

THE RIVER TYWI CATCHMENT MANAGEMENT PLAN CONSULTATION REPORT: JUNE 1994



NRA

*National Rivers Authority
Welsh Region*

TYWI CATCHMENT MANAGEMENT PLAN

CONSULTATION REPORT

June 1994

**National Rivers Authority
Welsh Region**

ENVIRONMENT AGENCY



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THE NRA'S VISION FOR THE TYWI CATCHMENT

The Tywi is an important rural catchment, the major land use in the middle and lower reaches being dairy/livestock farming. In this stretch, the Tywi has a wide floodplain and flood defences have been provided at several locations, including the market towns of Carmarthen, Llandeilo and Llandovery. In the uplands, sheep farming and coniferous forestry predominate. Following completion of the Llyn Brianne scheme in 1972, some 75 km of the Tywi, from the dam to the tidal limit, have been regulated under low flows. The river is a major source for drinking water, being used as far east as Cowbridge in Mid Glamorgan. The Tywi supports important salmon and sea trout fisheries, harvested both by anglers and net fishermen - including the traditional coracle fishery. The catchment also has a high environmental value, with special protection being afforded to a large number of Sites of Special Scientific Interest, and land within the Brecon Beacons National Park and Cambrian Mountains Environmentally Sensitive Area.

The challenge of managing the catchment will be addressed by implementing solutions to the existing problems and encouraging imaginative proposals to allow sustainable economic and community development to proceed whilst ensuring protection and improvement of the water environment. The interests of existing water users must also be safeguarded.

The river regulation scheme is one area that needs particular attention during the coming years, in order to achieve the best possible balance between the needs of water supply and the environment. For example, the threat posed to breeding little ringed plovers by reservoir releases must be addressed, whilst ensuring that fish movement into the system is not impaired unduly in low flows. The acidification of surface waters around Llyn Brianne, which is being addressed by the experimental liming project, is an issue which NRA is keen to resolve. The NRA would wish to see sulphur emissions controlled at source in order to achieve long term improvements. Water quality problems in the estuary must also be addressed, particularly the poor bacteriological quality and low dissolved oxygen levels which occur under certain conditions.

In Carmarthen, flood protection standards must be improved and the NRA will ensure that all new development, including road schemes, does not compromise protection standards within the catchment. In the middle reaches of the river, gravel extraction activities have led to channel instability, and environmental damage, and the NRA will be seeking tighter control through planning and regulatory procedures.

The realisation of the NRA's vision will be achieved through a balanced management approach to all activities so that the optimal potential of the catchment can be obtained and sustained. We will collaborate actively with all users of the catchment and all those statutory bodies that can assist us in striving to achieve this vision.

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PART 1:
THE TYWI CATCHMENT
MANAGEMENT PLAN
CONSULTATION REPORT

**1.0 THE PURPOSE OF
CATCHMENT MANAGEMENT
PLANS**

1.0 THE PURPOSE OF CATCHMENT MANAGEMENT PLANS (CMPS)

1.1 THE ROLE OF THE NRA

Never before have the rivers, lakes, estuaries and coastal waters of Wales been subject to such large and rapidly increasing demands from the users of water. Many different uses interact, or compete for water or water space, and will inevitably come into conflict with one another. The National Rivers Authority (NRA) is the major manager of the water environment in England and Wales and has the responsibility to reconcile conflicts between water users as well as its general duties that include: -

- Maintenance and improvement of water quality by control of pollution in surface and groundwater.
- Flood defence for people and property.
- Flood warning.
- Management of water resources.
- Maintenance and improvement of fisheries.
- Conservation of the natural water environment.
- Promotion of water based recreation.
- Navigation (in some rivers).

The NRA also plays a key role in the strategic management of the interaction between users of the water and land environments.

We believe that it is important that the interests of all water users are considered in the development and protection of the water environment. Therefore, we have consequently chosen to promote our *vision* and management proposals via published Catchment Management Plans (CMPS).

1.2 WHAT THIS PLAN IS DESIGNED TO DO

This consultation document presents a number of issues and options for the future management of the Tywi catchment, and is based on a detailed study carried out by the NRA during 1993. A number of proposals are presented for comment and it is intended that, following consultation with you and other river users, a final action plan will be presented which will seek to manage conflicts in river use and optimise the overall benefits to all river users within the catchment.

The Final Action Plan will steer us in developing our own management programme for the catchment and guiding us in the way we respond to any development proposals.

This consultation document is divided into 2 parts:

- Part I:** Presents the range of management issues, and options to address them, that have been identified by the NRA;
- Part II:** Provides background information on the approach we took in developing this plan, using information on identified river uses and the targets required to support them in terms of water quality, water quantity and physical features.

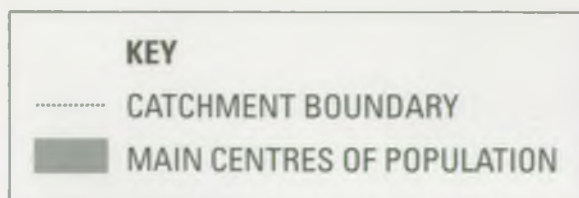
We hope that you find the information in this consultation document informative and thought provoking. Let us know whether you agree or disagree with our current proposals: remember this is not just our document, it is also yours: without your help we cannot produce a final workable Action Plan that will be of benefit to you and all users of the Tywi Catchment.

Please send any comments you may have on the Consultation Report to:

The Area Catchment Planner,
National Rivers Authority,
Llys Afon,
Hawthorn Rise,
Haverfordwest,
Dyfed,
SA61 2BQ

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MAIN TOWNS AND RIVERS



2.0 AN OVERVIEW OF THE TYWI CATCHMENT

2.1 Introduction

The Afon Tywi rises at an altitude of 425m AOD, falling steeply for the first 17 km before reaching the dam at Llyn Brianne Reservoir. Much of the open moorland of the upper catchment has been planted with conifers. Just above Llandovery the river gradient lessens as the river begins to meander across its flood plain.

Many tributaries join the Tywi on its course to the sea. On the left bank the Brân joins near Llandovery and the Sawdde, which drains one of the wettest areas of the catchment on the edge of the Black Mountains, contributes to the flow further downstream. The Cothi is the largest tributary and flows into the Tywi not far upstream of the tidal limit. The Gwili joins on the right bank within the tidal reaches. From its source to sea the Tywi runs for some 111 km draining a catchment area of 1376 km².

2.2 Infrastructure

The catchment is sparsely populated with a large proportion (46%) centred around the market towns of Carmarthen, Llandeilo and Llandovery.

The main road artery in the catchment is the A40, passing through all the major towns before forming part of the Euroroute which connects Fishguard with London. Many 'B' class roads criss-cross the middle and lower parts of the catchment, connecting the larger towns with outlying villages. The highly afforested part of the upper catchment around Llyn Brianne is largely devoid of any infrastructure.

Carmarthen forms part of the important Intercity rail link between London and the port of Fishguard. Llandeilo and Llandovery are served by part of the Mid-Wales rail link connecting with Llanelli.

2.3 Land Use

The catchment is predominantly rural with intensive dairy farming concentrated in the lowlands. Mixed dairy/livestock rearing is the major feature of the middle reaches, whilst sheep farming and large tracts of commercial coniferous plantations predominate in the upper reaches and high ground.

Most of the urban development has centred on the middle and lower reaches of the catchment, largely adjacent to the Tywi itself.

2.4 Flood Defence

The catchment is predominantly rural in nature and possesses an extensive flood plain which supports an active agricultural industry. In times of flood this flood plain provides natural storage for flood waters, without which the peak flow in the downstream channel would be significantly greater. Loss of this natural flood plain, either by landfill or by development, could increase flood peaks in the downstream channel and reduce flood protection standards accordingly.

Flood defence interest in the catchment relates primarily to the provision and maintenance of flood alleviation schemes. These schemes provide protection to centres of population located on the flood plain of the Tywi and its main tributaries. A programme of in-channel works, aimed at maintaining the flow-carrying capacity of the channel, is undertaken by the NRA and involves removing gravel shoals and other debris from the river channel which could cause blockages under flood conditions. A tree management programme is also implemented along the river corridor in order to minimise the risk of blockage as a result of fallen trees and debris.

2.5 Hydrology & Hydrogeology

Rainfall in the Tywi catchment varies from 2400mm/year on the Black Mountains to less than 1200mm in the estuary, with a catchment average of about 1550mm/year. Flows in the Tywi have been partially regulated by Llyn Brianne since it first was filled in March 1972. This allows a greater rate of abstraction from the river at Nantgaredig than natural flows could support.

The solid geology of the catchment is primarily sedimentary in origin. Silurian and Ordovician sandstones, shales and mudstones along with Devonian Old Red Sandstone are formed into a major syncline with considerable faulting. These rocks do not yield significant quantities of water and the main groundwater resources are within the unconsolidated sands, gravels and alluvium. These Quaternary deposits can reach several metres in thickness, in the floodplain.

2.6 Fisheries Conservation & Recreation

The Tywi catchment supports an internationally renowned sea trout (sewin) fishery which has provided higher declared annual rod catches than any river in England and Wales in recent years. The numbers of reported rod caught salmon are also high and place the Tywi amongst the top Welsh fisheries for this species. The estuary supports a licensed seine and coracle net fishery for salmon and sea trout, the latter fishery having a particular heritage value.

The environmental value of the catchment is very high in terms of both its conservation and landscape features, containing a large number of Sites of Special Scientific Interest (SSSIs) and two RSPB reserves. Parts of the upper catchment lie within the Cambrian Mountains ESA (Environmentally Sensitive Area) and the Brecon Beacons National Park. Amongst the many rare or notable species to be found in the catchment are otters, red kites and little ringed plovers. The latter species is also protected and breeds in greater numbers on the Tywi gravel shoals than anywhere else in Wales.

The landscape is rich and particularly varied, from the rugged mountain scenery around Llyn Brianne through to the wide flood plain dotted with archaeological sites, and from the intimate wooded valleys of the larger tributaries to the sandy expanse of the estuary overlooked by Llanstephan Castle.

There are many recreational and amenity activities available to residents and visitors, including scenic riverside walks, pony trekking, bird watching, camping, and the scenic beauty attracts many artists and photographers.

2.7 Water Quality

Water quality in the Tywi catchment is generally very good. The predominant uses in the catchment are water abstraction and salmonid fishing. The 1990 River Quality Survey showed that 92% of classified river achieved standards required for 'good' or 'very good' classification. The dissolved oxygen content is high with generally low Biochemical Oxygen Demand (BOD) and ammonia concentrations.

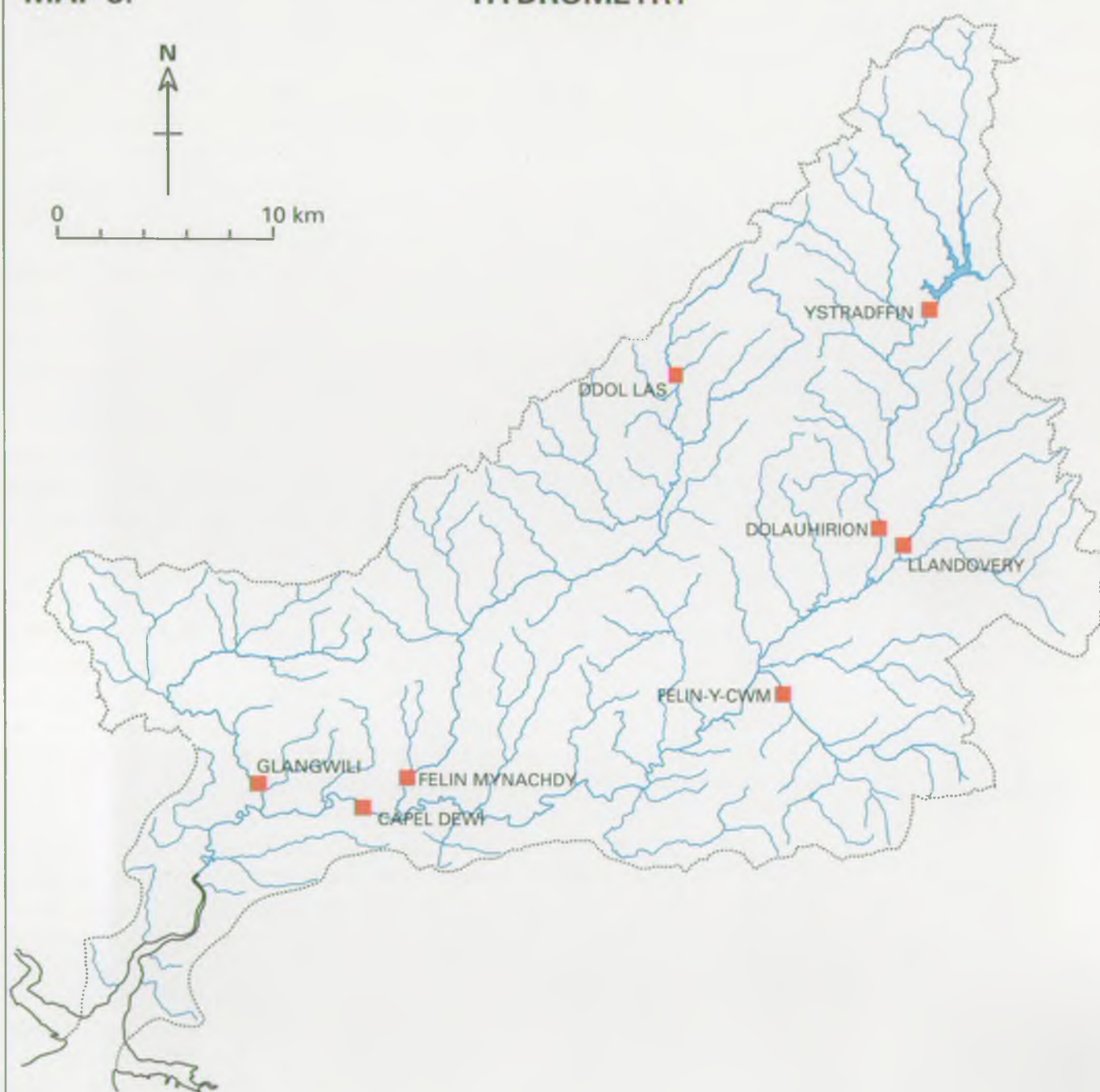
The upland part of the catchment around and including Llyn Brianne suffers from low pH and associated elevated aluminium concentrations due to surface water acidification. Contaminated drainage from abandoned mines also contributes to elevated zinc levels in the upper catchment.

Due to the generally sparse population of the catchment, the majority of sewage treatment works (STWs) serve relatively small communities. These generally discharge into receiving waters with high dilution and there are, as a result, only a few STWs that cause an adverse deterioration in water quality.

Bacteriological quality within the estuary is poor at certain states of the tide. In summer, when there is a combination of low river flows and spring tides, very low dissolved oxygen concentrations can result. This is caused by the breakdown of marine algae transported into the estuary by the incoming tide, resuspension of sediments and the discharge of sewage effluent from Parc-y-Splotts STW.

MAP 3.

HYDROMETRY



KEY

■ GAUGING STATIONS

2.8 Monitoring

River Levels, Flows and Rainfall

The NRA operates eight gauging stations to measure river levels and flows within the catchment. Information obtained from them is used to manage water resources, with the three stations on the Tywi at Ystradffin, Dolauhirion and Capel Dewi being particularly useful in controlling and regulating abstractions.

Telemetry at Dolauhirion, Llandovery, Felin-y-Cwm and Felin Mynachdy gauging stations provide information on river levels used in the flood warning system. These are supplemented by telemetric level recorders on the Tywi at Manorafon, near Llandeilo, and Carmarthen. There are also tipping-bucket raingauges linked to the flood warning system by telemetry at Ystradffin, Llyn-y-Fan Fach and Abergorlech. Rainfall is also recorded at a number of other sites within the catchment. There is no groundwater level monitoring.

Water Quality

Water quality samples are taken regularly at 65 sites throughout the catchment, being analysed for many substances. All significant discharges are sampled and analysed routinely to ensure that they meet standards required by the NRA.

Historically, groundwater quality has not been routinely monitored.

Regular inspections are carried out at high risk sites including farms, trade premises, industrial sites and sewage installations as part of the NRA pollution prevention programme. Details are retained on a computer database.

Biological Monitoring

Routine biological monitoring is undertaken at many sites within the catchment. An assessment of the biological quality is made by analysing the species of insects and other small aquatic life present. Other surveys are carried out to discover the impact of particular discharges on the river.

Habitat Surveys

A River Corridor Survey was carried out in June 1993, covering 230km of the rivers within the catchment. A total of 79km of the main Tywi were surveyed, together with sections of the larger tributaries. The results are due during early 1994.

Fish Stocks

Electrofishing surveys have been carried out in the catchment annually since 1986 as part of the Regional Juvenile Salmonid Monitoring Programme (RJSMP). 70 sites have been surveyed, 15 of them as routine annual monitoring sites, in addition to 32 river riffle sites. Additional fisheries surveys are carried out in response to specific requirements.

