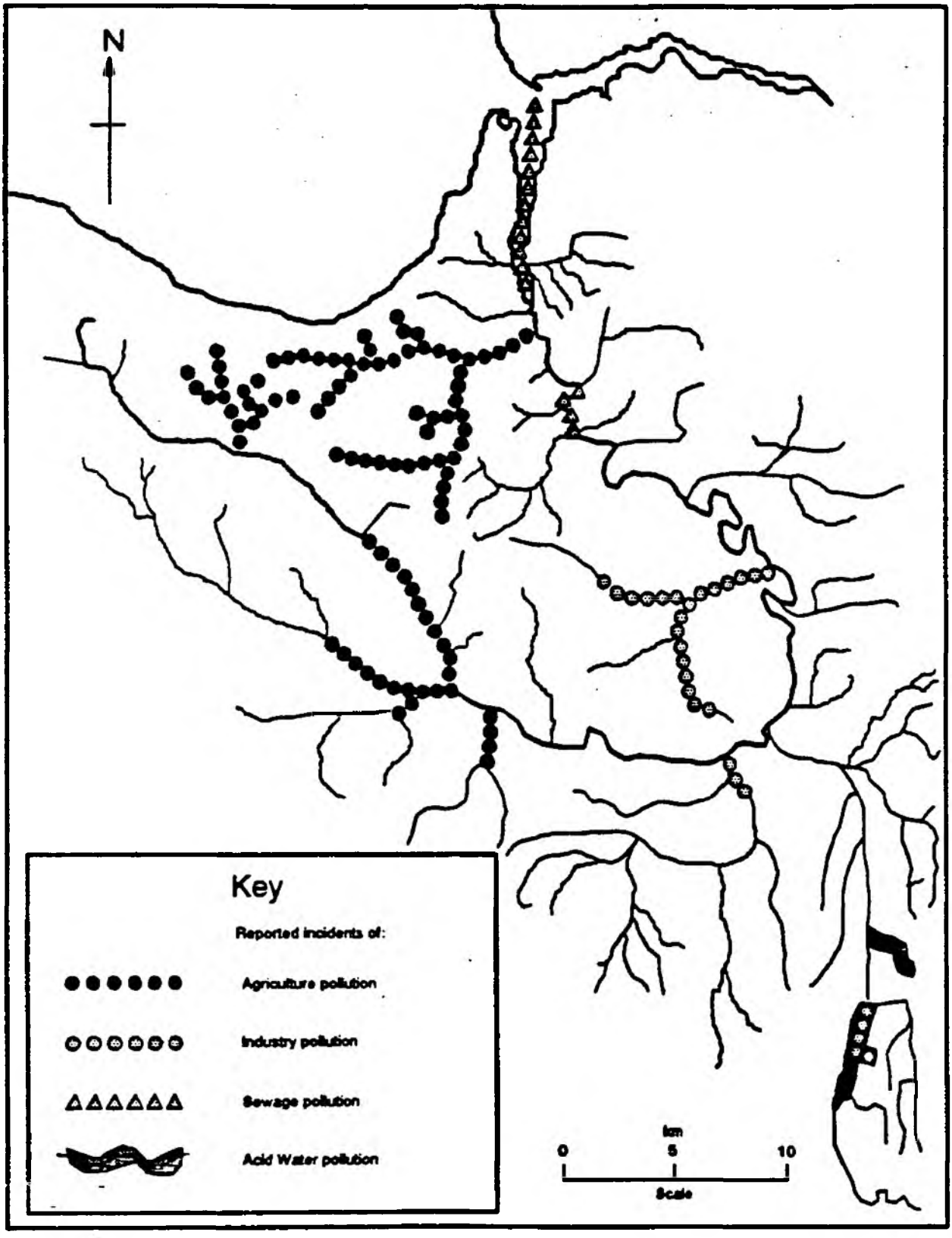
As intensive animal farming, particularly dairying, is commonly practiced, pollution of groundwater may be expected around these units.

5.1.3 Pollution Incidents

Pollution incidents may be natural or man-made, transitory or continuous. Their effects on users range from severe to negligible and, before 1987, no attempt was made to differentiate between them. The majority of pollution incidents are reported by the public and reflect public awareness. Where catchment studies and surveys are undertaken, pollutions reported by NRA staff are not recorded in incident statistics.

Records of pollution incidents have been kept in a systematic way since 1980 and in 1987 the pollution incident logging system (PILS) was introduced to enable computerised, consistent and accurate handling of data. Six categories were recognised until 1987 when a "not found" category was added to those incidents incapable of substantiation.

The Torridge Catchment
POLLUTION INCIDENTS (1986-1989)



Number of Pollution Incidents

TYPE	1980*	1981	1982	1983	1984	1985	1986	1987	1988	1989
Farms	13	22	17	68	45	64	74	70	85	77
Oil	4	8	6	7	14	6	5	14	13	11
Trades	2	13	21	28	24	14	6	15	19	27
Sewage/ Storm Overflow	1	10	3	9	14	8	13	24	12	40
Vehicle	0	0	1	0	0	0	2	0	0	1
Other	5	7	11	27	33	17	24	34	11	19
Not Found	-	-	-	-	-	-	-	15	30	33
Totals	25	60	59	139	130	110	124	172	170	208

* Only reported from May 1980

The majority of reported incidents are from agriculture reflecting the rural nature of the catchment. The proportion of farm incidents varies from between 29% to 60% and the total number has remained fairly constant for the past five years. However, sewage related incidents and those attributable to trade or industrial activity have seen a significant rise.

The number of serious incidents has been estimated for the past three years and whilst conclusions drawn from so few data should be treated with caution, it is encouraging to note a reduction from 1987 to 1989.

	1987	1988	1989
Total Incidents	157	140	175
Serious Incidents	74	56	56
% Serious	47	40	32

Pollution incidents resulting in fish mortalities have also reduced:-

	1987	1988	1989
Total Incidents	157	140	175
Fish Mortalities	13	4	3
% Fish Mortalities	8.2	2.8	1.7

These figures show the number of incidents resulting in fish loss rather than the quantities killed. For example, one of the three incidents in 1989 caused an estimated loss of 100,000 salmonids which equate to 50% of the Torridge stock (see Appendix 4).

Whilst the underlying trend in incidents is encouraging it is important to keep a sustained action plan directed towards pollution prevention and reducing pollution risk.

Where appropriate, prosecutions are undertaken as both a punishment and a deterrent to those who pollute. It is the serious incidents which attract prosecution:-

	1987	1988	1989
Serious incidents	74	56	56
Prosecutions	8	16	13
% Prosecutions	11	28	20

Since 1 September 1989 the national policy on enforcement and prosecution has been adopted.

Significant "natural" pollution events occur following extended dry periods in the River Okement Catchment. Watercourses become acidic as surface and groundwater levels rise to leach pyritic deposits which have become oxidised during these periods of dry weather. The resultant acidification leaches metals from metal-enriched strata. These changes in water quality are thought to be the causes of the recorded fish mortalities.

A water quality survey is underway in the Meldon and Brightley Streams sub-catchments to isolate the causes and evaluate whether there are any practical solutions to prevent further releases of acidic and metallic - enriched water.

5.2 STATE OF THE CATCHMENT: WATER RESOURCES - RIVER TORRIDGE CATCHMENT

5.2.1 General

The cumulative licensed abstraction data for the catchment is tabulated below:

Source by Type	No. of licensed sources in yield range m^3/d					Cumulative abstraction	
	<20	>20 <200	>200 <1000	>1000	Total	m^3/d	m^3 p.a.
Groundwater	76	1	-	-	77	324	105,154
Surface Water*	10	5	-	13	28	59,971	17,148,384
All	86	6	-	13	105	60,295	17,253,538

Note* Many of these abstractions are returned to the river system with little or no loss of resources except for a short reach which may be bypassed locally.

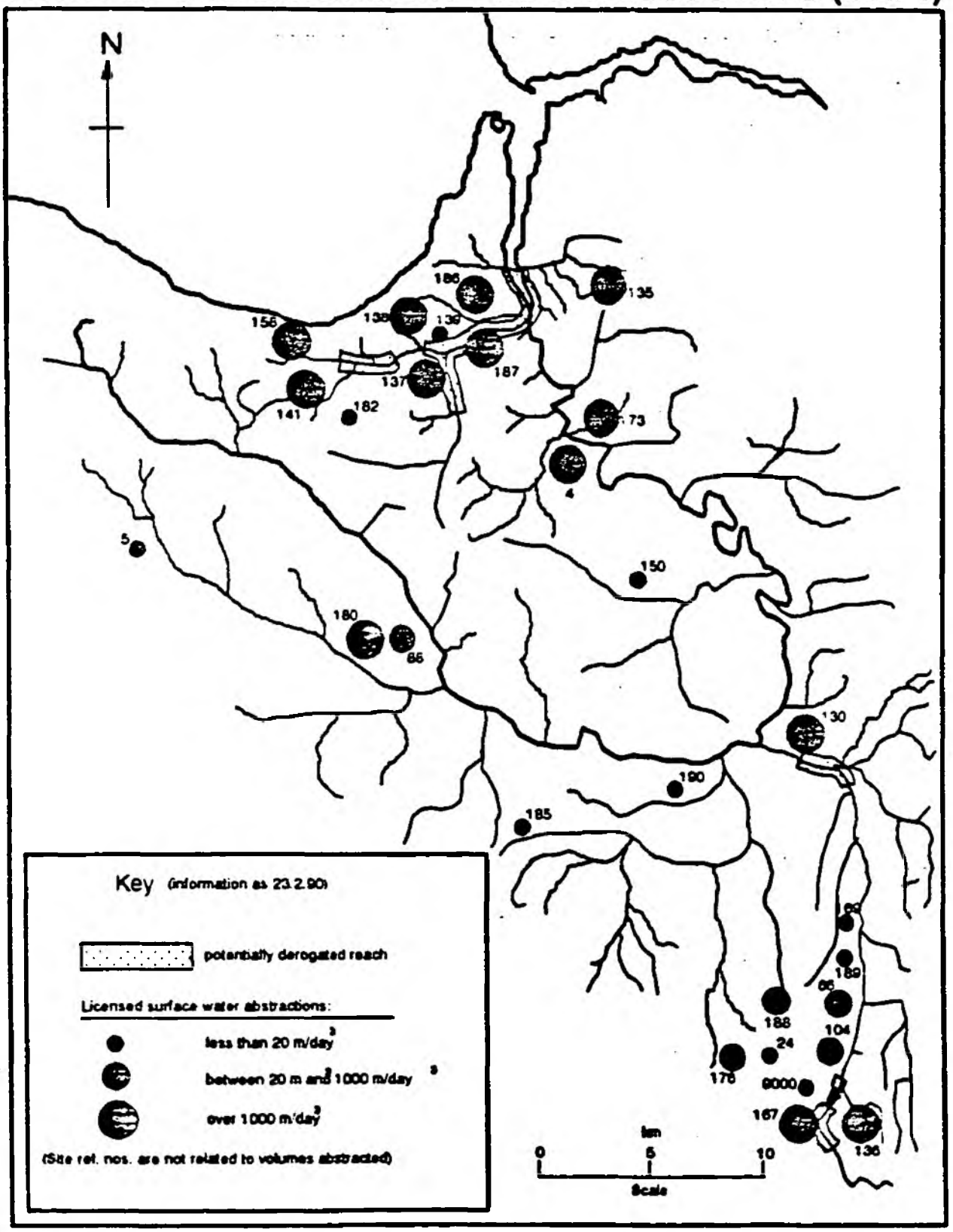
The hydrological statistics calculated at the tidal limit (excluding the River Yeo sub-catchment which flows into the Torridge below the tidal limit) are as follows:

Catchment Area	787 km^2
Theoretical Average Daily Flow	16.71 m^3/sec
Theoretical Q95 Flow	1.31 m^3/sec

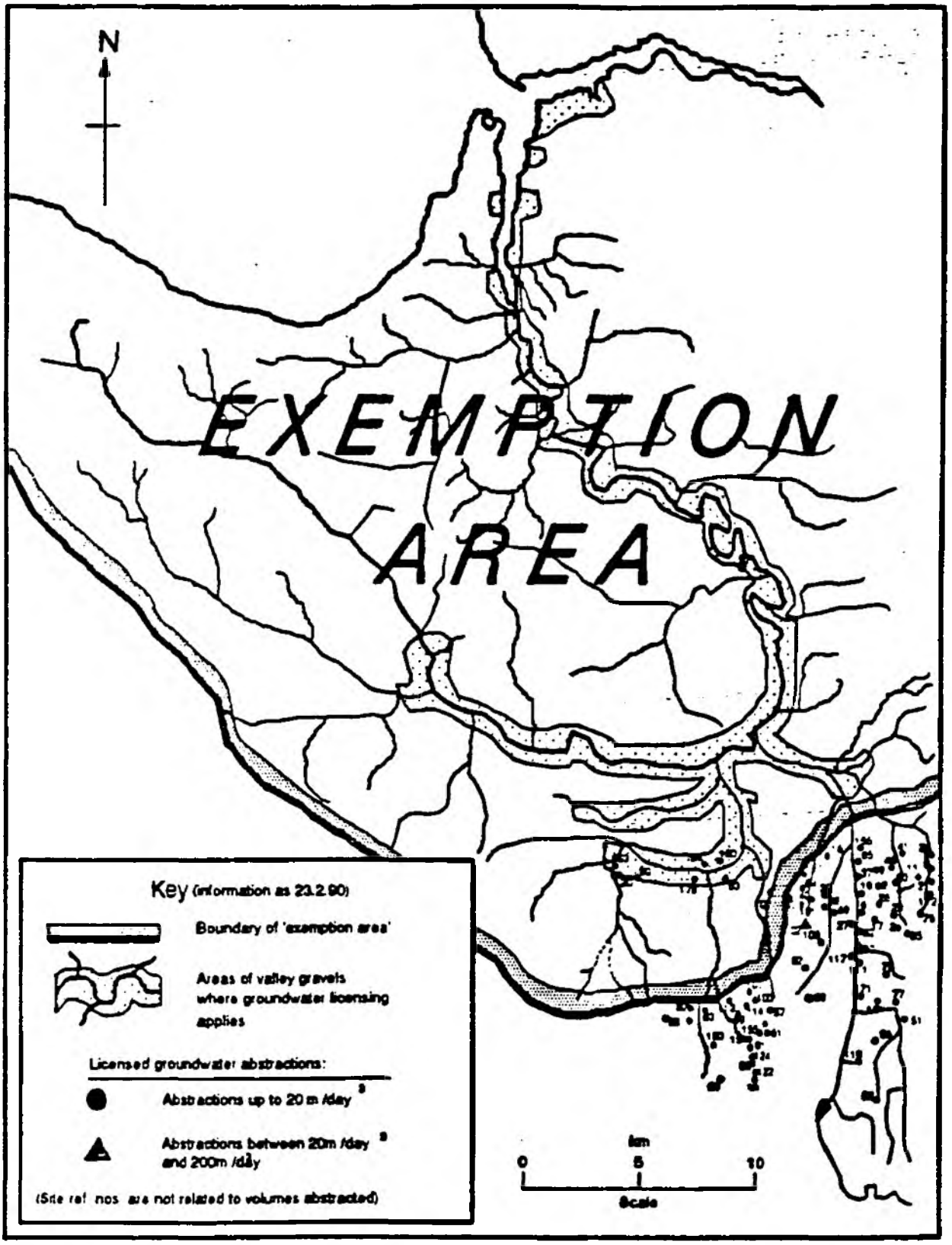
The total licensed surface water abstractions (excluding reservoirs) represent 4.0% of the total resources. Daily cumulative abstraction represents 4.2% of the average daily flow and 53% of the Q95 flow.

However, a number of the larger surface water abstractors return the bulk of the water abstracted to the river so the figures exaggerate the impact of these abstractions.

The Torridge Catchment
STATE OF THE CATCHMENT - WATER RESOURCES (MAP1)



The Torridge Catchment
STATE OF THE CATCHMENT - WATER RESOURCES (MAP2)



5.2.2 Problems Identified

The accompanying map (1) shows the surface water abstraction sites and indicates a number of problem areas.

Two detrimental effects can be caused to river flows by abstraction:

i) downstream flows can be reduced to around Q95 values for prolonged periods;

ii) a bypassed section of reach (e.g. by a leat) can suffer a serious reduction in flow.

Excluding "licences of entitlement", all new licences are issued with prescribed flow conditions to protect from very low flows. These are weighted to take account of water quality standards and existing abstractions, and consented discharges. When flows fall below the prescribed flow, abstraction must stop.

Licences are only required for groundwater abstractions in the south of the catchment, outside the Exemption Area or along valley bottoms where river gravels occur. The known abstractions shown on map 2 suggest that the number within the Exemption Area may be significant. The cumulative impact of these is not known.

The cumulative impact of the presumed large number of exempt surface water abstractions for agricultural purposes is also unknown.

Meldon Reservoir is intensively used both for direct supply and to support abstractions at Torrington at times of low flow.

This Reservoir, plus the ability of SWWSL to import supplies into the catchment from Roadford Reservoir, is likely to restrict their requirement for additional resources for public supply from within the catchment. Current strategy entails maximisation of the river abstraction at Torrington. Studies will be necessary to determine appropriate licence conditions to fully protect designated water uses.