2.9 KEY DETAILS

Catchment Details

Area	1376km ²	
	<u>Existing (1991 Census)</u>	
Population	41,900	
Main Towns	Carmarthen	15,000
	Llandeilo	2,500
	Llandovery	2,000
Population Density	30.4km ²	
Topography		
Ground Levels	Max. level 548m AOD	
Sea Levels (Ferryside)	Mean High Water Springs	4.2m AOD
	Mean Low Water Springs	-2.4m AOD
Geology	The solid geology is primarily sedimentary sandstones forming part of a major syncline with considerable faulting. This is overlain in places with alluvium and glacial sands and gravels.	

Administrative Details

County Council	Dyfed CC	97% of Catchment Area
	Powys CC	3%
District Councils	Carmarthen DC	30%
	Dinefwr BC	57%
	Ceredigion DC	10%
	Brecknock BC	3%
National Parks	Brecon Beacons	
Local Flood Defence Committee (LFDC)	South West Wales (SWWLFDC)	
NRA	Welsh Region - South West Area Western District	
Water Company	Dŵr Cymru cyf	
Sewage Treatment Works	49 Dŵr Cymru, 16 Private	
Significant Industrial Sites	12	
Domestic Refuse Sites	None	

Water Quality**Length of River in the 1990 River Quality Survey**

Very Good	293.5 km	Poor	17.4 km
Good	25.2 km	Bad	0.0 km
Fair	9.6 km		
Tywi Estuary	Good 12.6 km	Fair	9.4 km

Water Resources

Average Annual Rainfall	1550 mm
Total Licensed Abstraction: public supply	100,288 Ml/a
industrial/agricultural	2,559 Ml/a
Total Number of Abstraction Licences	82

Primary Gauging Stations: 8 (for locations, see Map 3)

Principal Reservoirs: Llyn Brianne - Capacity: 61,000 Ml

Flood Protection

Length of Designated Main River:	287.9 km
Length of River on which Flood Alleviation Schemes implemented:	3.9 km
(Walls	1.3 km)
(Embankments:	2.6 km)
Length of River covered by a Flood Warning Scheme:	105 km
Length of Tidal Defences (maintained by NRA):	0.9 km

Note: The above statistics are estimates which will be refined following the compilation of a flood information database which has been approved by the SWWLFDC.

Fisheries

Declared Annual Migratory Fish Catches:	<u>Salmon</u>	<u>Sea Trout</u>
(10 year average)		
Coracle	52	831
Seine	132	818
Rods	768	5214

Designated under EC Freshwater Fisheries Directive (78/659/EEC)

Salmonid	149.8 km
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SECTION 3.0 ISSUES AND OPTIONS

This section of the Plan presents the key Issues that the NRA has identified from its analysis of the Tywi catchment. One or more suggestions are made for solving each issue and you are invited to comment on these. The following section relates solely to those areas which have been shown not to be able to support certain of the identified Uses; the rest of the catchment should be regarded as being able to support **all** identified Uses.

Section 3.1 identifies in detail those areas of the catchment which have been identified as failing to meet specific targets to support identified Uses. Significant areas of conflict between identified Uses are also discussed. Section 3.2 presents these Issues along with options to address them, identified by the NRA.

The information that has been used to identify these Issues is provided in Part II of this report which lists the known Uses of the catchment and sets targets to support them.

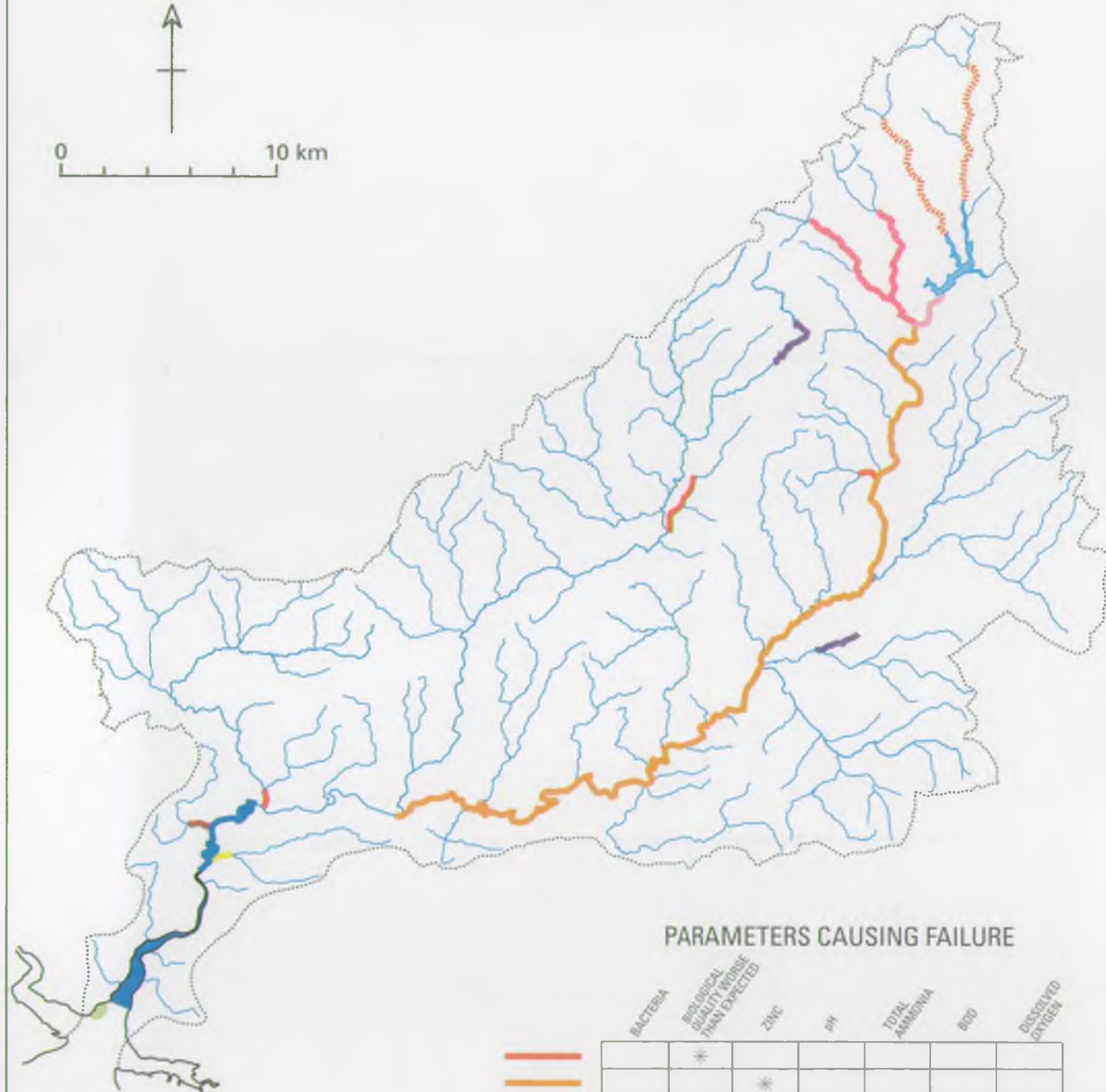
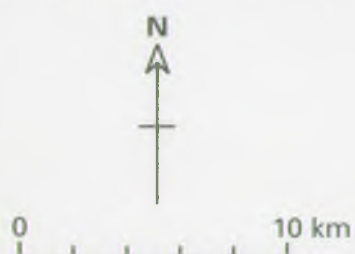
You should note that the Issues and Options are not NRA policy but have been considered within the NRA's policy framework and that no priority should be inferred from the order in which they are presented.

3.1 THE STATE OF THE CATCHMENT

The following section examines the ability of the catchment to support the Uses identified in Section 4, Part II, by assessing compliance with the targets set out in Section 5, Part II. In this manner the key Issues in the catchment are identified. The potential solutions to these Issues are discussed in Section 3.2.

MAP 4.

STATE OF THE CATCHMENT-WATER QUALITY Determinands Causing Failure



PARAMETERS CAUSING FAILURE

	BACTERIA	BIOLOGICAL QUALITY WORSE THAN EXPECTED	ZINC	PH	TOTAL AMMONIA	BOD	DISSOLVED OXYGEN
		*					
			*				
				*			
						*	
					*		
					*	*	
	*						
		*	*	*			
		*	*				
							*

3.1.1 WATER QUALITY

General

The current state of the water quality of the Tywi catchment has been assessed against the Use-related targets set in Section 5. This has been achieved largely by the use of data collected from routine sampling points for the past 3 years. In many of the smaller and headwater streams there is no requirement for the NRA to collect routine water quality data and in these reaches data from other sources has been used. These sources are often 'one-off' special surveys and the data cannot carry the same statistical certainty as those from routine points.

Since aquatic animals and plants have to endure the whole range of water quality at each site, biological data can be very useful in supporting the water chemistry data that only represent a series of 'snapshots' of the water quality. This is especially true in the smaller streams that are not routinely sampled. The Welsh Region of the NRA has developed a series of 'biological keys' based upon the presence and absence of certain indicator species, which can be used to detect intermittent or background problems such as acidification (acid rain) or farm pollution. Biological data is also used to qualify the results of much of the water chemistry data assessment. The Authority also routinely samples fish stocks at many sites. All these sources of data are used to assess the state of the catchment and identify areas where the targets set in Section 5 are not met.

The following sections and maps illustrate the results of this analysis: unless it is specifically stated otherwise, the catchment achieves its identified targets.

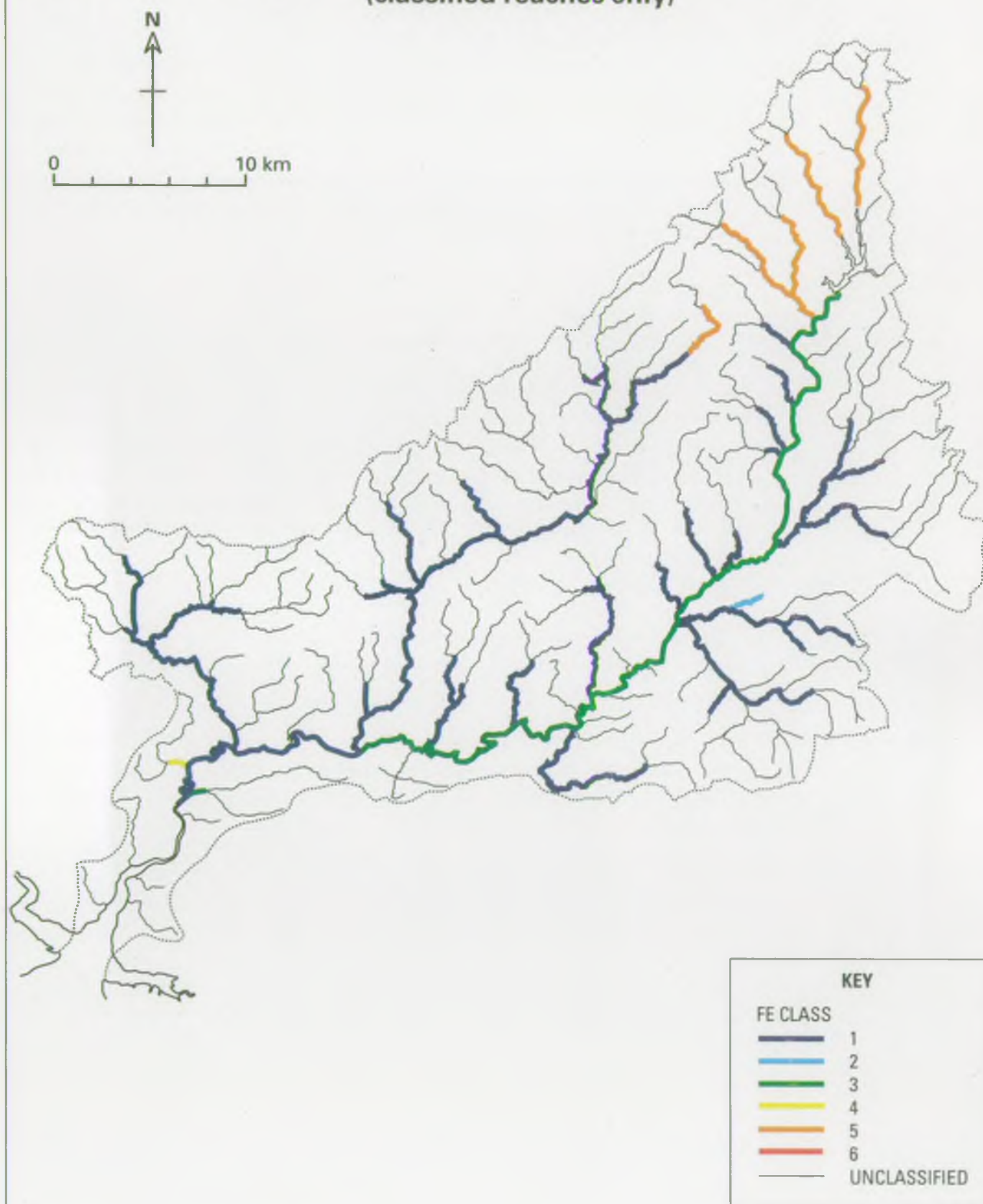
Local Perspective

The maps identify where water quality fails to meet standards required by the Uses. Map 4 indicates the determinand(s) causing failure and Map 5 shows the classification of rivers and streams using the hierarchical Fisheries Ecosystem classification.

In addition to routine water quality monitoring, the NRA also undertakes a programme of biological monitoring. A national classification system is under development by the NRA (DoE 1992) which will allow rapid comparison between chemical and biological quality for a given river (for further details, please refer to Appendix 2). Map 6 shows the results of this comparison for the catchment, in this case using a prototype biological classification system.

MAP 5.

FISHERIES ECOSYSTEM (FE) CLASSIFICATION
(classified reaches only)