There is a requirement to increase the compensation flow from Meldon Reservoir in 1993. Consideration will be given to the most appropriate use for this water for environmental benefit.

Less use is now made of minor impoundments in the catchment for supply purposes.

5.3 STATE OF THE CATCHMENT: FISHERIES - RIVER TORRIDGE CATCHMENT

5.3.1 General

The River Torridge catchment supports the following fisheries:

i) salmon and trout (both migratory and non migratory forms);
ii) freshwater (coarse);
iii) eel.

The salmonid fishery has declined since 1951. Poor water quality, pollution incidents and the progressive degradation of physical habitat have all affected juvenile salmonid production and subsequently limited adult numbers. Recruitment of both salmon and trout is considered to be poor in all parts of the catchment other than the River Okement. In the River Okement, fish stocks have been periodically affected by discrete pollution incidents over the past seven years. Additionally, illegal exploitation of adults in both the estuary and the river has increased pressure on adult stocks.

Freshwater (coarse) fish species are distributed throughout the catchment. A sport fishery exists which is localised in extent and little exploited.

Eels are found in most parts of the River Torridge, forming the basis of a limited commercial fishery. Stocks appear to be satisfactory.

5.3.2 Problems Identified

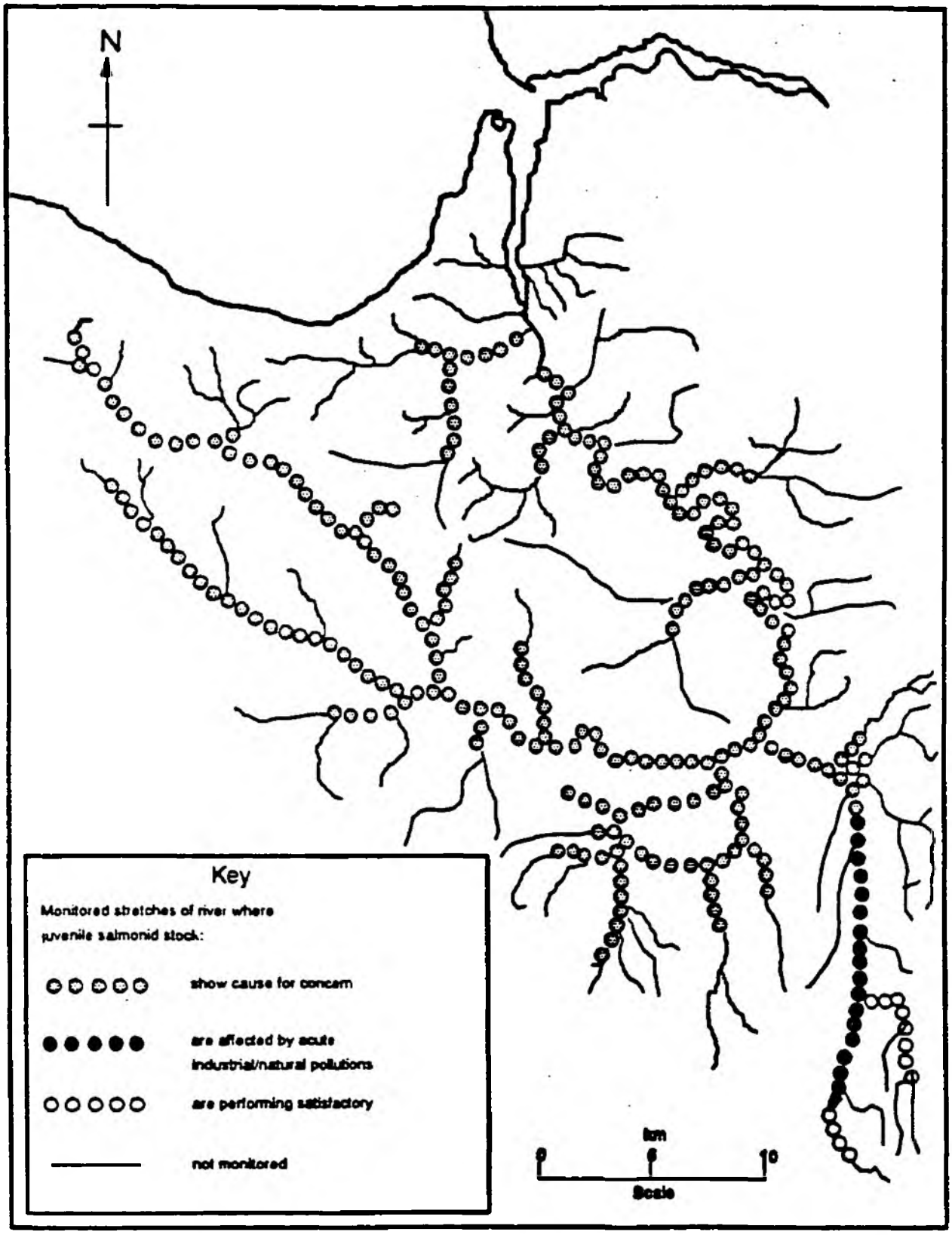
The following problems have been identified in the Torridge Catchment with particular regard to salmonid fish stocks:

(i) the successful survival of fish, particularly at the juvenile stage, has been limited apparently by declining water quality, acute pollution incidents and reduced river flows;

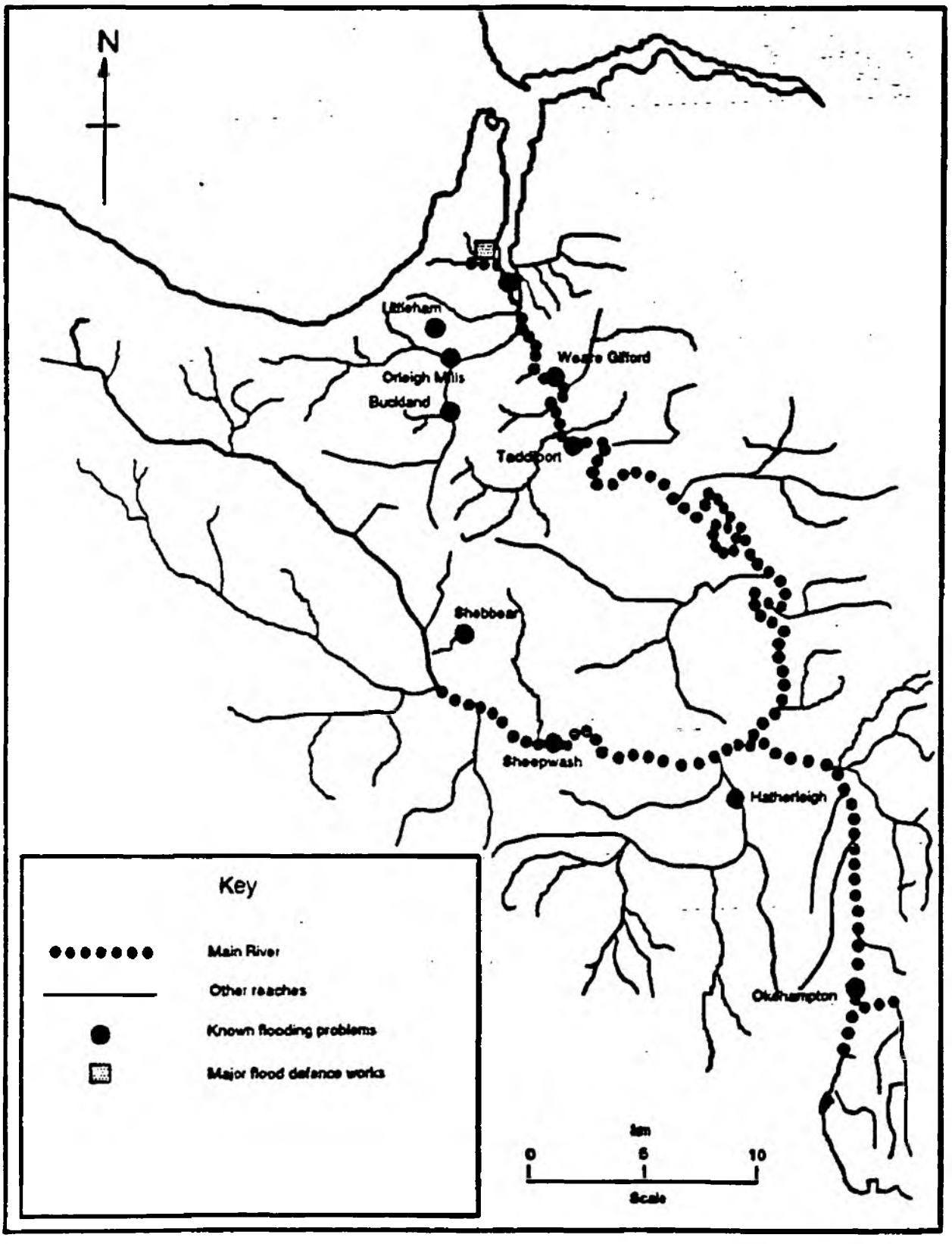
(ii) spawning beds deteriorating apparently as a consequence of agricultural and forestry practices resulting in siltation. Trash dam build-up has contributed here;

(iii) illegal exploitation of adult fish.

The Torridge Catchment
STATE OF THE CATCHMENT FISHERIES



The Torridge Catchment
STATE OF THE CATCHMENT - FLOOD DEFENCE



5.4 STATE OF THE CATCHMENT: FLOOD DEFENCE - RIVER TORRIDGE CATCHMENT

5.4.1 General

Several major schemes were carried out in the period 1982-89 to deal with urban flooding from the Kenwith, Northern and Westcombe streams which drain the western part of Bideford to the estuary. Pioneer clearance was carried out in 1977-80 on the main river lengths of the River Torridge and in 1981-83 on the main river lengths of the River Okement.

5.4.2 Problems Identified

Locations set out below were identified in the Section 24(5) Survey carried out under the Water Act 1973 as liable to flooding.

Okehampton	- River East and West Okement
Weare Giffard	- River Torridge
Taddiport	- River Torridge
Hatherleigh	- River Lew
Sheepwash	- River Torridge
Shebbear	- Unnamed Stream
Buckland	- River Duntz
Orleigh Mills	- River Duntz
Littleham	- Unnamed Stream

Schemes are included in the 5 year capital programme to protect Taddiport and Weare Giffard. A detailed feasibility study on flooding at Okehampton indicated that flood defence works were not viable on cost benefit grounds and the scheme was removed from the capital programme. No investigations have yet been undertaken on the other sites indicated above.

6 CONCLUSIONS

6.1 General

Problems have been identified in the following areas, and these will be addressed in the Stage 2 Plan.

6.2 Water Quality

Failure to achieve BOD standards in the upper/middle reaches of the main river, and in reaches of the River Yeo (Barnstaple), Dipple Water, River Lew, River Okement, River Mere and River Waldon.

Failure to achieve the ammonia standards in reaches of the main river, the River Yeo and River Mere.

Failure to achieve the dissolved oxygen standard in the middle reaches of the River Yeo and in the West Okement River immediately below Meldon Reservoir.

Failure to achieve metal standards in the West Okement River below Meldon Dam and in reaches of the Red-A-Ven Brook.

Data on the uses of groundwater within the catchment is incomplete. This is a consequence of part of the catchment being declared exempt from licensing. Data on groundwater quality is extremely limited.

6.3 Pollution Control:

The success of the farm pollution campaign in highlighting problems in agriculture and seeking and promoting practical solutions cannot be over-estimated. Investment by individual farmers and control of their farm waste products have greatly improved. More work is required and the recalcitrant few will be pursued vigorously, where necessary, through the courts to ensure that the work of the majority is not undone.

Lessons learned in the Torridge Catchment have national implications and many are already being adopted in all NRA regions. Solutions are still a longway off and agriculture itself may need to change in order to protect water quality.

Other pollution sources such as acid water, quarrying, sewage treatment and industry have been identified and a programme of improvements, much of it underway, will be reported in Stage 2 of the Plan.

6.4 Water Resources

There may be a cumulative impact from the presumed large number of exempt surface water and groundwater abstractions for agricultural purposes.

Meldon Reservoir is intensively used both for direct supply and to support abstraction at Torrington at times of low flow. There is a requirement to increase the compensation flow from Meldon Reservoir from 1993.

In addition to Meldon Reservoir, South West Water Services Ltd (SWWSL) will have the ability to import potable supplies into the catchment from Roadford Reservoir. This is likely to restrict their requirement for additional resources for public supply from within the catchment.

Current strategy by SWWSL entails the maximisation of the river abstraction at Torrington. The likely licence conditions necessary to protect downstream flows and fish movements have yet to be assessed.

6.5 Fisheries

The following problems have been identified in the Torridge Catchment with particular regard to salmonid fish stocks:

(i) spawning beds deteriorating apparently as a consequence of intensive land use practices, with trash dam build-up contributing;

(ii) the successful survival of fish particularly at the juvenile stage has been limited apparently by declining water quality, acute pollution incidents and reduced river flows, although this in under study;

(iii) illegal cropping of adult fish.

6.6 Flood Defence

Locations have been identified in reaches of the main river, River Duntz, River Lew and East and West Okement Rivers where flooding is liable to occur.

Schemes are included in the 5 year capital programme to protect Taddiport and Weare Giffard.

A detailed feasibility study on flooding at Okehampton indicated that flood defence works were not viable on cost benefit grounds.

Investigations have yet to be undertaken on the other sites.

7 THE WAY FORWARD

This Plan has been written as a pilot scheme to a format proposed by the Welsh region of the NRA and may not be the format adopted finally by the NRA for the presentation of catchment plans. A national NRA working group is reviewing the benefit and possible format of catchment management plans.

Stage 1

The catchment plan for the River Torridge consists of two stages. This document is the Stage 1 part of the Plan which identifies:

(i) the catchment;

(ii) the uses made of the aquatic environment;

(iii) the environmental objectives and requirements for each use;

(iv) targets to ensure environmental objectives are achieved;

(v) the present state of the catchment when compared with these targets;

(vi) known problems and conflicts;

(vii) information gaps.

It is essential that uses in the catchment are confirmed and agreement is reached on the environmental objectives, requirements and targets set out in this Stage 1 of the Plan before progressing with Stage 2 of the Plan. Consequently, this document is released for public consultation.

Comments on Stage 1 of the Plan are welcomed by the NRA-SW and should be sent to:

Water Quality Planner
Waters Rivers Authority
South West Region
Manley House
Kestrel Way
EXETER
EX2 7LQ

Comments should be made before 31 January 1991. NRA-SW will then consider all comments before producing a final version of the Stage 1 Plan.

The Stage 2 Plan will be developed after the completion of the Stage 1 Plan and will deal specifically with the resolution of those problems which have been identified.

Stage 2

Stage 2 will represent the Plan of Action for the catchment, and the problems will be dealt with in the following standardised way:

The nature of the problem is identified;

The cause of the problem is described;

The solution to the problem, which has been formulated after consultation between the NRA-SW and relevant outside organisations, is presented;

Responsibility for carrying out the remedial work is assigned;

The timetable is given for the work to be carried out.

The Stage 2 plan will address current problems in the catchment. It must also be recognised that circumstances may change. If the NRA decides that this format is effective the Plan will be updated as major new problems or opportunities arise, and will be reviewed at five year intervals as a routine practice.

Work within the Torridge catchment has progressed and action has already been or is being taken on some of the problems identified in the Stage 1 Plan.

8 REFERENCES

1. (2.7) National Rivers Authority, South West Region: Taw/Torridge Estuary Management Plan, STAGE I: Statement of Catchment Uses and Problem Identification 1990

2. (2.9) T R Harrod: Soils and Land Use in the Upper Tamar and Torridge Catchments 1987

3. (2.11) Marcus Hodges Environment Ltd Waste Disposal Site Survey Feb-April 1990

9 APPENDICES

APPENDIX 9.1.1: WATER QUALITY SUITE 1

AESTHETIC CRITERIA

DETERMINAND	UNIT	EQS+
AESTHETIC CRITERIA		
Colour	visual inspection	no abnormal change
Mineral oils	visual inspection	no visible surface film
	olfactory inspection	no odour
	mg/l after extraction and weighing dried residue	≤0.3
Surface-active substances (methylene-blue active)	visual inspection	no lasting foam
	mg/l as lauryl sulphate	≤0.3
Phenols	olfactory inspection	no specific odour
	mg/l	0.05
Transparency	m	1
Tarry residues, solid floating material	visual inspection	absent

DISSOLVED OXYGEN

Aerobic conditions (≥10% saturation) should be maintained to avoid effects of deoxygenation, particularly production of hydrogen sulphide, ammonia or methane.

Sulphide	ug/l undissociated hydrogen sulphide	40 (24 hour average)

LIST I SUBSTANCES

The presence of List I substances is not relevant to this use; however, the EC Dangerous Substances Directive applies to all waters.

Pollution attributable to persistent synthetic floatable substances or to persistent mineral oils should be avoided (cf AESTHETIC CRITERIA).