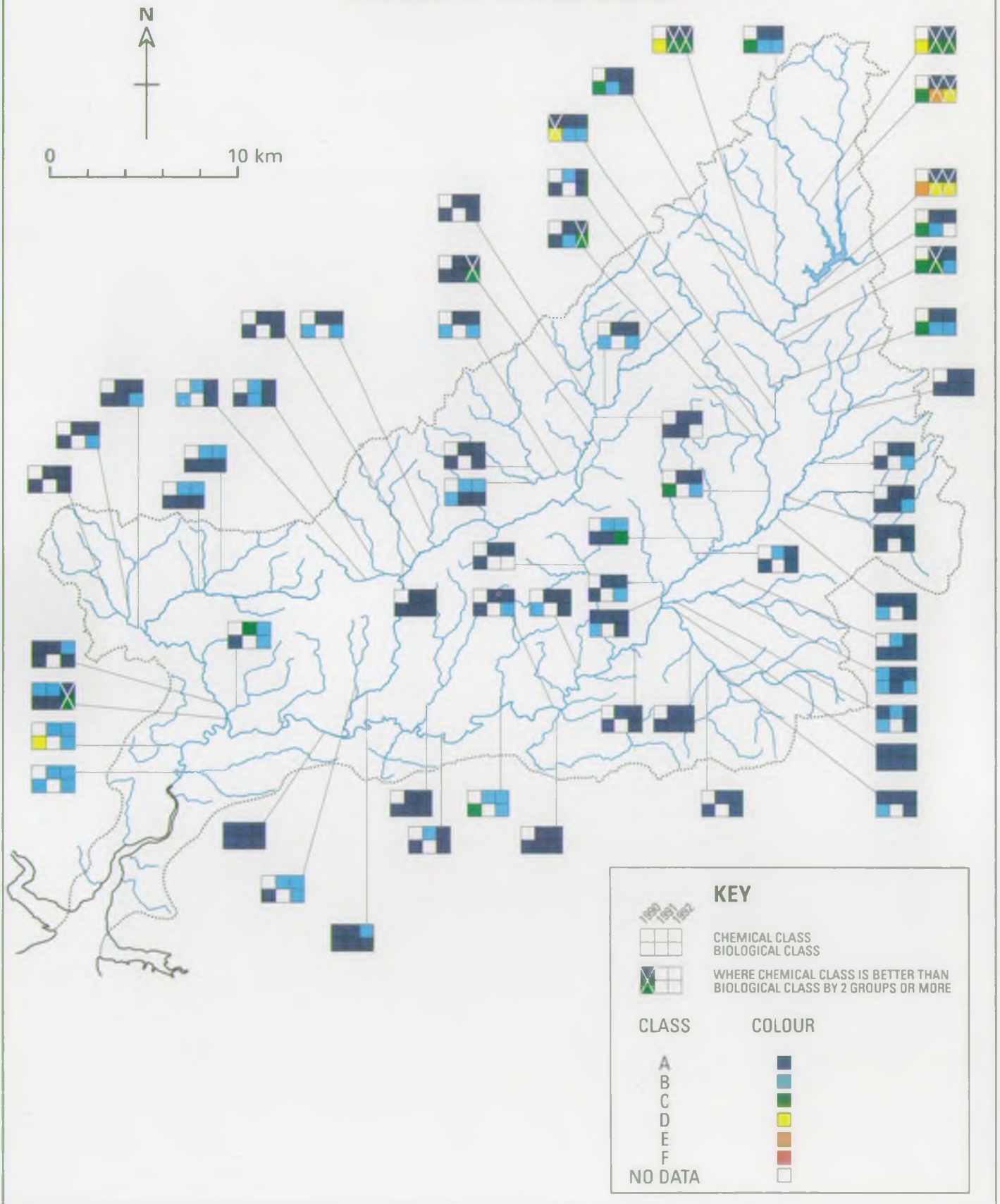


Issues Identified

- Issue 1** - General acidification problems in the upper catchment cause several reaches to fail FE Class 1 targets. The Tywi upstream of Llyn Brianne, the Camddwr, Doethie, Pysgotwr and Cothi all fail due to low pH, causing them to fall into FE Class 5. Elevated levels of aluminium are also experienced where acidification problems occur. In addition, poorer than expected biological quality is experienced on the Tywi above and just below Llyn Brianne and on the Camddwr. Prior to 1991 the effects of acidification were evident in the main Tywi downstream from Llyn Brianne. Since then pH has been artificially raised by regular liming operations carried out on the reservoir. Were it not for this remedial operation some 17km of the Tywi would still be affected by low pH (Issue 1, Section 3.2).
- Issue 2** - The Tywi and the Camddwr upstream of Llyn Brianne fail due to high levels of zinc (FE Class 5 due to the combined effects of pH and zinc), as does the Tywi from Llyn Brianne downstream to the Cothi confluence causing this stretch to fall into FE Class 3. Zinc levels are further elevated downstream of the disused metal mine workings at Nant-y-Mwyn, within the Rhandirmwyn mine area (Issue 2, Section 3.2).
- Issue 3** - Poorer than expected biological quality is experienced in the Annell, Dunant and the lower reaches of the Gwili, despite apparent good water quality (Issue 3, Section 3.2).
- Issue 4** - Ammonia concentrations in the Ydw fail targets for FE Class 1 standards, causing it to fall into FE Class 2 (Issue 4, Section 3.2).
- Issue 5** - Suspended solids concentrations within the Cloidach exceed guideline values, although other aspects of water quality are very good, achieving FE Class 1 standards (Issue 5, Section 3.2).
- Issue 6** - The lower reaches of the Tawelan Brook fail to meet FE Class 1 targets for ammonia and BOD, and guideline values for suspended solids, causing the stretch to fall into FE Class 4. Investigations suggest that the quality of the water in the upper reaches of the Tawelan Brook is of even poorer quality. It is thought that agricultural inputs are the major cause of this problem (Issue 6, Section 3.2).
- Issue 7** - The Pibwr fails FE Class 1 targets in respect of BOD, causing it to fall into FE Class 5 (Issue 7, Section 3.2).

MAP 6.

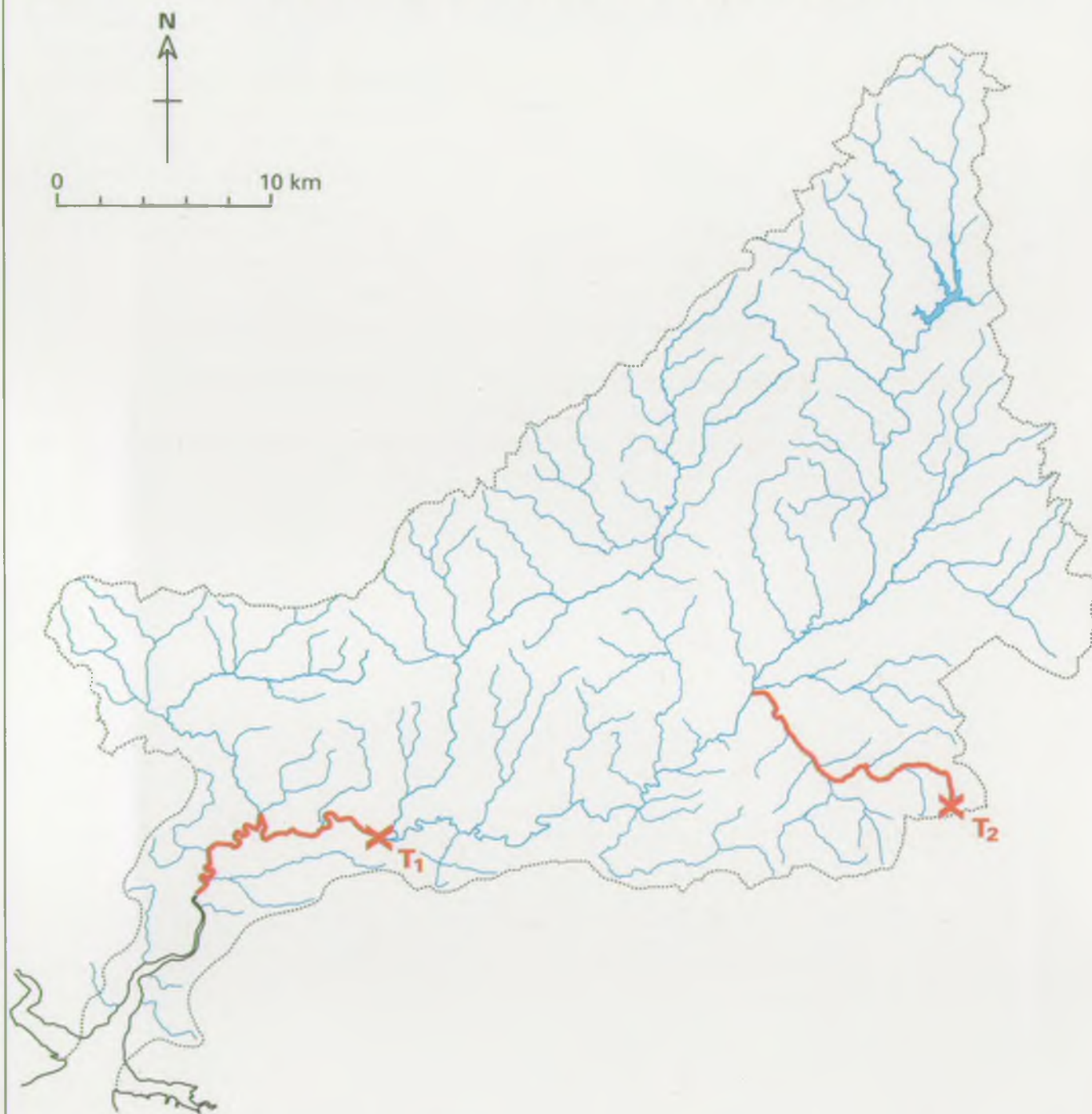
COMPARISON OF BIOLOGICAL AND CHEMICAL WATER QUALITY



- Issue 8** - Water Quality in the Tywi Estuary is generally very good. However, under conditions of low freshwater flow and spring tides occurring during spring and summer periods, low dissolved oxygen concentrations are experienced. These events occur during the rising tide and are short lived in duration. Investigations have demonstrated that the oxygen depletion results from several factors, including resuspension of sediments and breakdown of marine algae flushed into the estuary by the incoming tide. Parc-y-Splotts STW has also been implicated as contributing to the problem (Issue 8, Section 3.2).
- Issue 9** - Bacteriological quality within the estuary is poor, except around the high water period. There is no bathing water here, identified under the EC Bathing Waters Directive and as such there is no legal requirement to achieve the defined standards. Nevertheless the area is used actively for water contact recreation by the local boat clubs and there is much local concern about the health implications of these activities with the prevailing water quality conditions. Upgrading of Parc-y-Splotts STW, possibly as early as 1996, may alleviate this problem (Issue 9, Section 3.2).

MAP 7.

STATE OF THE CATCHMENT-WATER QUANTITY



KEY

— RIVER STRETCHES FALLING BELOW NATURAL 95 PERCENTILE FLOWS

T₁ Nantgaredig

T₂ Llyn-y-Fan Fach

3.1.2 WATER QUANTITY

General

A catchment would fail its targets for water resources if abstraction was causing rivers and streams to dry up or flows to become unacceptably low, or if groundwater levels were declining or groundwater quality deteriorating.

Licences of right had to be granted in 1965 without regard to the ability of the resource to sustain the abstraction in the long term without detriment. Over the years, the actual rates of abstraction have, in some cases, increased to the volumes specified in the licences. As this occurs, the potential arises for low flows or declining groundwater levels.

The NRA has considered carefully the available surface and groundwater resources within the Tywi catchment and their degree of utilisation. The following Section and Map summarise the results of this analysis. It must be stressed that where no problems or areas for further investigation have been identified, the NRA is satisfied that resources are adequate. As more information becomes available, for example about the actual flow requirements of the aquatic ecosystem, the NRA will review its resources management in each catchment.

Local Perspective

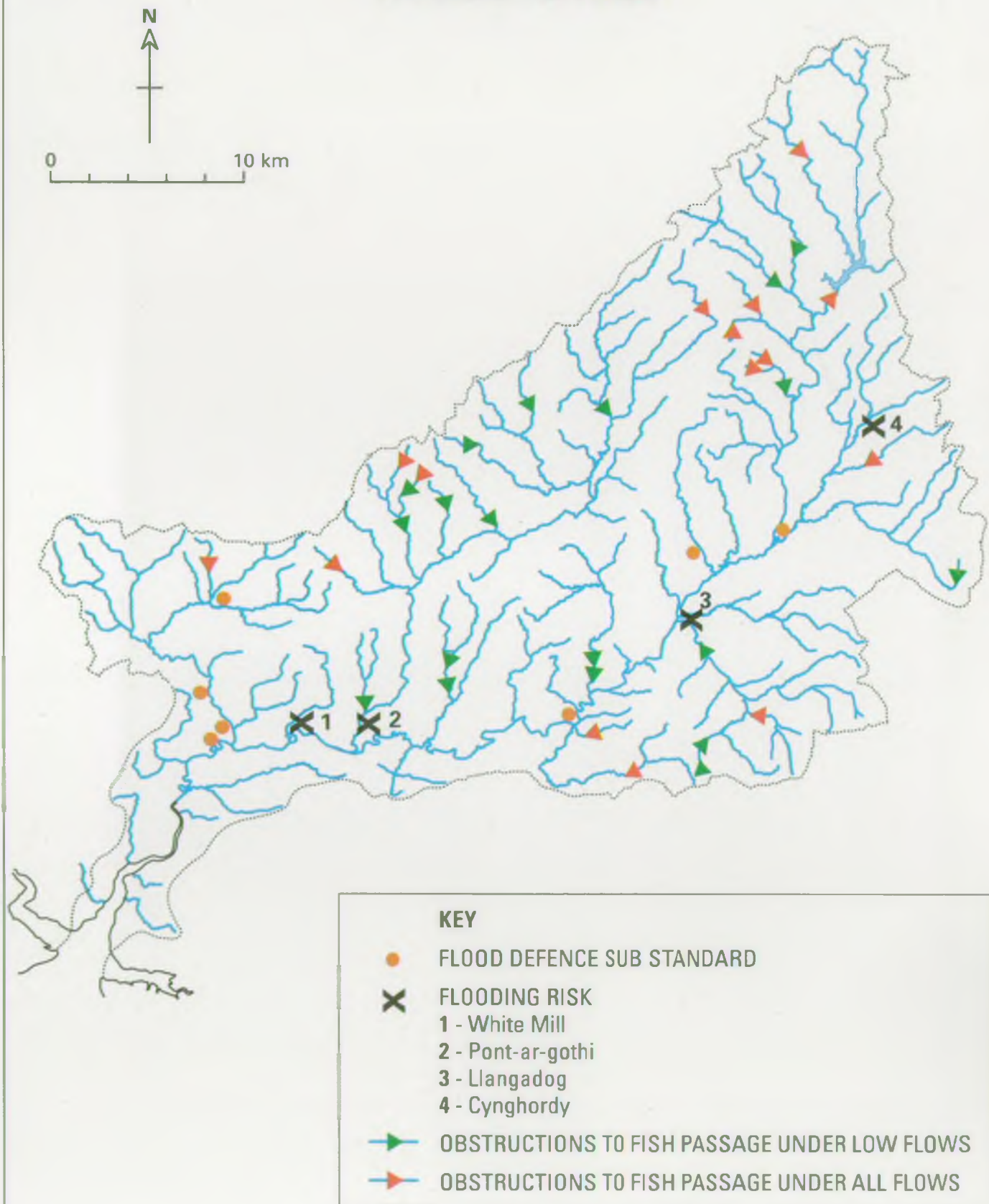
The regulation of the Tywi system is controlled by an operating agreement made under Section 20 of the Water Resources Act 1991 between the NRA and Dŵr Cymru. This prescribes certain flows to be protected or maintained at key points within the catchment. A reserve of 9092 Ml of water in Llyn Brienne can be used to supplement river flows in the Tywi as necessary. Although abstraction rates from the Tywi are, at times, at maximum authorised rates the total quantity abstracted is less than the authorised volume.

The presence of a large reservoir in the catchment does reduce the magnitude of flood peak flows particularly in the autumn refill period and the effects are more noticeable in the upper Tywi catchment. However, due to the need to maintain a full reservoir in the early spring, to ensure that the resource will satisfy water supply demands, the reservoir is not operated to provide flood alleviation capacity, neither does it exacerbate flooding problems.

- Issues Identified** Prior to the completion of a national abstraction licensing policy the identification of locations where in-river needs are not being met cannot be specifically quantified. Comparison of prescribed or residual flows with 95 percentile flows gives indication of the locations that should be the primary focus for study when satisfactory methods are available. These may not necessarily subsequently be identified as problems. The locations in this category are as follows:-
- Issue 10**
- The Tywi downstream from Nantgaredig where the maintained flow of 136 Ml/d is less than the 95 percentile flow. Pumping rates from the Tywi are varied to achieve minimisation of electricity costs and this adds to the divergence from a natural flow regime. Tracking studies carried out by the NRA will, when reported, assist in identifying the flows required to protect fishery interests (Issue 10, Section 3.2).
- Issue 11**
- The Sawdde below Llyn-y-Fan Fach due to the prescribed residual flow (Issue 11, Section 3.2).
- Issue 12**
- Droughts in 1976 and 1984 have caused the yield of Llyn Brianne to be re-assessed downwards from the design figure. The NRA is currently developing a nationally consistent methodology for determining the yield of a reservoir source. This method, when available, must be applied to the Tywi system to establish the current yield before an increased abstraction can be authorised (Issue 12, Section 3.2).

MAP 8.

STATE OF THE CATCHMENT -
PHYSICAL FEATURES



3.1.3 PHYSICAL FEATURES

- General**
- Since Physical Features targets are the most subjective (Section 5.3) it follows that much of the assessment of the state of the catchment must be similarly subjective. Data from many sources including routine fisheries, biological and habitat surveys and special investigations are used to identify areas that are apparently deficient in certain essential or desirable features such as spawning gravels, riparian tree cover or in-river habitats.
- Flood defence has been assessed by studying the flood history over the past 25 years and the known distribution of flooding.
- The following sections and maps illustrate the current state of the catchment and identify areas where there are felt to be deficiencies.
- Issues Identified**
- Despite regular maintenance of schemes, routine and emergency channel clearance, and tree management works, further consideration needs to be given to the flooding risks at the following locations:-
- Issue 13**
- Tywi at Carmarthen - existing flood defences were overtopped in 1979 and 1987, causing significant flood damage. Approximately 65 properties were affected (Issue 13, Section 3.2).
- Issue 14**
- Gwili at Abergwili - extensive flooding occurred in 1987 which affected approximately 20 properties in addition to the A40 Carmarthen to Llandeilo trunk road. The proposed Carmarthen Eastern Bypass would, if not controlled using the NRA's regulatory powers, exacerbate the flooding problem (Issue 14, Section 3.2).
 - Tywi at Llandeilo - extensive flooding occurred in 1987. Existing defences were overtopped and 15 properties were flooded. The proposed Bypass would, if not controlled using the NRA's regulatory powers, exacerbate the flooding problem (Issue 14, Section 3.2).
- Issue 15**
- At the following locations existing flood defence standards may be below the Authority's targets for urban areas, and require further investigation.
- Gwili at Bronwydd - three properties were flooded in December 1992 which represented the highest recorded flood levels in recent years (Issue 15, Section 3.2).
 - Gwili at Llanpumsaint - nine properties are at risk from flooding (Issue 15, Section 3.2).

- Annell at Whitemill - several properties are at risk from flooding (Issue 15, Section 3.2).
- Cothi at Pont-ar-Gothi - one commercial property is regularly flooded with a further seven properties at risk from flooding (Issue 15, Section 3.2).
- Brân at Llangadog - extensive flooding occurred in 1987 which affected approximately 16 properties including the Creamery (Issue 15, Section 3.2).
- Dulais at Llanwrda - in 1987 the Dulais overtopped its banks and affected 27 properties and disrupted traffic on the A40 trunk road (Issue 15, Section 3.2).
- Brân at Llandovery - in 1987 approximately 16 properties were flooded (Issue 15, Section 3.2).
- Brân at Cynghordy - in June 1993, seven properties were flooded and a highway bridge was washed away as a result of high flood flows and blockages caused by fallen trees (Issue 15, Section 3.2).
- Tywi at Llanstephan - residential caravans have been flooded here in the past. An investigation into the problem is currently being undertaken (Issue 15, Section 3.2).