+ Environmental Quality Standard

APPENDIX 9.1.2: WATER QUALITY SUITE 2

LIST I SUBSTANCES

DETERMINAND	UNIT	EQS+	STATISTIC
LIST I SUBSTANCES*			
Cadmium (total)	ugCd/l	5	annual mean
Carbon tetrachloride (total)	ugCCL_4/l	12	annual mean
Chloroform (total)	ug$CHCl_3$/l	12	annual mean
DDT total isomers	ng/l	25	annual mean
PP'-DDT	ng/l	10	annual mean
Cyclodiene Insecticides			
- total 'drins' **	ng/l	30	annual mean
- endrin (total) **	ng/l	5	maximum
aldrin (total) ***	ng/l	10	annual mean
dieldrin (total) ***	ng/l	10	annual mean
endrin (total) ***	ng/l	5	annual mean
isodrin (total) ***	ng/l	5	annual mean
Hexachlorocyclohexane (total)	ngHCH/l	100	annual mean
Hexachlorobenzene (total)	ngHCB/l	30	annual mean
Hexachlorobutadiene (total)	ngHCBD/l	100	annual mean
Mercury (total)	ugHg/l	1	annual mean
Pentachlorophenol	ugPCP/l	2	annual mean

Proposals have been published for the following candidate List I substances(II) but these have not so far been adopted: 1,2-dichloroethane, trichloroethylene, perchloroethylene, trichlorobenzene.

* The concentrations of the following List I substances in <u>sediments</u> must not increase significantly with time:

cadmium, hexachlorocyclohexane, mercury.

** Standards applicable to 1 January 1994.

*** Standards applicabe after 1 January 1994.

The concentrations of the following List I substances in <u>sediments</u> and/or <u>molluscs</u> and/or <u>fish</u> must not increase significantly with time:

DDT, pentachlorophenol, cyclodiene insecticides, hexachlorobenzene, hexachlorobutadiene.

\+ Environmental Quality Standard

APPENDIX 9.1.3: WATER QUALITY SUITE 3

PROTECTION OF SENSITIVE AQUATIC LIFE INCLUDING SALMONID FISH

DETERMINAND	UNIT	EQS+	STATISTIC
A. General Physico-Chemical Parameters			
pH	pH units	>6.0	95 percentile
		<9.0	95 percentile
Water temperature	°C	21.5	98 percentile
Dissolved oxygen	% saturation	60%	95 percentile
	mg O_2/l	>9	50% greater than
	mg O_2/l	7	minimum allowable
BOD (total) 5 day	mg O_2/l	5	95 percentile
Ammonia (total)	mg N/l	0.78	95 percentile
(non-ionised)	mg N/l	0.021	95 percentile
Suspended Solids	mg/l	25	annual mean
Residual chlorine	mg Cl_2/l	0.0068	95 percentile
B. Inorganic Anions			
Chloride (tentative)	mg Cl/l	250	annual mean
Cyanide (total)(tentative)	mg CN/l	0.005	maximum allowable
Nitrite	mg N/l	0.15	95 percentile
Sulphate (tentative)	mg SO_4/l	400	annual mean
C. Metals			
Boron (total)	mg B/l	2	annual mean
Cadmium (total)	ug Cd/l		
- at edge of mixing zone		5	annual mean
- away from mixing zone		1	annual mean
Iron (total)	mg Fe/l	2	annual mean
(dissolved)	mg Fe/l	1	annual mean
Mercury (total)	ug Hg/l	1	annual mean
Sodium (tentative)	mg Na/l	170	annual mean
Tin-inorganic (total)	ug Sn/l	25	annual mean

D. Hardness - Related Standards for Metals

DETERMINAND	UNIT	Total hardness as mg/l $CaCO_3$					
		<50	50-100	100-150	150-200	200-250	>250
Arsenic (dissolved)	ug As/l	50	50	50	50	50	50
Chromium (dissolved)	ug Cr/l	5	10	20	20	50	50
Copper (dissolved)	ug Cu/l	1	6	10	10	10	28
		*5	22	40	40	40	112*
Lead (dissolved)	ug Pb/l	4	10	10	20	20	20
Vanadium (total)	ug V/l	20	20	20	20	60	60
Zinc (total)	ug Zn/l	8	50	75	75	75	125
		*30	200	300	300	300	500*

All values as annual mean except where indicated as '*...*' for copper and zinc. The '*....*' refers to 95 percentile values to be applied to those river lengths designated under the EC Freshwater Fish Directive.

+ Environmental Quality Standard

E. ORGANIC SUBSTANCES

DETERMINAND	UNIT	EQS+	STATISTIC
Carbon tetrachloride (total)	ug CCl_4/l	12	annual mean
Chloroform (total)	ug $CHCl_3$/l	12	annual mean
DDT - total isomers	ng/l	25	annual mean
pp' - DDT	ng/l	10	annual mean
Cyclodiene Insecticides			
- total 'drins'	ng/l	30	annual mean
- aldrin	ng/l	10	annual mean
- dieldrin	ng/l	10	annual mean
- endrin	ng/l	5	annual mean *
	ng/l	5	maximum **
- isodrin	ng/l	5	annual mean
Diazinon (total)(tentative)	ng/l	20	annual mean
HCH - total isomers	ng/l		
- at edge of mixing zone		100	annual mean
- away from mixing zone		50	annual mean
Hexachlorobenzene (total)	ng HCB/l	30	annual mean
Hexachlorobutadiene (total)	ng HCBD/l	100	annual mean
Mothproofing agents			
- cyfluthrin	ng/l	1	95 percentile
- flucofuron	ug/l	1	95 percentile
- PCSD's and PAD's	ng/l	50	95 percentile
- permethrin	ng/l	10	95 percentile
- sulcofuron	ug/l	25	95 percentile
Organotin compounds			
- tributyltin	ng/l	20	maximum allowable
- triphenyltin	ng/l	20	maximum allowable
Pentachlorophenol	ug/l	2	annual mean
Tecnazene (tentative)	ug/l	1	95 percentile

\+ Environmental Quality Standard

* applicable after 1 January 1994
** applicable to 1 January 1994

APPENDIX 9.1.4: WATER QUALITY SUITE 4

PROTECTION OF OTHER AQUATIC LIFE INCLUDING CYPRINID FISH

DETERMINAND	UNIT	EQS+	STATISTIC
A. General Physico-Chemical Parameters			
pH	pH units	>6.0	95 percentile
		<9.0	95 percentile
Water temperature	°C	28.0	98 percentile
Dissolved oxygen	% saturation	50	95 percentile
	mg O_2/l	7	50% greater than
	mg O_2/l	5	minimum allowable
BOD (total) 5 day	mg O_2/l	9	95 percentile
Ammonia - (total)	mg N/l	1.56	95 percentile
- non-ionised	mg N/l	0.021	95 percentile
Suspended Solids	mg/l	25	annual mean
Suspended Solids	mg/l	80	95 percentile
Residual chlorine	mg Cl_2/l	0.0068	95 percentile
B. Inorganic Anions			
Chloride (tentative)	mg Cl/l	250	annual mean
Cyanide (total)(tentative)	mg CN/l	0.005	maximum allowable
Nitrite	mg N/l	0.46	95 percentile
Sulphate (tentative)	mg SO_4/l	400	annual mean
C. Metals			
Boron (total)	mg B/l	2	annual mean
Cadmium (total)	ug Cd/l		
- at edge of mixing zone		5	annual mean
- away from mixing zone		1	annual mean
Iron (total)	mg Fe/l	2	annual mean
(dissolved)	mg Fe/l	1	annual mean
Mercury (total)	ug Hg/l	1	annual mean
Sodium (tentative)	mg Na/l	170	annual mean
Tin-inorganic (total)	ug Sn/l	25	annual mean

D. Hardness - Related Standards for Metals

DETERMINAND	UNIT	Total hardness as mg/l $CaCO_3$					
		<50	50-100	100-150	150-200	200-250	>250
Arsenic (dissolved)	ug As/l	50	50	50	50	50	50
Chromium (dissolved)	ug Cr/l	150	175	200	200	250	250
Copper (dissolved)	ug Cu/l	1	6	10	10	10	28
		*5	22	40	40	40	112*
Lead (dissolved)	ug Pb/l	50	125	125	250	250	250
Vanadium (total)	ug V/l	20	20	20	20	60	60
Zinc (total)	ug Zn/l	75	175	250	250	250	500
		*300	700	1000	1000	1000	2000*

All values as annual mean except where indicated as '*...*' for copper and zinc. The '*....*' refers to 95 percentile values to be applied to those river lengths designated under the EC Freshwater Fish Directive.

+ Environmental Quality Standard

WATER QUALITY SUITE 4 (CON'T)

E. ORGANIC SUBSTANCES

DETERMINAND	UNIT	EQS+	STATISTIC
Carbon tetrachloride (total)	ug CCl_4/l	12	annual mean
Chloroform (total)	ug $CHCl_3$/l	12	annual mean
DDT - total isomers	ng/l	25	annual mean
pp' - DDT	ng/l	10	annual mean
Cyclodiene Insecticides			
- total 'drins'	ng/l	30	annual mean
- aldrin	ng/l	10	annual mean
- dieldrin	ng/l	10	annual mean
- endrin	ng/l	5	annual mean *
	ng/l	5	maximum **
- isodrin	ng/l	5	annual mean
Diazinon (total)(tentative)	ng/l	20	annual mean
HCH - total isomers	ng/l		
- at edge of mixing zone		100	annual mean
- away from mixing zone		50	annual mean
Hexachlorobenzene (total)	ng HCB/l	30	annual mean
Hexachlorobutadiene (total)	ng HCBD/l	100	annual mean
Mothproofing agents			
- cyfluthrin	ng/l	1	95 percentile
- flucofuron	ug/l	1	95 percentile
- PCSD's and PAD's	ng/l	50	95 percentile
- permethrin	ng/l	10	95 percentile
- sulcofuron	ug/l	25	95 percentile
Organotin compounds			
- tributyltin	ng/l	20	maximum allowable
- triphenyltin	ng/l	20	maximum allowable
Pentachlorophenol	ug/l	2	annual mean
Tecnazene (tentative)	ug/l	1	95 percentile

\+ Environmental Quality Standard

* applicable after 1 January 1994
** applicable to 1 January 1994

APPENDIX 9.1.5: WATER QUALITY SUITE 5

POTABLE ABSTRACTION FOR PUBLIC AND DOMESTIC USE

(all concentrations in ug/l except where stated otherwise)

Class	A1 treatment		A2 treatment		A3 treatment	
	G	I	G	I	G	I
Metals and metalloids						
Arsenic as As	10	50	-	50	50	100
Barium as Ba	-	100	-	1000	-	1000
Cadmium as Cd	1	5	1	5	1	5
Chromium as Cr	-	50	-	50	-	50
Copper as Cu	20	50(o)	50	-	1000	-
Iron as Fe +	100	300	1000	2000	1000	-....(D)
Lead as Pb	-	50	-	50	-	50
Manganese as Mn +	50	-	100	-	1000	-
Mercury as Hg	0.5	1	0.5	1	0.5	1
Zinc as Zn	500	3000	1000	5000	1000	5000
Boron as B	1000	-	1000	-	1000	-
Selenium as Se	-	10	-	10	-	10
Inorganic anions						
Chloride as mg Cl/l	200	-	200	-	200	-
Cyanide as CN	-	50	-	50	-	50
Fluoride as F(t)	700-1000	1500	700-1700	-	700-1700	-
Nitrate as mg NO_3/l+	25	50(o)	-	50(o)	-	50(o)
as mg N/l	5.65	11.3	-	11.3	-	11.3
Sulphate as mg SO_4/l	150	250	150	250(o)	150	250(o)
Phosphate as P_2O_5(2)	400	-	700	-	700	-
as P	87	-	153	-	153	-
Organic substances						
Dissolved or emulsified Hydrocarbons	-	50	-	200	500	1000
Pesticides (total)	-	1	-	2.5	-	5
Phenols as C_6H_5 OH	-	1	1	5	10	100
Polycyclic aromatic Hydrocarbons	-	0.2	-	0.2	-	1
Cyfluthrin	-	0.001	-	0.001	-	-
Permethrin	-	0.01	-	0.01	-	0.01+
Organotins						
Tributyltin	-	0.02	-	0.02	-	-
Triphenyltin	-	0.09	-	0.09	-	-
Surfactants	200	-	200	-	200	-
Substances extractable with Chloroform	100	-	200	-	500	-

WATER QUALITY SUITE 5 (CON'T)

Class	A1 treatment G	A1 treatment I	A2 treatment G	A2 treatment I	A3 treatment G	A3 treatment I
Other Criteria (concentrations as mg/l)						
Ammonia as N	0.04	-	0.78	1.17	1.56	3.11(o)
Colour ^{o}H (Pt/Co Scale)	10	20(o)	50	100(o)	50	200(o)
pH	6.5-8.5	5.5-9.0	-	5.5-9.0		
Temperature ^{o}C	22	25(o)	22	25(o)	22	25(o)
Total suspended solids	25	-	-	-	-	-
Conductivity uS/cm at 20^{o}C	1000	-	1000	-	1000	-
Odour (dilution factor at 25^{o}C)	3	-	10	-	20	-
Chemical oxygen demand (as O_2)	-	-	-	-	30	-
Dissolved oxygen % saturation	>70	-	>50	-	>30	-
BOD (total) 5 day at 20^{o}C as mg/l O_2	3	-	5	-	7	-
Nitrogen by Kjeldahl method mg/lN (except Nitrate)	1	-	2	-	3	-
Bacteriological						
Total coliforms at 37^{o}C/100 ml	50	-	5000	-	50000	-
Faecal coliforms /100 ml	20	-	2000	-	20000	-
Faecal streptococci /100 ml	20	-	1000	-	10000	-
Salmonella	NP(5L)	-	NP(1L)	-	-	-

QUALITY REQUIRED OF SURFACE WATER INTENDED FOR THE ABSTRACTION OF DRINKING WATER IN MEMBER STATES

ANNEX 1

Definition of the standard methods of treatment for transforming surface water of categories A1, A2 and A3 into drinking water.

Category A1

Simple physical treatment and disinfection, e.g. rapid filtration and disinfection.

Category A2

Normal physical treatment, chemical treatment and disinfection e.g. pre-chlorination, coagulation, flocculation, decantation, filtration, disinfection (final chlorination).

Category A3

Intensive physical and chemical treatment, extended treatment and disinfection e.g. chlorination to break-point, coagulation, flocculation, decantation, filtration, absorption (activated carbon), disinfection (ozone, final chlorination).

I	=	mandatory
G	=	guide
(o)	=	exceptional climatic or geographical conditions
+	=	see Article 8(d)
...D	=	dissolved
(t)	=	the values given are upper limits set in relation to the mean annual temperature (high and low)
(2)	=	this determinand has been included to satisfy the ecological requirements of certain types of environment.
NP	=	Not present

APPENDIX 9.1.6: WATER QUALITY SUITE 6

IRRIGATION OF CROPS

DETERMINAND		CROP CATEGORY	UNITS	ESQ+	STATISTIC
A. Inorganic Anions					
pH		All	pH Units	5.5	5 percentile
Chloride	(tentative)			8.5	95 percentile
		very sensitive (e)	mg Cl/l	100	annual mean
		moderately sensitive (f)	mg Cl/l	300	annual mean
		slightly sensitive (g)	mg Cl/l	500	annual mean
		least sensitive (h)	mg Cl/l	900	annual mean
Sulphate	(tentative)				
		very sensitive (e)	mg SO_4/l	150	annual mean
		moderately senstive (f)	mg SO_4/l	450	annual mean
		slightly sensitive (g)	mg SO_4/l	750	annual mean
		least sensitive (h)	mg SO_4/l	1350	annual mean
B. Metals and Metalloids					
Arsenic	(total)	All	ug As/l	40	annual mean
Boron	(total)	sensitive (a)	mg B/l	2	annual mean
		intermediate (b)	mg B/l	3	annual mean
		tolerant (c)	mg B/l	4	annual mean
Cadmium	(total)	All	ug Cd/l	20	annual mean
Chromium	(total)	All	mg Cr/l	2	annual mean
Copper	(total)	All	ug Cu/l	500	annual mean
Iron	(total)	All	mg Fe/l	1	95 percentile
Lead	(total)	All	mg Pb/l	2	annual mean
Mercury	(total)	All	ug Hg/l	1	annual mean
Molybdenum	(total)	All	ug Mo/l	30	annual mean
Nickel	(total)	All	ug Ni/l	150	annual mean
Selenium	(total)	All	ug Se/l	20	annual mean
Vanadium	(total)	All	ug V/l	80	annual mean
Zinc	(total)	All	mg Zn/l	1	annual mean

Notes:

a Sensitive crops include plums, pears, apples, cherries, blackcurrants, strawberries and raspberries.

b Intermediate crops include barley, wheat, maize, oats, potatoes, peas, radish and tomatoes.

c Tolerant crops include asparagus, beet marigolds, lucerne, broad beans, turnips, onions, cabbage, lettuce and carrots.

d Very sensitive crops include peas, dwarf beans, strawberries, blackberries, gooseberries and plums.

e Moderately sensitive crops include broad beans, lettuce, radish, onion, celery, maize, clover, cocksfoot, apples, pears, raspberries and redcurrants.

f Slightly sensitive crops include potatoes, cabbage, carrots, cauliflower, wheat, oats, ryegrass, lucerne, blackcurrants and vines.

g Least sensitive crops include sugar beet, mangolds, red beet, spinach, asparagus, rape, kale and barley.