It is recognised that other isolated properties, sited within the flood plains of the Tywi catchment, have been flooded from time to time. It would not be cost effective, however, to provide protection for these dwellings.

Issue 16

- Development on the flood plain can adversely affect existing drainage standards. The Government has indicated that the principal NRA input to development plan preparation relating to flooding issues should be achieved using the results of surveys, required of the NRA by S105(2) of the Water Resources Act 1991. These surveys will identify the extent of land liable to flood and highlight any likely flood defence problems. Surveying of all catchments in Wales will be carried out by 1998, but the programming of the Tywi catchment survey has yet to be determined (Issue 16, Section 3.2).

Issue 17

- The effectiveness of fish screening facilities at the Nantgaredig and Manorafon intakes is unknown and requires validation, and improvement if necessary (Issue 17, Section 3.2).

- Issue 18**

- The upstream migration of salmonids is impeded by a number of natural and artificial obstructions (see map 8). The feasibility and desirability of easing fish passage to waters upstream should be considered, taking account of cost/benefit, landscape issues and the Region's brown trout policy in maintaining genetic integrity and protecting stocks from disease (Issue 18, Section 3.2).
- Issue 19**

- Llyn Brianne, a reservoir constructed for water supply purposes, prevents salmon and sea trout from reaching traditional spawning grounds in the very top of the catchment. Full implementation of the Fisheries Protection Scheme (FPS), historically instigated to mitigate against these losses, has not been possible as a result of water quality problems and the adult trap at Ystradffin has not been operated for many years. Recent lake liming of Llyn Brianne has improved water quality in the Tywi below the reservoir and salmon and sea trout are more numerous in this area. It may now be feasible to recommission the adult trap and install smolt release ponds to improve the implementation of the FPS (Issue 19, Section 3.2).
- Issue 20**

- In-river and coastal poaching of adult salmon and sea trout continues to be a problem although the level of activity has declined in recent years, largely due to the efforts of the NRA's bailiff force (Issue 20, Section 3.2).
- Issue 21**

- The traditional licensed coracle net fishery in the tidal river is considered by some to be under threat due to rising costs and reduced catch. The 'heritage' value of this fishery is recognised, particularly in the case of coracles made of traditional materials, and this aspect should be explored in attempting to ensure the continuation of this fishing method on the Tywi (Issue 21, Section 3.2).
- Issue 22**

- There has been a virtual loss of the spring run of salmon on the Tywi (as in other rivers) and the summer run has tended to arrive later in recent years rendering them less available for capture by the nets and the rods. The implications of these trends need to be assessed and remedies sought where appropriate and feasible (Issue 22, Section 3.2).
- Issue 23**

- There may be threatened populations of rare fish species (e.g. shad), and local strains of more common native species within the catchment, the status of which needs to be assessed. Appropriate measures must then be taken to ensure the survival and, where possible, enhancement of these populations (Issue 23, Section 3.2).

- Issue 24** - Invasive and alien plant species, in particular Japanese Knotweed, which is present in many parts of the catchment, pose a threat to the native habitat and hinder access to the river bank. Effective methods of control should be sought and implemented where appropriate (Issue 24, Section 3.2).
- Issue 25** - Public footpath access to and along the river bank is extremely limited except through fishery ownership/lease. The desirability and feasibility of improving public access to the river should be investigated (Issue 25, Section 3.2).
- Issue 26** - The NRA has yet to agree formally with CCW a "standard of service" for SSSIs (e.g. water levels to be maintained at a specified height and minimum return periods for cutting vegetation) (Issue 26, Section 3.2).

3.1.4 CONFLICTS BETWEEN USES

General Certain conflicts may arise between different catchment uses, irrespective of the catchment's ability to support these uses in terms of Water Quality, Water Quantity or Physical Features. For example, demands placed on the catchment by recreational uses often come into conflict with the need to conserve the wider environment. This section identifies conflicts between uses which are present within the Tywi catchment.

Local Perspective *Set out below are significant areas of conflict identified within the catchment. It is suggested that a change in mode of operation by the use/interest listed last in the margin (highlighted) should be considered: options for solving these issues are provided in Section 3.2.*

Conflicts Identified

- | | |
|--|---|
| Fisheries,
Recreation
Conservation &
Flood Defence/
Development | <p>- Development within a catchment can impact upon environmental interests and create new flooding problems or exacerbate existing ones as follows :</p> <ul style="list-style-type: none"> (1) Individual developments can result in increased rates of run-off, leading to reduced flood protection standards; (2) Development adjacent to, or within, the main river channel can impact upon environmental interests as well as reduce the NRA's ability to maintain existing flood defences, construct new defences and maintain the river channel (Issue 27, Section 3.2). (3) Development on the flood plain can itself be at risk from flooding and can lead to increased flood risk to other land adjoining the particular site. The proposed Carmarthen and Llandeilo Bypasses are examples of such developments. Both of these schemes will exacerbate existing flooding problems and should not be allowed to proceed until works to offset the adverse effect on flooding and environmental issues are undertaken (Issue 28, Section 27). |
| Conservation &
Flood Defence /
In-river Works | <p>- Habitat disturbance/degradation arising from development, river engineering and agricultural practices has led to extensive loss of riparian vegetation and has exacerbated problems of bed and bank instability, particularly in gravel-based stretches (Issue 29, Section 3.2).</p> |

- | | |
|--|---|
| <p>Fisheries &
Conservation/
Gravel Removal</p> | <p>- Private gravel removal operations and unconsented in-channel works have great potential for environmental damage and channel destabilisation. The extraction may be limited by the NRA, through consenting practices, to protect fisheries and conservation interests. Consents are required for statutory main river only. Significant numbers of little ringed plovers breed on the Tywi gravels, making it the most important catchment in Wales for this species (Issue 30, Section 3.2).</p> |
| <p>Conservation &
Water Quality/
Agriculture
& Forestry</p> | <p>- Current land use practices (e.g. agriculture and forestry), can result in releases of pollutants to watercourses to the detriment of fisheries and conservation and presents risks to water abstractions. Improved methods of containment and prevention of run-off from adjacent land to ground and surface waters should be identified and implemented (Issue 31, Section 3.2).</p> |
| <p>Angling &
Fisheries/
Natural Predators</p> | <p>- The presence of fish-eating birds, in particular cormorants and sawbill ducks, is of great concern to some fisheries interests as they believe that they have an unacceptable impact on fish stocks. Assessments of the numbers of these species in the catchment are made periodically and investigations into their diet elsewhere in the British Isles have been completed or are underway. To date, evidence to support the expressed concerns is lacking but the situation is under constant review. Both anglers and netmen are also concerned that predation by seals on returning adult salmonids, particularly in coastal and estuarial waters, is having a significant impact on stocks. Licensed netmen, in particular the estuary seine netmen, allege that seals are taking at least 50% of their catch and damaging their equipment. The Dyfed Wildlife Trust is carrying out a two year study, sponsored by the NRA, into diet of seals around the West Wales coastline which will report its findings in 1994. Up to four seals at a time are making occasional long incursions into freshwater (above Llandeilo) and anglers and fishery owners allege that this results in serious disruption of sport and heavy predation. The NRA has investigated sonic devices which are used in Scottish salmon farms to deter seals from approaching nets or from entering freshwater, but no effective deterrent has yet been identified (Issue 32, Section 3.2).</p> |
| <p>Canoeing/Fishing
Interests &
Riparian Owners</p> | <p>- There is no established right of navigation on the Tywi above the tidal limit, although white water and touring canoeing is practised. There is a need for the establishment of access agreements to allow canoeing on appropriate stretches of the main river and some of the major tributaries (e.g. Cothi, Sawdde), to incorporate conditions regarding such aspects as permitted areas and times to ensure minimal disturbance to other users, fish and wildlife generally (Issue 33, Section 3.2).</p> |

**Conservation/
Water Sports**

- The increased use of powered craft (e.g. jet-skis and motorboats) in the estuary and Carmarthen Bay is likely to disturb and hence have an impact on wildlife in the area, in particular internationally important populations of wintering wildfowl (Issue 34, Section 3.2).

**Fisheries &
Angling/
Water Resources**

- The relatively low temperature of water discharged from Llyn Brianne is perceived by angling interests as having an adverse effect on fish survival and catchability in the upper Tywi. Investigative work carried out to date has not substantiated these claims but further work may be desirable. Should it be demonstrated that water temperature is having a significant impact upon fisheries and angling interests then possible solutions, which may include a multi-level draw-off at the reservoir, will need to be examined (Issue 35, Section 3.2).

**Conservation/
Water Releases**

- Under the terms of the impounding licence for Llyn Brianne, a river management reserve of 9092 M1 is available annually for the release of freshets from the reservoir for environmental purposes, (e.g. pollution flushing, drawing fish into the river from the estuary and enhancing dissolved oxygen levels). Such releases are most likely to be required during periods of low flows. If they are to be effective such releases need to be of significant magnitude and result in rapid increases in river levels. The little ringed plover, a species of wader which is specially protected under Schedule 1 of the Wildlife and Countryside Act (1981), utilises the low lying gravel shoals of the main river for nesting during the spring and summer in greater numbers than on any other river in Wales. The nests would be at serious risk from the rising waters during such artificial freshets in the spring and early summer, and therefore the NRA is prevented from initiating environmentally beneficial releases during these periods in order to protect the plovers (Issue 36, Section 3.2).

**Water Quality/
Surface Water
Abstractions**

- Surface water supply sources, primarily potable supplies from Nant-garedig, are vulnerable to acute pollution incidents arising from a variety of sources, in particular agricultural activities. Abstractions under such conditions, it is imperative that abstractors are provided with information on the likely arrival time of polluted water at the abstraction point and the likely duration of any incident. Such information can be provided by undertaking time of travel studies in the river under a variety of conditions. A programme of these studies has been progressed for the Tywi but has still to be completed (Issue 37, Section 3.2).

Water Quality/ Development

- There are several sewage treatment works (STWs) and sewerage systems within the Tywi catchment that have discharge which cause unacceptable environmental impact. In the following cases the NRA will oppose all further developments leading to an increase in the discharges until such time as firm commitments are given by Dŵr Cymru to remedial schemes to address the environmental problems:
 - Salem STW - current discharge of treated effluent causes unacceptable biological and aesthetic impact on the Myddyfi (Issue 38, Section 3.2).
 - Sawmills Pumping Station, Llandeilo - premature operation of combined sewer overflows (CSOs) and surcharging of manholes lead to aesthetic impact on the Gurrey Fach and cause public complaints (Issue 38, Section 3.2).
 - Pumsaint Sewerage System - long term problems with surcharging of manholes on the sewerage system giving rise to public complaints and aesthetic impact on the Cothi (Issue 38, Section 3.2).

In the following case the NRA will not currently oppose developments subject to the conditions specified:

- Parc-y-Splotts - the NRA wishes to ensure that the loading discharged to the Tywi estuary from Parc-y-Splotts STW does not exceed the current consented limits prior to the required improvement scheme. The approach taken to date has been to review the consent to require effluent quality improvements equivalent to any additional flow, thereby maintaining the current consented load discharged. Should Dŵr Cymru be unable to achieve further such short term improvements in association with developments prior to uprating of the works, then the NRA may have to oppose any developments within the catchment that might otherwise lead to increases in loading from the works (Issue 38, Section 3.2 - see also Issues 8 & 9, Section 3.1.1).

Further assessments of the impact of discharges from other treatment works and sewerage systems are continuing. Information arising from these investigations will assist in identifying any additional catchment areas within which the NRA will oppose developments, until remedial schemes are committed.

3.2 A SUMMARY OF THE ISSUES, AND OPTIONS FOR THEIR RESOLUTION

General

This section of the plan considers options to address the issues that have been raised in the preceding section. The options as presented are the initial thoughts of the South West Area, Welsh Region of the NRA and do not constitute policy statements. Comments on the issues and options are invited together with any new ideas/suggestions.

Wherever possible the body responsible for carrying out each option has been identified. In some cases this is identified as an individual(s) or an organisation other than the NRA. However, the options as presented are intended to facilitate improvements to the water environment for the benefit of all users. Their implementation will entail many bodies and individuals co-operating.

In the tables of issues and options that follow, no priority has been assigned to the issues. They are listed in accordance with the current understanding of when the work, or a significant part of the work will be completed.

ISSUE No : 1 SURFACE WATER ACIDIFICATION IN VARIOUS PARTS OF THE CATCHMENT			
OPTIONS	Responsibility	Advantages	Disadvantages
Continued direct liming of Llyn Briannè to regulate pH and water hardness	NRA	Improved water, fishery and biological quality over 17km of river	Open-ended commitment by NRA of £51k per annum
Control new planting and re-planting in sensitive areas	Forestry Authority/ NRA/ Forest Owners	Maintenance and recovery of water quality	Limits forestry development on upland areas
Control sulphur emissions nationally and from local sources (e.g. Pembroke)	Government/ HMIP/ Power generation companies	Improved water, fishery and biological quality	Cost and environmental impact of control techniques

ISSUE No : 2 ELEVATED ZINC CONCENTRATIONS IN THE TYWI DOWNSTREAM OF NANT-Y-MWYN METAL MINE (DISUSED)			
OPTIONS	Responsibility	Advantages	Disadvantages
Implementation of a site reclamation scheme in whole or in part	Dyfed CC (or successor) / WDA/ NRA	Improvements in water quality, fisheries and possibly environmental value of the site	Estimated cost of surface work alone £1m

ISSUE No : 3 POORER THAN EXPECTED BIOLOGICAL QUALITY IN THE ANNELL, DUNANT AND GWILI			
OPTIONS	Responsibility	Advantages	Disadvantages
Further investigation into cause of problem using biological and chemical monitoring	NRA	Identify cause of problems and effect remedial measures	Investigational costs: £1k Cost/benefit of remedial measures may prove to be unacceptable

ISSUE No : 4 AMMONIA CONCENTRATIONS IN THE YDW CAUSE THIS STREAM TO FAIL TARGETS FOR FE CLASS 1			
OPTIONS	Responsibility	Advantages	Disadvantages
Implementation of a programme of farm inspections during 1994/5	NRA	Identification of point sources of pollution	Cost to NRA of £3k for 30 site inspections
Improvements to farm effluent storage and disposal systems	Farmers	Improvements in water quality	Cannot be quantified but 25% grant aid available

ISSUE No : 5 FAILURE TO ACHIEVE GUIDELINE SUSPENDED SOLIDS STANDARDS ON THE CLOIDACH			
OPTIONS	Responsibility	Advantages	Disadvantages
Continued monitoring of problematic farms in the catchment	NRA/Farmers	Improvements in farm effluent storage /disposal	Cost to farmers unknown but 25% grant available
Continue liaison with Forestry Authority on felling /replanting	NRA/ Forestry Authority	Improvements in water quality	May limit forestry development in certain areas

ISSUE No : 6 TAWELAN BROOK AT JOHNSTOWN FAILS TO MEET FE CLASS 1 STANDARDS FOR AMMONIA AND BOD, AND GUIDELINE STANDARDS FOR SUSPENDED SOLIDS			
OPTIONS	Responsibility	Advantages	Disadvantages
Investigate run-off and inputs from agricultural activity as possible source of water quality failure	NRA	Improved water quality	Investigation costs: £1k Cost of solving identified problems may be high and take a considerable time

ISSUE No : 7 THE PIBWR FAILS TO MEET FE CLASS 1 TARGETS FOR BOD			
OPTIONS	Responsibility	Advantages	Disadvantages
Investigate run-off and inputs from agricultural activity as possible source of elevated BOD. Catchment survey is planned for Sept. to Dec.1994.	NRA	Identification of cause of problem Subsequent improvement in water quality	Investigation costs: c. £5k Remedial measures likely to be expensive and take a considerable time before being implemented

ISSUE No : 8 LOW DISSOLVED OXYGEN IN THE TYWI ESTUARY DURING LOW RIVER FLOWS COINCIDING WITH SPRING TIDES			
OPTIONS	Responsibility	Advantages	Disadvantages
Study to monitor problem caused by natural decay of marine algae and re-suspension of sediments	NRA	Improve understanding of problem which may lead to solutions being found	Cost : unknown
Situation may improve when Parc-y-Splotts STW is uprated (currently estimated at 1996)	Dŵr Cymru	Improved effluent and water quality	Cost : £3.8m

ISSUE No : 9 POOR BACTERIOLOGICAL QUALITY IN PARTS OF THE ESTUARY AND AT LLANSTEPHAN BEACH			
OPTIONS	Responsibility	Advantages	Disadvantages
Uprating of Parc-y-Splotts STW in line with UWWT Directive	Dŵr Cymru	Improved water quality	Cost : £3.8m Will not totally solve problem
Promote 'best practice' by farmers in following MAFF guidelines	Farmers/NRA	Improved agricultural practices and water quality	Will not totally solve problem but may reduce bacteria inputs from freshwater sources
Define tidal states with optimum quality conditions for water based recreational activities	NRA/Carmarthen DC (Env. Health)	Water users can restrict activities to periods of optimum water quality	Uses constrained and no guarantee of water quality conditions