\+ Environmental Quality Standard

WATER QUALITY SUITE 6 (CON'T)

C. Organic Substances - for all crop categories

DETERMINAND	UNIT	EQS+	STATISTIC
Carbon tetrachloride (total)	ug CCl_4/l	12	annual mean
Chloroform (total)	ug $CHCl_3$/l	12	annual mean
DDT - total isomers	ng/l	25	annual mean
pp' - DDT	ng/l	10	annual mean
Cyclodiene Insecticides			
- total 'drins'	ng/l	30	annual mean
- aldrin	ng/l	10	annual mean
- dieldrin	ng/l	10	annual mean
- endrin	ng/l	5	annual mean *
	ng/l	5	maximum **
- isodrin	ng/l	5	annual mean
Diazinon (total)(tentative)	ng/l	20	annual mean
HCH - total isomers	ng/l		
- at edge of mixing zone		100	annual mean
- away from mixing zone		50	annual mean
Hexachlorobenzene (total)	ng HCB/l	30	annual mean
Hexachlorobutadiene (total)	ng HCBD/l	100	annual mean
Mothproofing agents			
- cyfluthrin	ng/l	1	95 percentile
- flucofuron	ug/l	1	95 percentile
- PCSD's and PAD's	ng/l	50	95 percentile
- permethrin	ng/l	10	95 percentile
- sulcofuron	ug/l	25	95 percentile
Organotin compounds			
- tributyltin	ng/l	20	maximum allowable
- triphenyltin	ng/l	20	maximum allowable
Pentachlorophenol	ug/l	2	annual mean
Tecnazene (tentative)	ug/l	1	95 percentile

\+ Environmental Quality Standard

* applicable after 1 January 1994
** applicable to 1 January 1994

APPENDIX 9.1.7: WATER QUALITY SUITE 7

WATERING OF LIVESTOCK

DETERMINAND	UNIT	EQS+	STATISTIC
A. Inorganic Anions			
pH	pH Units	6.5	5 percentile
		9.0	95 percentile
Chloride (tentative)	mg Cl/l	400	annual mean
Sulphate (tentative)	mg SO_4/l	250	annual mean
B. Metals and Metalloids			
Arsenic (total)	ug As/l	200	annual mean
Cadmium (total) - at edge of mixing zone	ug Cd/l	5	annual mean
- away from mixing zone	ug Cd/l	1	annual mean
Chromium (total)	mg Cr/l	1	annual mean
Copper (total)	ug Cu/l	200	annual mean
Lead (total)	mg Pb/l	100	annual mean
Mercury (total)	ug Hg/l	1	annual mean
Nickel (total)	mg Ni/l	1	annual mean
Sodium (tentative)	mg Na/l	150	annual mean
Zinc (total)	mg Zn/l	25	annual mean
C. Organic Substances			
Carbon tetrachloride (total)	ug CCl_4/l	12	annual mean
Chloroform (total)	ug $CHCl_3$/l	12	annual mean
DDT - total isomers	ng/l	25	annual mean
pp' - DDT	ng/l	10	annual mean
Cyclodiene Insecticides			
- total 'drins'	ng/l	30	annual mean
- aldrin	ng/l	10	annual mean
- dieldrin	ng/l	10	annual mean
- endrin	ng/l	5	annual mean *
	ng/l	5	maximum **
- isodrin	ng/l	5	annual mean
Diazinon (total)(tentative)	ng/l		
HCH - total isomer			
- at edge of mixing zone		100	annual mean
- away from mixing zone		50	annual mean
Hexachlorobenzene (total)	ng HCB/l	30	annual mean
Hexachlorobutadiene (total)	ng HCBD/l	100	annual mean
Mothproofing agents			
- cyfluthrin	ng/l	1	95 percentile
- flucofuron	ug/l	1	95 percentile
- PCSD's and PAD's	ng/l	50	95 percentile
- permethrin	ng/l	10	95 percentile
- sulcofuron	ug/l	25	95 percentile
Organotin compounds			
- tributyltin	ng/l	20	maximum allowab
- tricyclohexyltin	ng/l	100	95 percentile
- triphenyltin	ng/l	20	maximum allowab
Pentachlorophenol	ug/l	2	annual mean
Tecnazene (tentative)	ug/l	1	95 percentile

\+ Environmental Quality Standard
* applicable after 1 January 1994
** applicable to 1 January 1994

APPENDIX 9.2 : NWC RIVER QUALITY CLASSIFICATION SYSTEM

River Class	Quality criteria	Remarks	Current potential uses
	Class limiting criteria (95 percentile)		
1A Good Quality	(i) Dissolved oxygen saturation greater than 80% (ii) Biochemical oxygen demand not greater than 3 mg/l (iii) Ammonia not greater than 0.4 mg/l (iv) Where the water is abstracted for drinking water, it complies with requirements for A2* water (v) Non-toxic to fish in EIFAC terms (or best estimates if EIFAC figures not available)	(i) Average BOD probably not greater than 1.5 mg/l (ii) Visible evidence of pollution should be absent	(i) Water of high quality suitable for potable supply abstractions and for all abstractions (ii) Game or other high class fisheries (iii) High amenity value
1B Good Quality	(i) DO greater than 60% saturation (ii) BOD not greater than 5 mg/l (iii) Ammonia not greater than 0.9 mg/l (iv) Where water is abstracted for drinking water, it complies with the requirements for A2* water (v) Non-toxic to fish in EIFAC terms (or best estimates if EIFAC figures not available)	(i) Average BOD probably not greater than 2 mg/l (ii) Average ammonia probably not greater than 0.5 mg/l (iii) Visible evidence of pollution should be absent (iv) Waters of high quality which cannot be placed in Class 1A because of the high proportion of high quality effluent present or because of the effect of physical factors such as canalisation, low gradient or eutrophication (v) Class 1A and Class 1B together are essentially the Class 1 of the River Pollution Survey (RPS)	Water of less high quality than Class 1A but usable for substantially the same purposes
2 Fair Quality	(i) DO greater than 40% saturation (ii) BOD not greater than 9 mg/l (iii) Where water is abstracted for drinking water it complies with the requirements for A3* water (iv) Non-toxic to fish in EIFAC terms (or best estimates if EIFAC figures not available)	(i) Average BOD probably not greater than 5 mg/l (ii) Similar to Class 2 of RPS (iii) Water not showing physical signs of pollution other than basic colouration and a little foaming below weirs	(i) Waters suitable for potable supply after advanced treatment (ii) Supporting reasonably good coarse fisheries (iii) Moderate amenity value

or lity	(i) DO greater than 10% saturation (ii) Not likely to be anaerobic (iii) BOD not greater than 17 mg/l. This may not apply if there is a high degree of re-aeration	Similar to Class 3 of RPS	Waters which are polluted to an extent that fish are absent only sporadically present. May be used for low grade industrial abstraction purposes. Considerable potential for further use if cleaned up
d ity	Waters which are inferior to Class 3 in terms of dissolved oxygen and likely to be anaerobic at times	Similar to Class 4 of RPS	Waters which are grossly polluted and are likely to cause nuisance
	DO greater than 10% saturation		Insignificant watercourses and ditches not usable, where the objective is simply to prevent nuisance developing

es (a) Under extreme weather conditions (eg flood, drought, freeze-up), or when dominated by plant growth, or by aquatic plant decay, rivers usually in Class 1, 2, and 3 may have BODs and dissolved oxygen levels, or ammonia content outside the stated levels for those Classes. When this occurs the cause should be stated along with analytical results.

(b) The BOD determinations refer to 5 day carbonaceous BOD (ATU). Ammonia figures are expressed as NH_4.

(c) In most instances the chemical classification given above will be suitable. However, the basis of the classification is restricted to a finite number of chemical determinands and there may be a few cases where the presence of a chemical substance other than those used in the classification markedly reduces the quality of the water. In such cases, the quality classification of the water should be down-graded on the basis of biota actually present, and the reasons stated.

(d) EIFAC (European Inland Fisheries Advisory Commission) limits should be expressed as 95 percentile limits.