ISSUE No : 10 MAINTAINED FLOW BELOW NANTGAREDIG IS LESS THAN 95 PERCENTILE FLOW			
OPTIONS	Responsibility	Advantages	Disadvantages
Desk study to identify if existing flow conditions create an environmental problem and, if so, initiate a feasibility study of possible solutions	NRA	Increased knowledge of the catchment Protection of the environment and migratory fish stocks	Cannot commence until ongoing Research and Development (R&D) is complete Cost effective solutions may not be apparent Desk study cost : £2k

ISSUE No : 11 PRESCRIBED FLOW BELOW LLYN-Y-FAN FACH IS LESS THAN 95 PERCENTILE FLOW			
OPTIONS	Responsibility	Advantages	Disadvantages
Desk study to identify if existing conditions do create an environmental problem and, if so, feasibility study of possible solutions	NRA	Increased knowledge of the catchment Protection of the environment	Cannot commence until on-going R&D is complete Cost : Desk study £2k

ISSUE No : 12 CURRENT YIELD OF LLYN BRIANNE TO BE QUANTIFIED			
OPTIONS	Responsibility	Advantages	Disadvantages
Study to investigate yield of Llyn Brianne	NRA/Dŵr Cymru	Potential of reservoir to meet future demands whilst protecting environmental needs can be evaluated	Study cannot commence until national methodology agreed (R&D in progress) Cost : £9k

ISSUE No : 13 FLOOD PROTECTION STANDARDS ARE KNOWN TO BE BELOW THE NRA'S TARGET FOR URBAN AREAS AT CARMARTHEN			
OPTIONS	Responsibility	Advantages	Disadvantages
Investigation now complete. Improvement schemes to be carried out	NRA	Increased flood protection to reduce flood damage	Significant capital costs Increased maintenance

ISSUE No : 14 FLOOD PROTECTION STANDARDS ARE CONSIDERED TO BE BELOW THE NRA'S TARGET FOR URBAN AREAS AT ABERGWILI AND LLANDEILO			
OPTIONS	Responsibility	Advantages	Disadvantages
Carry out investigation Enhancement of existing defences to offset impact of proposed bypass	Welsh Office in liaison with NRA	Enhanced flood protection	Increased maintenance costs

ISSUE No : 15 FLOOD PROTECTION STANDARDS ARE CONSIDERED TO BE BELOW THE NRA'S TARGET FOR URBAN AREAS AT SITES WITHIN THE CATCHMENT			
OPTIONS	Responsibility	Advantages	Disadvantages
Investigate the problem and possibility of improving flood protection	NRA	Increased flood protection and reduce flood damage	Future maintenance costs

ISSUE No 16 S105 SURVEYS REQUIRED TO IDENTIFY THE EXTENT OF LANDS LIABLE TO FLOOD			
OPTIONS	Responsibility	Advantages	Disadvantages
Undertake surveys National timetable is under consideration Priorities to be set in consultation with Local Authorities	NRA	Flood plain & flood defence problems identified to enable NRA to advise Local Authorities for Local Plans	Cost : unknown

ISSUE No : 17 EFFECTIVENESS OF FISH EXCLUSION SCREENS AT NANTGAREDIG AND MANORAFON INTAKES IS UNKNOWN			
OPTIONS	Responsibility	Advantages	Disadvantages
Investigation into effectiveness of current provisions to be carried out Implementation of any necessary improvements to be carried out	NRA/Dŵr Cymru	Loss of fish from catchment minimised Compliance with legal requirements	Cost and maintenance requirement for Dŵr Cymru

ISSUE No : 18 OBSTRUCTIONS TO THE PASSAGE OF MIGRATORY FISH			
OPTIONS	Responsibility	Advantages	Disadvantages
To review feasibility /desirability of improving access at obstructions and then to define and implement a rolling programme of works (currently underway)	NRA/Angling Associations/ Fishery Owners	To improve the productivity of the catchment and hence enhance rod and net catches	Resource and cost (unknown) implications Possible detriment to local brown trout stocks

ISSUE No : 19 THE LLYN BRIANNE FISHERIES PROTECTION SCHEME HAS NOT BEEN FULLY AND SUCCESSFULLY IMPLEMENTED			
OPTIONS	Responsibility	Advantages	Disadvantages
Following advice on water quality trends in the upper catchment, review and, if appropriate, implement stock enhancement measures by reopening adult trap and installing smolt release ponds downstream of the reservoir	NRA/Dŵr Cymru	Improvement of catchment productivity and hence enhancement of net/rod catches	Resource and cost implication unknown, but may be insufficient with anticipated funding

ISSUE No : 20 POACHING OF ADULT SALMON AND SEA TROUT			
OPTIONS	Responsibility	Advantages	Disadvantages
Through planning and flexibility, to ensure that resources are effectively targeted on high risk areas, and that staff are highly trained and equipped to maximise effectiveness of enforcement operations	NRA/Fishery Owners	To maximise spawning, escapement and hence productivity of the catchment Compliance with statutory duties	Reduction in resources and time available for dealing with other key threats (e.g. pollution and habitat destruction)

ISSUE No : 21 PERCEIVED THREAT TO CONTINUATION OF CORACLE FISHERY			
OPTIONS	Responsibility	Advantages	Disadvantages
Encourage and support funding applications by the Coracle fishermen to grant-aiding and other organisations	Tywi Coracle Netsmen's Association/ Local Authority/ Welsh Tourist Board / NRA	Continuation of 'heritage' fishery Potential tourism implications	Continuation of cropping of returning adult salmonids, thus reducing spawning escapement Cost to other organisations

ISSUE No : 22 REDUCTION IN SALMON AVAILABILITY DURING NETTING/ANGLING SEASONS			
OPTIONS	Responsibility	Advantages	Disadvantages
To investigate the true situation through study of catch data and to consider any appropriate action (e.g. line rearing and stocking of early running salmon, changes in seasons through Byelaw amendments)	NRA/CFF/Fishery Owners	Greater availability for rods and nets	<p>Possible net increase in exploitation and hence reduction in spawning escapement</p> <p>Increased period of enforcement</p> <p>Possible excessive costs</p>

ISSUE No : 23 PROTECTION OF THREATENED SPECIES AND LOCAL GENETIC STRAINS OF FISH			
OPTIONS	Responsibility	Advantages	Disadvantages
Establish status of populations and take appropriate protective action where feasible	NRA/SWSFC/ Fishery Owners/ Angling Clubs	Continued survival of threatened populations	Cost : unknown

ISSUE No : 24 THE INVASIVE PLANT, JAPANESE KNOTWEED, IS PRESENT IN MANY PARTS OF THE CATCHMENT			
OPTIONS	Responsibility	Advantages	Disadvantages
Implement effective and co-ordinated control measures within the catchment where appropriate	NRA/BBNP/DCC/ CCW/ Local Authorities/ Land Owners	Environmental and access improvements	Resource and cost implication unknown Likely to be a long term commitment

ISSUE No : 25 PUBLIC ACCESS TO RIVERBANKS IS LIMITED			
OPTIONS	Responsibility	Advantages	Disadvantages
Consider the adequacy of the existing footpath network and take appropriate action	Local Authorities/ Land Owners	Improved public access to heighten appreciation of beauty and environmental value of river	Cost : unknown Possible disruption to landowners and other users (e.g. anglers) and wildlife

ISSUE No : 26 "STANDARDS OF SERVICE" FOR SSSIS HAVE NOT BEEN FORMALLY AGREED WITH CCW			
OPTIONS	Responsibility	Advantages	Disadvantages
Agree "standards of service" and implement	NRA/CCW	SSSIs safeguarded	Cost : unknown

ISSUE No : 27 DEVELOPMENT ON FLOOD PLAINS AND THEIR CONFLICT WITH FLOOD DEFENCE REQUIREMENTS			
OPTIONS	Responsibility	Advantages	Disadvantages
<p>Improve liaison between NRA and Local Authorities to ensure protection standards are not compromised</p> <p>Keep river banks free from development</p>	NRA/ Local Authorities	<p>No reduction in existing flood protection. Developer pays for any necessary mitigation works</p> <p>Ensures that existing defences and river can be maintained at reasonable cost and new defences provided in future</p>	<p>Cost to developer</p> <p>Reduction in land available for development</p>

ISSUE No : 28 A NEW BYPASS HAS BEEN IDENTIFIED FOR CARMARTHEN AND LLANDEILO WITHIN THE CATCHMENT			
OPTIONS	Responsibility	Advantages	Disadvantages
<p>Close liaison between the NRA and Welsh Office to ensure NRA interests are protected</p>	NRA/ Welsh Office	<p>NRA interests are taken into account as scheme developed and implemented</p> <p>Environment and property protected</p>	<p>Cost of mitigation works dependent on scheme</p>

ISSUE No : 29 HABITAT DISTURBANCE/DEGRADATION ARISING FROM DEVELOPMENT, RIVER ENGINEERING AND AGRICULTURAL PRACTICES			
OPTIONS	Responsibility	Advantages	Disadvantages
<p>Impacts of various uses need to be assessed and areas/ habitats most at risk need to be identified</p> <p>Tighter planning and regulatory controls to be implemented where appropriate and acceptable working practices agreed and implemented</p>	NRA/ Local Authorities/NFU/ FUW/ Landowners	<p>Compliance with statutory obligations</p> <p>Protection and enhancement of environment and optimization of catchment productivity and conservation value</p>	<p>Constraint on developers operations</p>

ISSUE No : 30 ENVIRONMENTAL DAMAGE AND CHANNEL DESTABILISATION FROM PRIVATE GRAVEL REMOVAL AND UNCONSENTED OPERATIONS			
OPTIONS	Responsibility	Advantages	Disadvantages
<p>Need for tighter planning and regulatory control with increased enforcement. Areas /habitats most at risk to be identified and acceptable methods of working agreed and implemented</p>	NRA/Local Authorities/ NFU/ FUW/ Landowners	<p>Compliance with statutory obligations</p>	<p>Constraint on developers operations</p>

ISSUE No : 31 CURRENT LAND USE PRACTICES (E.G. AGRICULTURE AND FORESTRY) CAN RESULT IN RELEASES OF POLLUTANTS TO THE DETRIMENT OF FISHERIES AND CONSERVATION			
OPTIONS	Responsibility	Advantages	Disadvantages
Pollution prevention inspections and control measures to minimise the risk of spillage from stores of farm wastes, pesticides etc.	NRA/FUW/NFU/Forestry Organisations/ Landowners	Compliance with statutory obligations Improved value and productivity of catchment in fisheries, conservation and amenity terms Protection of legitimate uses	Cost : unknown
Forestry operations to follow Forests and Water Guidelines	Forest Enterprise/ Forest Owners/ Managers/ Contractors	As above	As above

ISSUE No : 32 SEALS, CORMORANTS AND SAWBILL DUCKS ARE BELIEVED, BY SOME ANGLERS AND NETSMEN, TO BE SIGNIFICANT THREATS TO FISH STOCKS. SEALS ARE ALSO DISRUPTING ESTUARY NETSMEN AND INVADING FRESHWATER AS FAR AS LLANDEILO			
OPTIONS	Responsibility	Advantages	Disadvantages
To monitor results of national investigations and status of predators within the catchment and then to review NRA policy and advice to Welsh Office/angling interests if required	NRA/RSPB/CCW WOAD/ Angling and Netting Interests	Proper balance is maintained between predator numbers and fish stocks	None
To periodically review available technology to determine whether seal deterrence equipment is an effective solution to seal incursion into freshwater, and to review national NRA policy if appropriate	NRA/Angling & Netting Interests	Development of deterrence methods can be identified at an early stage	None

ISSUE No : 33 NO ACCESS AGREEMENTS EXIST FOR CANOEISTS WITHIN THE CATCHMENT			
OPTIONS	Responsibility	Advantages	Disadvantages
Encourage and support access agreements between fishery owners and canoeists, with such agreements incorporating the protection of fishery and conservation issues	Welsh Canoeing Association/ Land and Fishery Owners/ NRA	Reduced risk of disturbance to fish, redds and wildlife Reduced conflict between canoeing interests and land/ fishery owners Realisation of canoeing potential	Possible impact on conservation interests and fishery

ISSUE No : 34 DISTURBANCE OF FAUNA IN ESTUARIAL AND COASTAL WATERS AS A RESULT OF POWER BOAT USAGE			
OPTIONS	Responsibility	Advantages	Disadvantages
Determine and monitor situation Implement effective control measures if appropriate	Local Authority/ CCW/ Boat Clubs/ RSPB	Protection of nationally important wintering populations of wildfowl and reduced disturbance to other users	Enforcement difficult Reduced enjoyment by power-boaters

ISSUE No : 35 POSSIBLE IMPACT UPON FISH SURVIVAL AND ANGLING OF LOW TEMPERATURE OF WATER LEAVING LLYN BRIANNE			
OPTIONS	Responsibility	Advantages	Disadvantages
Continue present investigations to determine whether impact is significant	NRA/Dŵr Cymru	Determination of scale of problem	Investigation costs : c. £10k
Should significant impact be proven, investigate possible solutions, which may include multi-level draw-off	NRA/Dŵr Cymru	Improvement to fishery and angling success	Cost : e.g. multi-level draw-off estimated at £500k to £1m

ISSUE No : 36 POSSIBLE IMPACT UPON LITTLE RINGED PLOVER BREEDING SUCCESS FROM FRESHETS RELEASED FROM LLYN BRIANNE			
OPTIONS	Responsibility	Advantages	Disadvantages
Ensure that freshets are not released when the birds are nesting	NRA	Protection of Schedule 1 protected species	Prevents NRA authorising releases for other environmental benefits

ISSUE No : 37 INCOMPLETE TIME OF TRAVEL INFORMATION FOR PROVISION OF ADVICE TO ABSTRACTORS DURING ACUTE POLLUTION INCIDENTS			
OPTIONS	Responsibility	Advantages	Disadvantages
Complete travel time and dispersion studies under a full range of flow conditions for main Tywi downstream of Llandovery and major tributaries	NRA	Comprehensive matrix of flow/ travel time data to assist in management of incidents and protection of abstractors	Cost : c. £10k

ISSUE No : 38 DEVELOPMENT IN SOME SEWERED AREAS MAY LEAD TO FURTHER ENVIRONMENTAL IMPACT			
OPTIONS	Responsibility	Advantages	Disadvantages
Oppose developments in areas where inadequate sewerage systems and/or STWs cause unacceptable environmental impact and for which no remedial schemes are committed	NRA/ Local Authorities/ Dŵr Cymru	No increased environmental impacts Interim arrangements may be promoted	Constraints on development in affected areas

PART II:
SUPPORTING INFORMATION

4.0 THE USES OF THE TYWI CATCHMENT

The following sections catalogue the legitimate Uses of the Tywi catchment which fall under the control of the NRA in one way or another. A general description of the nature of the NRA's responsibility towards each is given, complete with a set of management objectives and targets. These are designed to protect both the environment and the requirements of other Uses. In Section 5 these targets are used to help us set overall targets, for the whole catchment, for water quality, water quantity and physical features, that reflect the NRA's view of the balance of interests between the different users of water.

4.1 URBAN DEVELOPMENT (including road and rail)

General

Development must be considered when planning the management of a river catchment because it can directly and indirectly affect other Uses. This Use is related to existing and predicted residential, commercial and industrial development that is identified in the county structure and district local plans. These plans identify policies against which planning authorities consider development proposals.

While the NRA has statutory powers and responsibilities to protect the water environment, these can be complemented by effective control of land use to prevent anticipated problems at an early stage.

The NRA is a statutory consultee under planning legislation and advises local authorities on development proposals that can have an impact on matters relevant to the NRA. Consequently, a major objective of this Catchment Management Plan is to provide the planning authorities with a clear picture of the NRA's responsibilities and policies towards development of this catchment. The Plan identifies all legitimate users of the catchment so that their interests can be taken fully into account during the planning process. This approach is consistent with the Government's declared objective of "plan led" development.

The NRA seeks to pursue its aims and policies regarding development through the planning consultation process. Although the final decision on planning matters rests with the planning authority, government guidelines advise on the need to consider the NRA's concern in determining proposals.

The NRA has produced a series of Guidance notes for LPAs that outline methods of protecting the water environment. The NRA proposes that these should be incorporated into the LPAs' own Development Plans, whenever possible.

Local Perspective

The majority of the catchment (97%) lies within the administrative County of Dyfed with the remainder (3%) in the County of Powys. Carmarthen District Council (30%), Dinefwr Borough Council (57%), Ceredigion District Council (10%) and Brecknock Borough Council (3%) are responsible for District matters.

The Dyfed County Structure Plan was adopted in 1983 and, following a review, an amended document was approved in 1989: further revision is underway. Most of the allocation for development is in the existing towns and main villages. Population prediction estimates to the year 2011 are currently not available from the County Council, but based on census information, growth of approximately 9% (max.) could be expected. However, future trends in the economy will influence growth to a large extent.

Powys County Council are currently reviewing their existing Structure Plan, approved in 1983. A draft replacement plan is currently subject to a consultation exercise.

Dinefwr Borough Council has prepared a Draft Local Plan, while Carmarthen and Ceredigion District Councils and Brecknock Borough Council are currently formulating their Local Plans.

Like much of rural Wales, a key goal for the Tywi Catchment is to achieve sustainable economic and community development. It is therefore important that the policies of all statutory bodies are brought together in integrated actions to this end.

The A40 London to Fishguard road, which serves the car ferry terminal for the Irish Republic, is a major road artery which crosses the catchment. Its strategic significance has led to its designation as a "Euroroute" and it will therefore be the subject of improvement works in coming years. Road Schemes to bypass Carmarthen (East), and Llandeilo are planned.

Objectives

To ensure that development does not adversely impact, and wherever possible, to ensure that it proceeds in a way that benefits, the water environment.

To ensure, wherever possible, that development proceeds in a way that benefits the water environment and its users.

Environmental Requirements

Water Quality

The water environment should not suffer any detriment due to development.

Adequate pollution prevention methods, that are consistent with the Groundwater Protection Policy and the NRA's Guidance Notes, should be incorporated into developments.

Water Quantity To protect surface and groundwaters from the adverse effects of development, including mineral extraction, landfill, afforestation, road construction and other changes in land use.

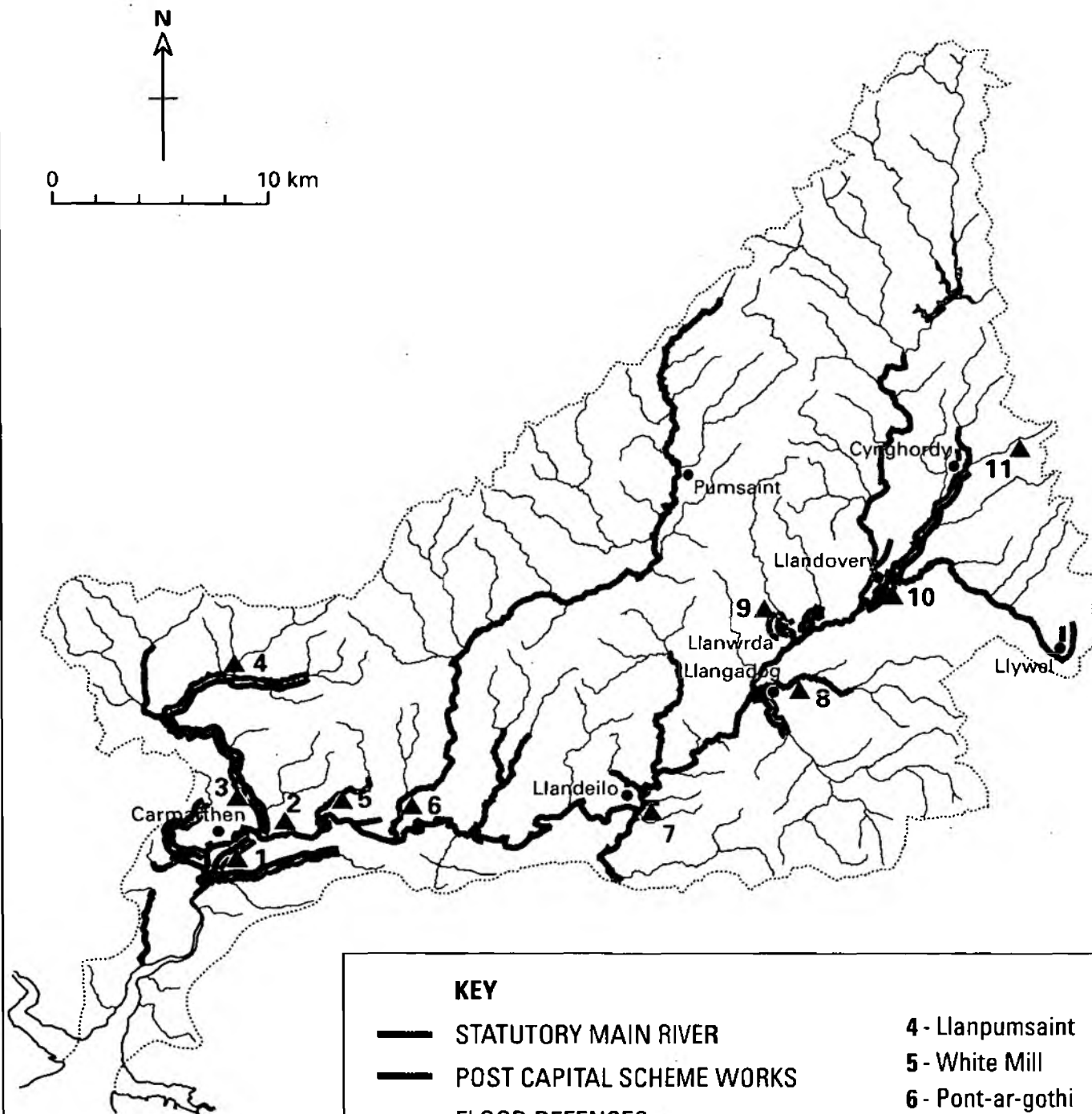
Physical Features Development should not be at risk from flooding and should not put other areas at risk of flooding which could endanger life and damage property.

To ensure any work that is needed to reduce the risk of flooding created by a development is paid for by the developer and not from public funds.

Wildlife associated with the water environment should not suffer any detriment due to development, and wherever possible, development should enhance wildlife.

MAP 9.

FLOOD DEFENCE



KEY

- STATUTORY MAIN RIVER
- POST CAPITAL SCHEME WORKS
- - - FLOOD DEFENCES

▲ PROPERTY AT RISK FROM FLOODING

- 1 - Carmarthen
- 2 - Abergwili
- 3 - Bronwydd

- 4 - Llanpumsaint
- 5 - White Mill
- 6 - Pont-ar-gothi
- 7 - Llandeilo
- 8 - Llangadog
- 9 - Llanwrda
- 10 - Llandovery
- 11 - Cyngordy

Note : Agricultural dwellings on the Tywi flood plain liable to flooding

4.2 FLOOD DEFENCE

General

This Use relates to the protection of people and property against flooding from rivers and the sea and primary role of the river as a drainage system for surface water.

Flooding normally follows from extreme climate conditions such as very heavy rainfall causing high river flows and, in coastal areas, surge and storm generated waves combining with high tides. The severity of an individual flood event is generally described in terms of its frequency of occurrence. This is often expressed as a return period in years, for example, 1 in 50 years (i.e. a flood of this severity would, on average, be expected to occur once in a 50 year period).

Areas of land next to rivers known as flood plain or washlands take the additional flow or naturally store water when the channel capacity is exceeded. Development on these areas over time has resulted in the need for protection works.

Protection against flooding is provided, where necessary and cost-effective, by the construction and maintenance of flood defences. The effectiveness of these flood defences is often measured in terms of the most severe flood against which protection is provided. The level of protection required depends on the land use; for example, urban areas are often provided with 1 in 100 year protection while, for agricultural areas, 1 in 5 year protection may be considered sufficient.

Under the Water Resources and Land Drainage Acts 1991 the NRA has general supervisory duties with respect to all matters relating to Flood Defence, and powers to consent culverting and the construction of obstructions in "ordinary watercourses" (i.e. not designated as "Main River"). Certain reaches of a river are designated formally as "Statutory Main Rivers" and on such Main Rivers the NRA has special powers to carry out flood defence works and to control the actions of others.

Any proposal that could interfere with the bed or bank or obstruct the flow in the Main River requires the formal consent of the NRA. If such works are not consented then the NRA can serve notice on the owner, requiring their removal. Failure to comply with this instruction may result in the NRA removing the works and recharging the cost to the owner.

On ordinary watercourses the Local Authority is a designated drainage authority and as such, has powers to carry out flood defence works (Land Drainage Act 1991). Works on some ordinary watercourses are administered by Internal Drainage Boards.

The provision of flood defences, including the maintenance of channel capacity, needs to be executed with care if other Uses - notably fisheries and conservation - are not to be affected unduly. For this reason consultations are carried out within and outside during the formulation and undertaking of schemes. In this way, wherever feasible, and consistent with the original purpose, habitat enhancements form part of the scheme.

The NRA provides and operates a flood warning system on designated main rivers within the catchment. The Police pass the warnings to the general public.

Local Perspective

Property at Carmarthen, Abergwili, Bronwydd, Llanpumsaint, Whitemill, Pont-ar-gothi, Llandeilo, Llangadog, Llanwrda, Llandovery and Cyngordy has been flooded in the past. Consequently, flood defence works have been constructed at many of these locations and these are regularly inspected and maintained. Recent floods have confirmed the need for these defences and the possible need to increase the level of defence provided. As a result, consideration is being given to improving flood protection standards at several locations within the catchment.

The presence of Llyn Brianne reduces the magnitude of peak flood flows, particularly in the Autumn refill period. This reduction can be significant in the upper reaches of the Tywi but is much less so in the lower reaches, particularly once the reservoir is full. Constructed to provide additional potable water supply, the reservoir is kept as full as possible at all times and is not drawn down in winter to provide storage for floodwater. However, when the reservoir is full (including flood conditions), the compensation flow released, plus any overspill, is no larger than the flood flow that would occur naturally from the reservoir catchment area. Releases from the reservoir have not, as has been suggested in the past, added to flooding problems in Carmarthen and elsewhere in the catchment.

The flow carrying capacity of the Tywi and its major tributaries is frequently reduced by the deposition of gravel and the formation of shoals within the channel. When this occurs, and properties are threatened by flooding as a result, these shoals are removed. Working in the river channel can have a major impact on the river environment and, unless there is an emergency requirement, the work is programmed to minimise disruption to the river and wildlife supported by it.

Much of the river corridor is tree lined and under flood conditions trees are sometimes uprooted and swept downstream. These can create blockages at bridge crossings and other sites and can increase the flood risk to property on the adjoining flood plain. To minimise this risk, a tree management programme is carried out on the Tywi and some tributaries.

The NRA is currently undertaking a scheme to enhance existing defences at Carmarthen. Phase 1 of this scheme is complete and Phase 2, which involves construction of flood defence walls through the town centre, will commence once the line of the Carmarthen Eastern Bypass has been finalised.

Proposed development within the catchment and particularly on the flood plain can have an adverse effect on existing flood protection standards. Two proposed bypass schemes which involve crossing the Tywi flood plain at Carmarthen and at Llandeilo provide examples of such development. At the NRA's request the developer has assessed the impact of these proposals on works to offset these impacts.

Tidal flooding does not constitute a significant problem, although there is a history of flooding to property along The Quay in Carmarthen during periods of high tide, and perceived problems at Llanstephan which are currently being investigated. Tidal flaps in Carmarthen prevent floodwater from affecting property and agricultural land behind the flood defences. These flaps and defences are regularly inspected and routinely maintained by the NRA.

Generally, flood damage within the catchment has been reduced by the provision of alleviation schemes. However, damage potential is further reduced by a flood warning system operated by the NRA. This involves NRA staff in continuously monitoring weather and potential flooding conditions and issuing warnings via the Police, as appropriate.

Objectives

To maintain existing flood defences for people and property against flooding from rivers and the sea, taking account of environmental requirements.

To improve the standard of flood defence where appropriate by promoting and constructing new flood defences and maintaining them in perpetuity to provide an adequate level of service.

To maintain effective drainage, taking account of environmental requirements.

To provide warnings of imminent flooding to the public (via the police) where appropriate.

Environmental Requirements

Physical Features In protected areas, the flood defences/river bank should not be overtopped by a flood flow within a specified return period.

In areas where land use is primarily agricultural, the watercourse should provide effective drainage.

The river banks should contain flows up to a defined maximum, expressed as the calculated probability of occurrence.

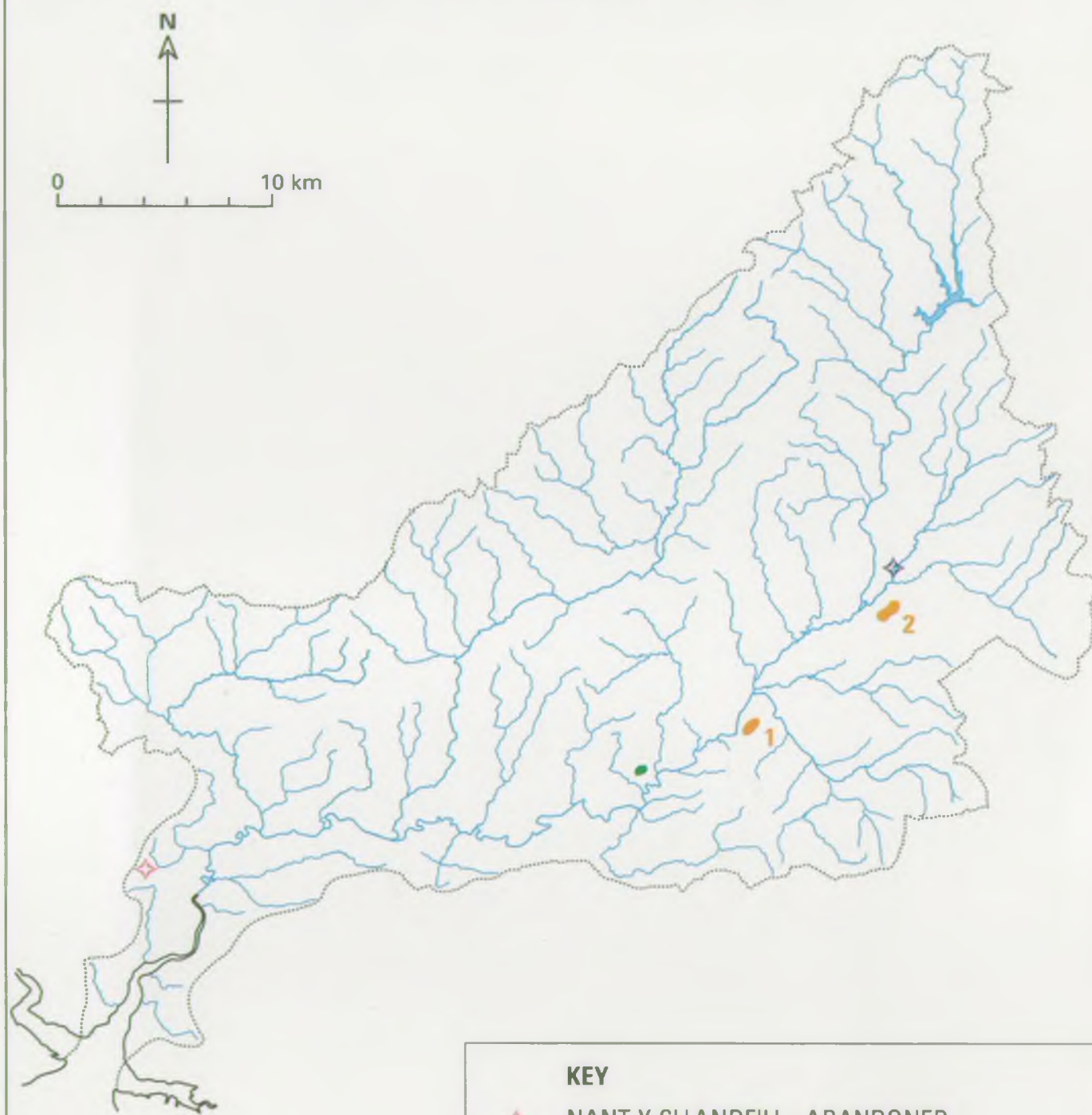
No development should be permitted which would impair the effectiveness of any flood defence scheme or prevent access for maintenance of flood defence works.

To provide adequate arrangements for flood warning.



MAP 10.

SOLID WASTE DISPOSAL (LANDFILL)



KEY

- ◆ NANT-Y-CI LANDFILL - ABANDONED
- ◆ DOMESTIC LANDFILL - ABANDONED
- NEW INN SLUDGE LAGOONS (DYFED HIGHWAYS)
- PROPOSED INERT LANDFILL
- 1 - MANORDEILO
- 2 - CEFN-YR-ALLT

4.3 SOLID WASTE DISPOSAL (LANDFILL)

General

The disposal of domestic and industrial waste into landfill sites is a common form of waste disposal in England and Wales. All sites that receive material that is not inert have the potential to produce a toxic liquid effluent (leachate) which can pollute surface and groundwater. Consequently the NRA's policy is for all new sites to be designed and operated in a way that contains any liquid effluents. This is monitored by the NRA. Older sites may cause pollution long after tipping has ceased and in these cases, the owner or operator may be required to undertake remedial works.

Waste Regulation Authorities (WRAs) presently issue licences to handle waste or operate a waste disposal site under the Control of Pollution Act 1974 (eventually under the Environmental Protection Act 1993). The NRA is a statutory consultee on applications for landfill waste disposal licences.

Local Perspective

Domestic refuse was deposited at the Nant-y-ci and Bronwydd waste disposal sites until approximately 1984. There are presently no active licensed waste disposal sites in the catchment. The current site at Nant-y-Caws drains into the adjacent Gwendraeth Fach catchment. The leachate from the site is currently tankered to Amex park Ltd, in Carmarthen for treatment.