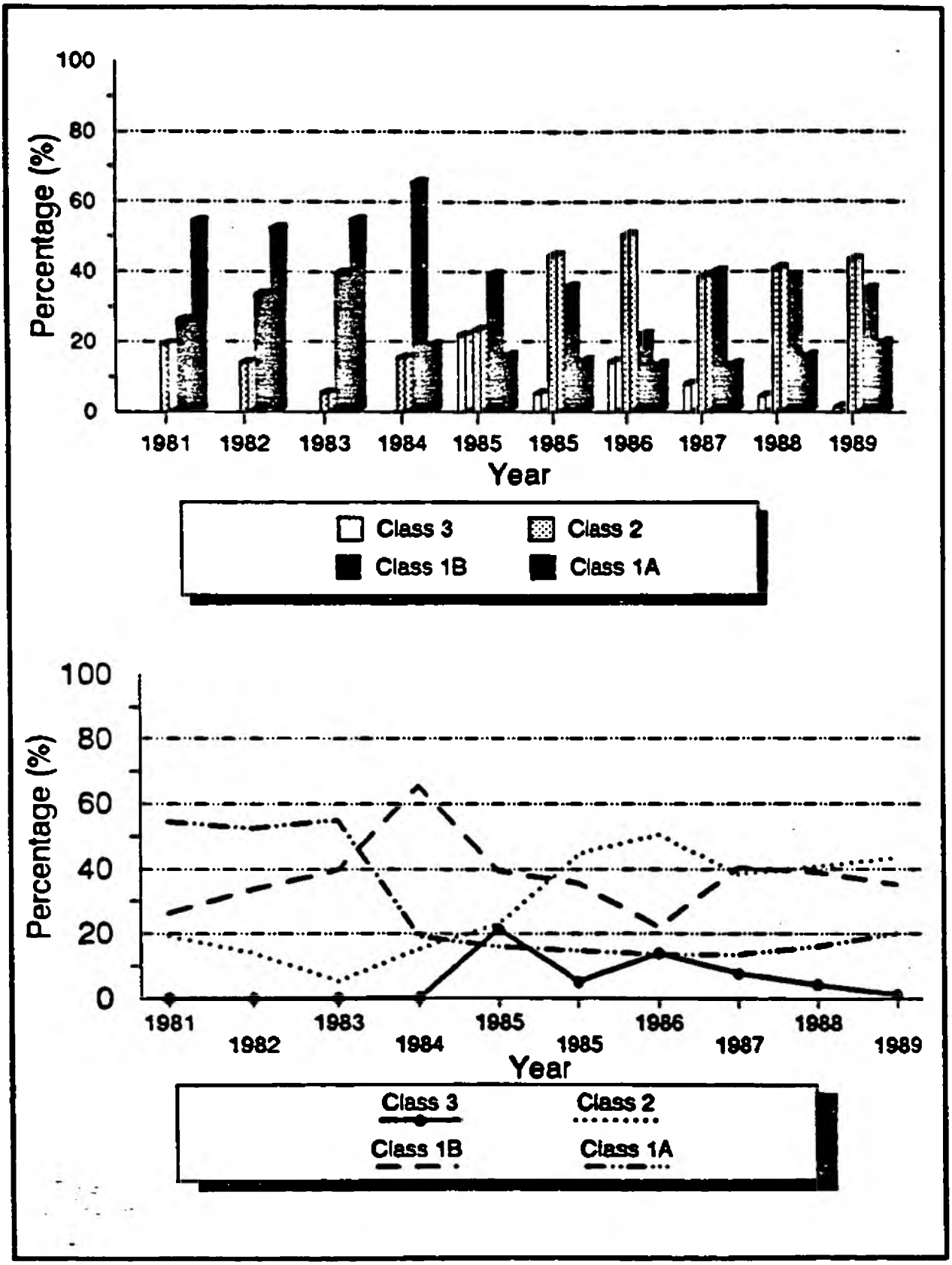
EEC category A2 and A3 requirements are those specified in the EEC Council directive of 16 June 1975 concerning the Quality of Surface ater intended for Abstraction of Drinking Water in the Member State.

Ammonia Conversion Factors

(mg NH_4/l to mg N/l)

Class 1A 0.4 mg NH_4/l = 0.31 mg N/l
Class 1B 0.9 mg NH_4/l = 0.70 mg N/l
0.5 mg NH_4/l = 0.38 mg N/l

The Torridge Catchment
HISTORICAL WATER QUALITY



APPENDIX 9.3: HISTORICAL WATER QUALITY IN THE RIVER TORRIDGE CATCHMENT

The Torridge Catchment has experienced a decline in water quality over the past 10 years, resulting in a decrease of Class 1A/1B classification and compensatory increases in Class 2/3 classification. The table below shows the water quality classification since 1981.

Torridge Catchment - Historical Water Quality
(Percentage in each NWC Class)

NWC Class	(Classified April - March) 1981	1982	1983	1984	1985	(Classified Jan - Dec) 1985	1986	1987	1988	1989
1A	54.5	52.5	55.0	19.2	16.1	14.7	13.6	13.6	16.1	20.1
1B	26.3	33.6	39.7	65.5	39.3	35.7	22.0	40.3	38.8	35.2
2	19.2	13.9	5.3	15.3	23.1	44.6	50.4	38.4	40.8	43.4
3	0.0	0.0	0.0	0.0	21.5	5.0	14.0	7.7	4.3	1.3
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

The 95-percentile basis was modified a number of times during this period. This affects how the river reaches are classified and is shown by the change in quality between the two sets of 1985 results. The more recent classifications are thought to represent a more accurate description of water quality.

Generally, a decline in water quality up to 1985/1986 and an improvement in water quality since this date has been experienced. Recent improvements have occurred as a result of targeting the catchment to identify and eliminate sources of pollution, by the introduction of the 'Together we can beat it' Farm Campaign and other investigations.

However, river water quality is still not at the level it was during the 1970s and early 1980s. Hence, improvements are still required to achieve compliance with existing river quality objectives.

APPENDIX 9.4: TORRIDGE CATCHMENT FISH MORTALITIES

Date	Watercourse/ Location	Cause	Fish Mortality
03/07/87	Common Lake Stream Torrington	Abattoir effluent	25 eels
25/08/87	Jennetts Reservoir Bideford	Poor management	14 cyprinids 25 eels
24/09/87	Kenwith Lake Bideford	Unknown	70 brown trout
06/12/89	Huntshaw Water Weare Giffard	Farm drainage	2 salmonid
07/05/87	River Torridge Torrington	Cooling Water	1000 elvers
18/06/87	Cranford Lake St Giles-in-the-Wood	Farm silage	60 cyprinids 2 eels
20/07/87	Pound at Roborough	Unknown	10 salmonids 4 eels
23/01/87	River Torridge at Woolsery	Farm	58 salmonids
01/08/87	Woodford Bridge Pond	Farm	30 salmonids
11/09/87	River Waldon at Sutcombe	Farm	476 salmonids
01/11/87	River Waldon at Sutcombe	Unknown	1 salmonid 5 cyprinids
05/11/87	River Lew at Northlew	Farm	8 salmonids
08/07/87	East Okement Fatherford	Farm	10 salmonids
08/04/88	Pond at Wakewell Bideford	Unknown	5 cyprinids
14/06/88	Tributary of Torridge at Inwardleigh	Farm	11 salmonids
22/01/88	Hole Brook at Jacobstowe	Farm	24 salmonids

Date	Watercourse/ Location	Cause	Fish Mortality
11/08/88	Brightley Stream Okehampton	Detergent	2 salmonids 6 eels
02/12/89	Tributary of River Mere at Petersmarland	Farm	5 salmonids
01/06/89	Dipple Water at Parkham	Farm	16 salmonids
16/09/89	River Okement Okehampton	Acid water	100,000 salmonids (estimated)

Terms:

AONB	Area of Outstanding Natural Beauty
BOD	Biochemical Oxygen Demand
BT	Brown Trout
DO	Dissolved Oxygen
EIFAC	European Inland Fisheries Advisory Committee
EQS	Environmental Quality Standard
NCC	Nature Conservancy Council
NGR	National Grid Reference
NRA	National Rivers Authority
NWC	National Water Council
OD	Ordnance Datum
OS	Ordnance Survey
PWS	Potable Water Supply
RQO	River Quality Objective
SSSI	Site of Special Scientific Interest
STW	Sewage Treatment Works
SWWSL	South West Water Services Limited

Signs, Statistics and Units

Signs:

< Less than

> Greater than

≤ equal or less than

Statistics:

Q95 flow exceeded for 95% of the time, on average

Units:

m	metre(s)
km	kilometre(s)
km^2	square kilometre(s)
mm	millimetre(s)
°C	temperature, degree(s) Centigrade
m/km	metre(s) per kilometre
m^3/s	cubic metre(s) per second
$m^3/d(ay)$	cubic metre(s) per day

m^3 p.a.	cubic metre(s) per year
ug/l	microgramme(s) per litre
ng/l	nanogramme(s) per litre
mg/l	milligramme(s) per litre
Ml	Megalitre(s)
Ml/day	Megalitres per day
kg	kilogramme(s)