The NRA have been in consultation with Dinefwr Borough Council with regard to licensing of proposed inert landfill sites near Llandovery and Llandeilo. Sludge lagoons at New Inn, Llandeilo, accept road sweepings and gulley washings from highways in the area. The site may require licensing subject to determination of the waste category under the Environmental Protection Act 1990. An old domestic landfill site has recently been identified adjacent to the Bran in Llandovery; however, no leachate problems have yet been identified.

Objective

To ensure that waste disposal sites are designed and operated in a way that does not adversely affect other uses of surface water or groundwater.

To protect the quality of groundwaters by implementing the NRA's Groundwater Protection Policy.

Environmental Requirements**Water Quality**

Waste disposal sites must be designed and managed to prevent liquid effluent from adversely affecting the quality of surface water and groundwaters.

Where appropriate waste disposal sites must comply with prohibition notices or discharge consent conditions. These will be enforced by the NRA and WRAs.

Water Quantity

Waste disposal activities must not harm groundwater resources or adversely affect the rights of water abstractors.

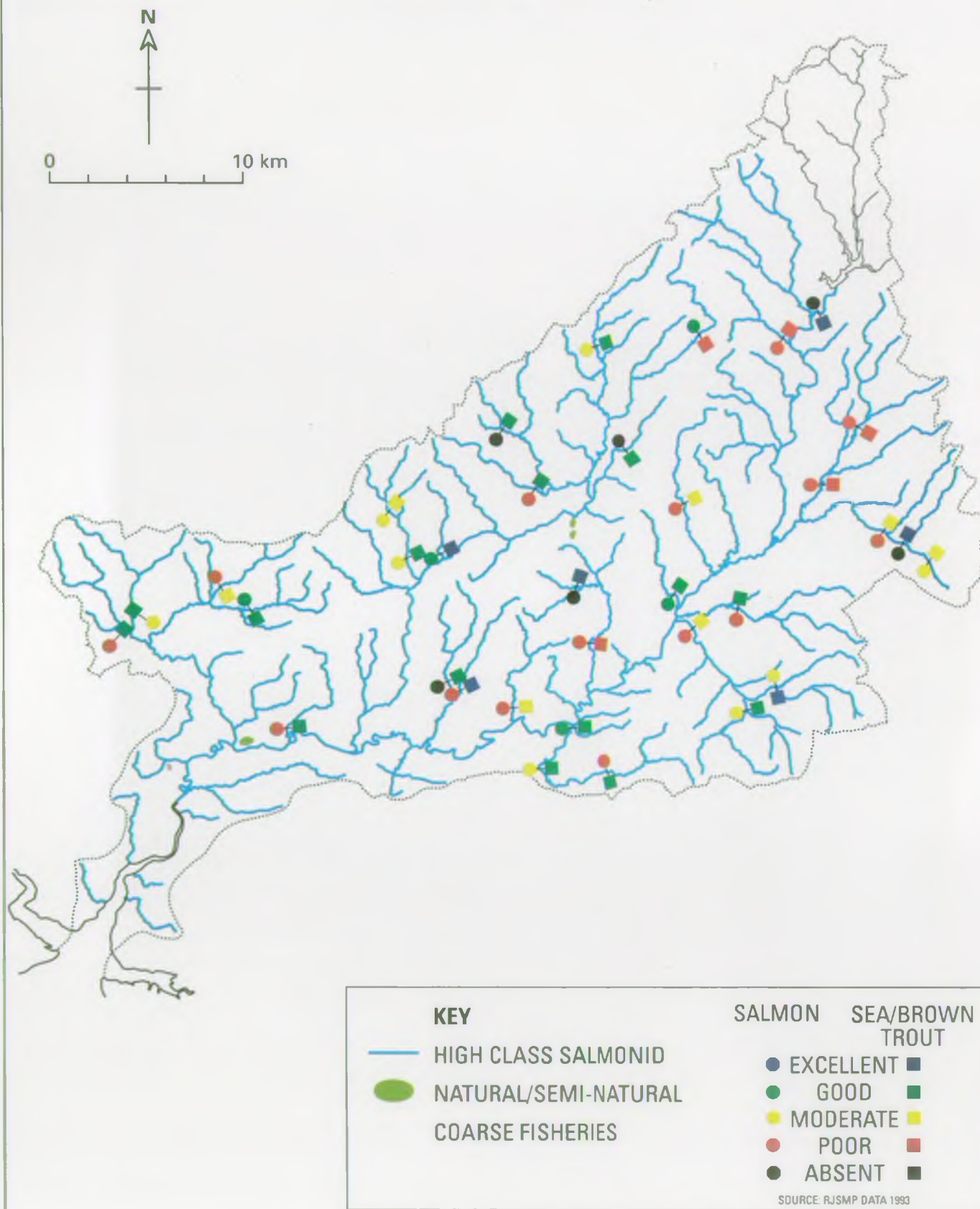
Physical Features

Windblown litter from waste disposal sites must not be permitted to create an aesthetic problem in adjacent rivers, estuaries or coastal waters.

Following the cessation of tipping, all aftercare provisions stated on the planning consent must be carried out by those responsible.

MAP 11.

FISHERIES ECOSYSTEM



4.4 FISHERIES ECOSYSTEM

General

The Fisheries Ecosystem Use addresses the whole water-based ecosystem, although fish are used as the key indicators of the general well-being of the river environment. Consequently, there are 6 water quality classes based upon the requirements of different fish species, Class 1 (high quality salmonid fishery) being the highest.

It is intended that the Fisheries Ecosystem Use will be the first Use to be included within the new Water Quality Objective (WQO) scheme being developed by the Department of the Environment (DoE). It is proposed that the standards supporting the WQO will be the same as those for the Fisheries Ecosystem targets identified in CMPs. These WQOs would then become statutory following public consultation and agreement by the Secretaries of State.

In setting the first WQOs based on Fisheries Ecosystem Classifications, the DoE will select, a small number of pilot catchments to test the procedures for implementing the scheme. Although the Tywi catchment is not among those catchments being considered for inclusion in the first batch, it is appropriate to consider the proposed water quality standards of the WQO scheme when planning the maintenance and improvements of the fisheries and general ecosystem of the river.

Local Perspective

The Tywi is one of the major migratory salmonid fisheries in the Region, although reported catches of salmon and sea trout by both anglers and netmen have declined since the peak catches in the late 1980s. This decline could be due to a number of factors which have not been clearly identified. Nevertheless, the Tywi should be capable of sustaining a high class salmonid fishery.

The major tributaries of the Tywi have been sampled routinely since 1985 as part of the Regional Juvenile Salmonid Monitoring Programme (RJSMP). Data from a total of 70 sites have now been collected. Juvenile salmon occur in low numbers throughout the catchment with 85% of sites being designated Class C (moderate) or lower in the 1993 survey. Juvenile trout, however, are generally more abundant, with 65% of sites either Class A (excellent) or Class B (good) over the same period.

Since 1990, riffle sites (shallow, gravel areas) have also been sampled to describe relative numbers of salmonid fry (less than one year old fish) in the Tywi, Cothi and Gwili. The Cothi supports higher numbers of salmon fry compared with the Tywi and Gwili, although the low productivity of fry in the upper reaches of the Tywi has improved with the liming of Llyn Brianne since 1991. Trout fry are less abundant throughout the main

river riffles, which may reflect preferential spawning in the tributaries. There is no shortage in the amount of usable spawning gravel available both on the tributaries and on the main river and, although some obstructions to fish passage exist (on 16 of the 65 tributaries), these are not believed to have a significant impact on the productivity of the catchment as a whole.

Under the provisions of the Llyn Brianne Order (1968) mitigation for the loss of production of salmonids from the area inundated during the creation of Llyn Brianne was provided by a Fisheries Protection Scheme (FPS). Initially this involved trapping and tracking adults from below the dam to tributaries upstream, and trapping smolts from the tributaries to release them below Llyn Brianne. However, surface water acidification of the headwaters above Llyn Brianne has required the modification of the FPS, such that 6,250 salmon smolts are now reared and released annually into the Tywi system. Concern has also been expressed by anglers regarding the possible impact on fish stocks and catchability resulting from an observed modification of the temperature regime in the upper Tywi by releases from Llyn Brianne.

Under the terms of the Llyn Brianne Order, the impounding licence and S.20 Operating Agreement make provision for a reserve of 9092 Ml of water to be available annually for the release of freshets from the reservoir for environmental purposes, including fisheries benefit.

Brown trout are found throughout the catchment but anglers have expressed their concern that stocks of takeable sized fish are depleted.

Eels are also present throughout most of the catchment and other fish species such as minnow, stickleback, bullhead, loach, perch and lamprey are also to be found locally. A few pike are taken from the river system each year and these are believed to originate from Talley Lakes in the Cothi catchment which, together with the Bishop's Pond near Carmarthen, are notable for their coarse fish populations. Sea lamprey enter the river to spawn each spring as well as small numbers of Twaite shad and, more rarely, Allis shad run the river. Sturgeon have been caught on very rare occasions. The estuary is important as a feeding/nursery area for several species of sea fish including the grey mullet, flounder and bass. The latter species is given special protection as the estuary has been designated as a Bass Conservation Area by MAFF.

Significant stretches of the catchment are designated 'salmonid' waters under the EC Freshwater Fisheries Directive (78/659/EEC). The Tywi is designated from just below Llyn Brianne to the tidal limit at Nantgaredig, a distance of 73.3 km. An additional 6 stretches on some of the larger tributaries, including the Cothi and the Gwili, constitute a further 76.5 km.

Objectives

To sustain the populations of wild fish species at the levels appropriate to a catchment of this type and to protect the passage of migrating fish into and from freshwater.

To ensure a rich and varied range of in-river and bankside habitats and species dependent upon them, typical of a catchment of this type.

Environmental Requirements

Water Quality

Rivers: Waters should comply with the formal and informal standards set for the Fishery Ecosystem Use for CMPs.

Stillwaters: Until specific stillwater Water Quality Objectives are set, these waters should conform with the same standards used for the Fisheries Ecosystem Use, applied to rivers in CMPs.

Estuaries: Coastal and estuarial waters should conform with the informal standards for the Protection of Aquatic Life.

Water Quantity

The Authority will develop and implement a Regional abstraction licensing policy that will enable the effective management of water resources within the catchment. This will achieve the right balance between the needs of the environment, abstractors and other river users.

Physical Features

An appropriate diversity of natural instream and bankside habitats should be maintained to support the wildlife (including fish) typical of the river type.

Appropriate levels of riparian and instream vegetation should be maintained to provide adequate cover for fish and habitats for other wildlife associated with the river and its corridor.

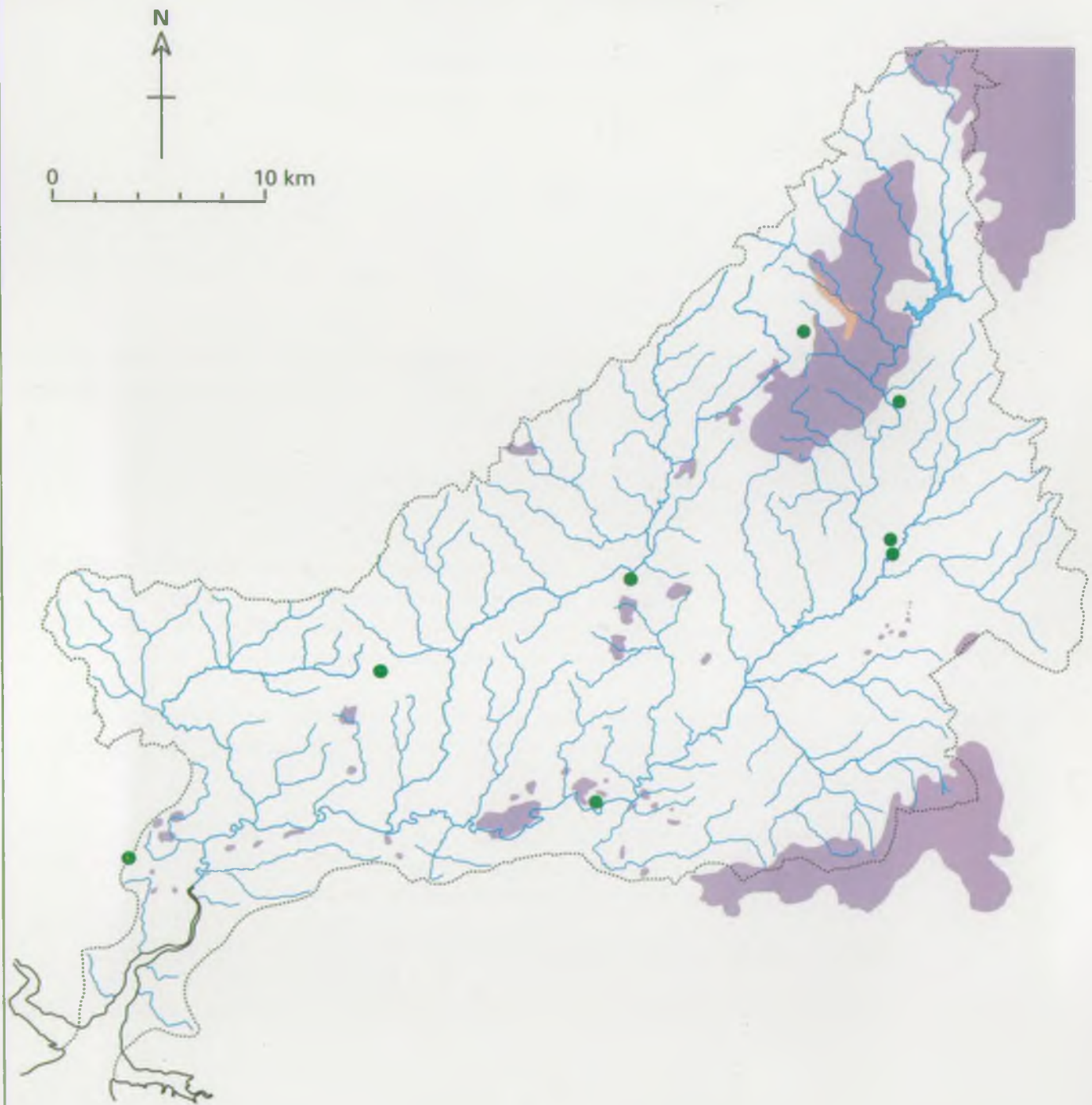
Artificial barriers should not obstruct passage of migratory fish.

Natural or artificial barriers should not lead to excessive exploitation of fish.

River maintenance and other works should be carried out in a way that causes the least detrimental impact on the fishery or general ecosystem, and where possible should lead to enhanced diversity.

MAP 12.

SPECIAL ECOSYSTEMS



KEY

SSSI

NATIONAL NATURE RESERVE

DYFED WILDLIFE TRUST RESERVE

4.5 SPECIAL ECOSYSTEMS

General

Special ecosystems are regarded as those areas that are formally designated for their high conservation value. Such areas include National Parks, National Nature Reserves (NNRs), Sites of Special Scientific Interest (SSSIs) and Scheduled Ancient Monuments (SAMs).

This Use is extended to sites that are valuable in conservation terms but are not formally protected eg. Nature Reserves and County Trust Sites and other non-statutory nature reserves.

It is possible that a WQO for the Special Ecosystems Use will be introduced by the DoE during the lifespan of this Plan. Proposals by the NRA and English Nature are being considered and will be the subject of separate public consultation.

Local Perspective

The environmental value of the catchment is reflected in the high number of SSSIs (56), and a single NNR, Allt Rhyd-y-groes. These sites, designated by the Countryside Council for Wales under the Wildlife and Countryside Act 1981, vary in size from less than a hectare to several thousand hectares and encompass a range of features such as geological and geomorphological (Birdshill Quarry and Carreg Cennen), woodlands (Alltywern), wetlands (Beacon Bog and Rhos Dolau Bran) and geese wintering areas (Dryslwyn Meadows).

Parts of the upper catchment lie within the Cambrian Mountains Environmentally Sensitive Area (ESA) and some of the southern and eastern tributaries lie within the Brecon Beacons National Park. There are two RSPB Reserves in the upper catchment at Dinas and Gwenffrwd. Carmarthen Bay, into which the Tywi estuary discharges, has been proposed as a Special Protection Area/RAMSAR site on account of its value for waders and wildfowl, in particular wintering common scoter.

Objectives

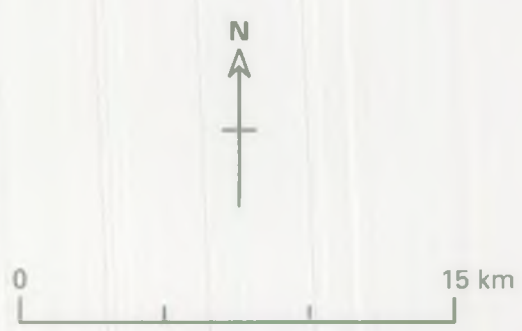
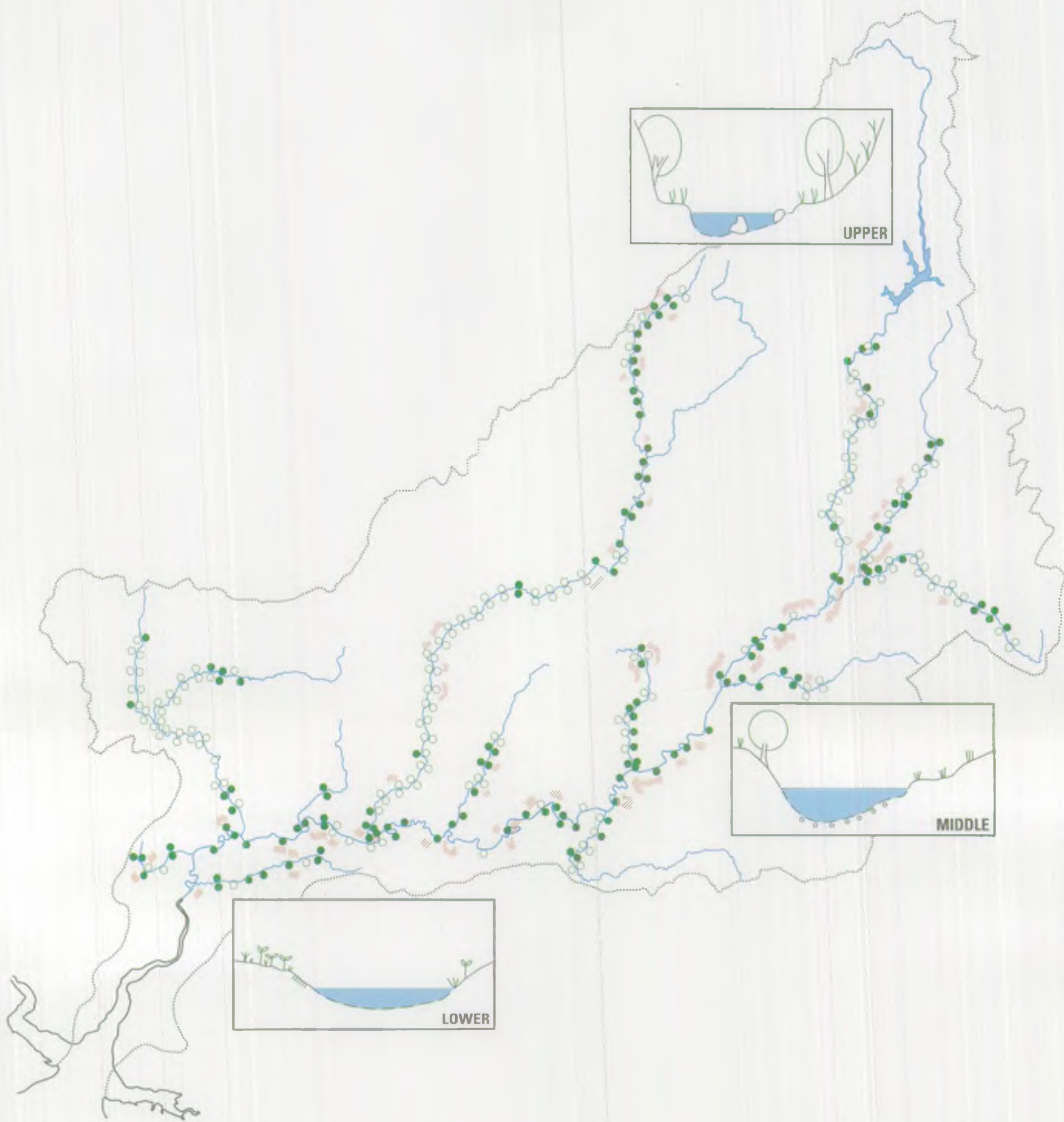
To protect the special conservation interest for which the water based sites were designated.

Environmental Requirements

Special Conservation Areas are likely to have their own specific environmental requirements for water quality, water quantity or physical features. Currently no designatory agency has identified environmental targets for any sites and, inevitably, consultation would be required before such standards could be implemented.

CONSERVATION USES

Meanwhile at sites where water quality is a key factor the most stringent alternative standards for water quality for a 'Conservation Use' (ie. Fisheries Ecosystem, Class 1) will be applied. Water quantity and physical feature standards will be addressed to the maintenance of existing conditions, unless otherwise specified.



- KEY**
- MODERATE COVER FROM BANKSIDE TREES (<500m BANK LENGTH)
 - DENSE COVER FROM BANKSIDE TREES (>500m BANK LENGTH)
 - VALUABLE WETLAND RIPARIAN HABITAT BEYOND BANK

Map 13 Overleaf

4.6 CONSERVATION - ECOLOGY, LANDSCAPES AND HERITAGE

General

The protection of the aquatic ecosystem and designated sites for nature conservation are covered in the Fisheries Ecosystem and Special Ecosystems sections respectively. This section deals with the broader aspects of the conservation of wildlife, landscape and heritage features that extend beyond the river corridor.

The landscape and features of conservation or archaeological interest are of great importance in many catchments and may attract large numbers of visitors.

The NRA has a duty to promote and further conservation of flora and fauna while it carries out its business. This includes the protection of water based or associated plants and animals that are so vital to the water environment. It also has to pay regard to any features of natural beauty or interest and must also consider the desirability of improving access to these features.

Exceptionally beautiful landscapes may be protected as Areas of Outstanding Natural Beauty (AONBs), for which the NRA is an informal consultee, or as National Parks.

Sites of historic or heritage interest may be classed as Scheduled Ancient Monuments or as 'listed buildings' but can be any feature of interest.

Local Perspective

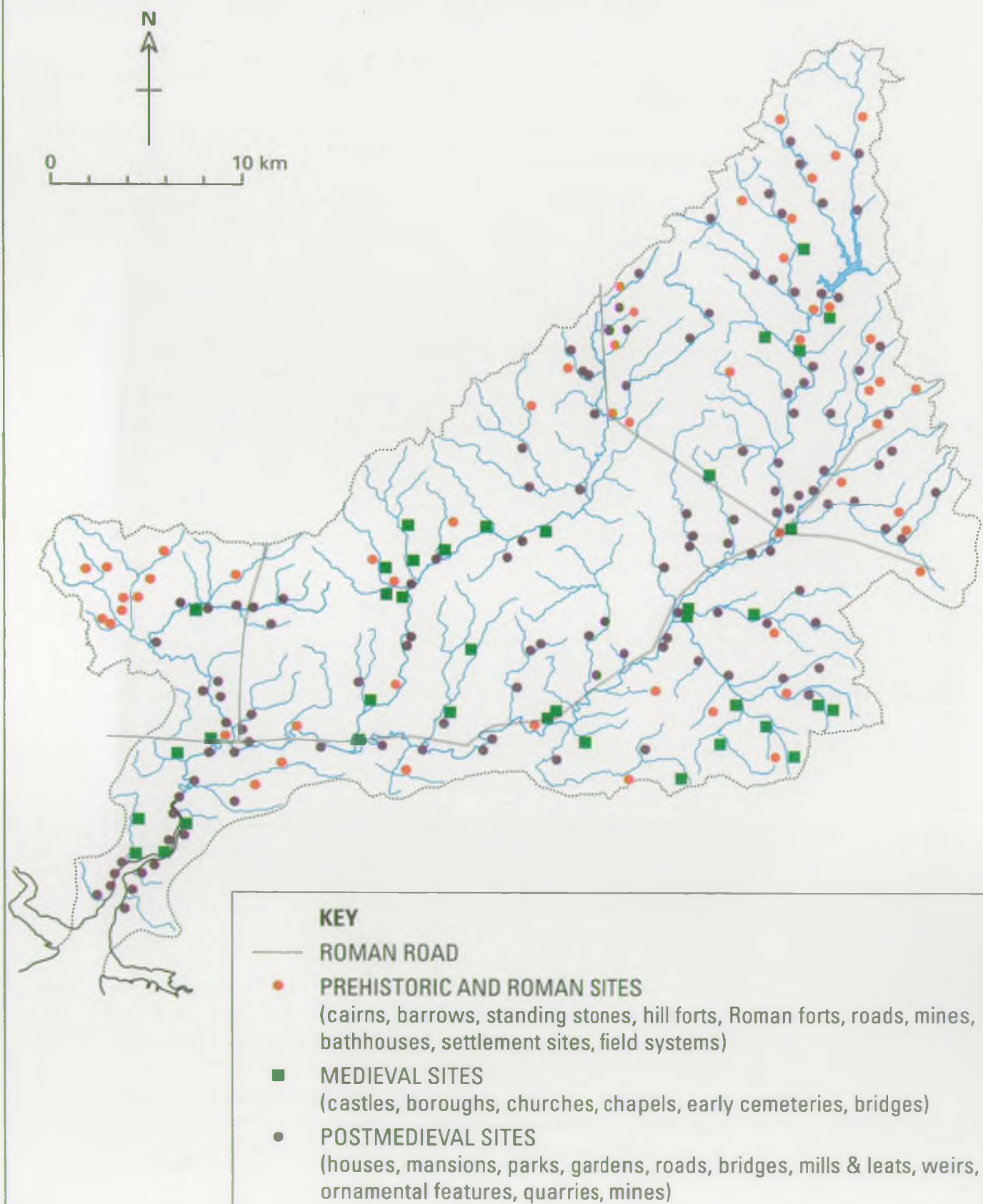
The Tywi catchment is renowned for the beauty, variety and ecological value of its landscape. Parts of the upper catchment fall within the Cambrian Mountains Environmentally Sensitive Area (ESA) and the Brecon Beacons National Park.

The upper catchment above Llandovery is characterised by poor, acidic soils and rocky and often steep river channels. Sheep-grazed Mollinia moorlands or coniferous plantations predominate. This area is within the range of the rare red kite which has shown a welcome increase in numbers in recent years.

Downstream of Llandovery the main river takes a meandering course through a wide, gravel-based flood plain which is utilised extensively for intensive dairying and livestock rearing. Although the valley retains substantial areas of deciduous woodland on its sides, tree cover on the banks of the main river is generally sparse. Partly as a result of this, active bank erosion is a feature of the river, and many old ox-bows remain to enhance the landscape and the conservation value.

MAP 14.

ARCHAEOLOGICAL SITES



A number of the major tributaries (e.g. the Cothi, the Sawdde and the Gwili/Duad) have heavily wooded and highly scenic valleys which are a great asset to the landscape and conservation value of the area. It is these wooded sections of main river and tributaries which provide the essential habitat for species like the otter and the goosander, a species of fish eating sawbill duck. This species has extended its range southwards from Scotland in recent years and is now well established in the Tywi catchment.

Results of a 1991 survey indicate that otters are widespread in the catchment, with 68% of sites surveyed showing positive signs of the presence of otters. They appear to be increasing their range, particularly in the smaller tributaries.

The gravel shoals of the main river are also an important habitat feature, having been found to support distinctive invertebrate populations including a number of rare species, such as Pearl Mussels which have been reported locally. These shoals also provide nest sites for the little ringed plover, a species given special protection under Schedule 1 of the Wildlife and Countryside Act (1981). In 1992, the RSPB recorded 39 pairs of these birds nesting in the catchment, a far greater population than in any other river catchment in Wales.

A River Corridor Survey (RCS), describing the flora, fauna and major habitats associated with the river and adjacent land was carried out in 1993. A total of 230km of main river and thirteen tributaries was surveyed. Map 13 illustrates the dominant bankside features and valuable wetland areas recorded throughout the catchment. The NRA has produced a separate report containing the full details of this survey (NRA Welsh Region, Afon Tywi Catchment River Corridor Survey).

The Tywi valley is rich in sites of historic and archaeological interest. Most prominent are the many castles which hold strategic positions, many of them overlooking the river. Notable amongst these are the castles at Llanstephan, Dryslwyn, Dynevor (Llandeilo) and Llandovery. The remains of the Abbey at Talley are a noble reminder of the past, as is the mansion at Edwinstford on the Cothi. At Dolaucothi near Pumsaint are gold mines, which are thought to be of Roman origin.

The Old Quarry at Carmarthen is a more recent reminder of the importance of the river as a trading route in the 18th and 19th centuries. Downstream from the Quay, tourists can watch the coracle fishermen plying their ancient skills, which have been passed down through many generations.

Objectives

To ensure that wildlife, landscape and heritage features of interest, including designated sites, are protected and, where appropriate accessible.

Environmental Requirements

Water Quality

It is unlikely that there could be any specific water quality requirements to protect landscape or heritage sites although water around such public places should at least conform with the informal standards for Aesthetic Standards criteria.

Where water quality is a key factor, it should comply with the appropriate Fisheries Ecosystem class, while estuarial and coastal waters should conform with standards for the Protection of Sensitive Aquatic Life.

Water Quantity

The Authority will develop and implement a Regional abstraction licensing policy that will enable the effective management of water resources within the catchment. This will achieve the right balance between the needs of the environment, abstractors and other river users.

Physical Features

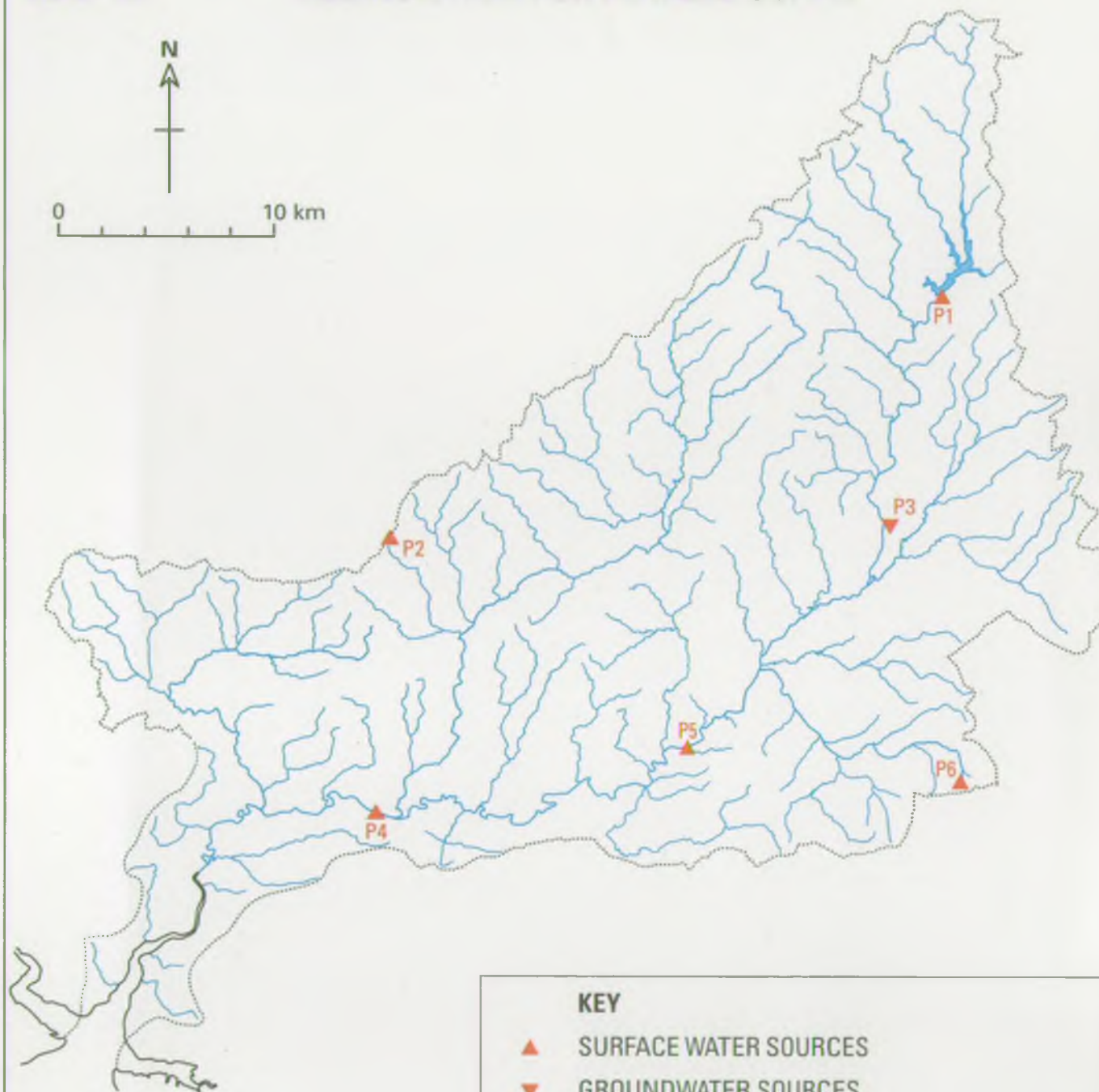
Physical features that give rise to natural beauty should be protected.

Sites and buildings of interest should, where cost-effective, be protected from damage by flooding and/or drought.

The diversity of natural in-stream features and river corridor plants and animals should be maintained and enhanced.

MAP 15.

ABSTRACTION FOR POTABLE SUPPLY



KEY



SURFACE WATER SOURCES



GROUNDWATER SOURCES

MAP REFERENCE	LOCATION	AUTHORISED ABSTRACTION MI/d	PRESCRIBED FLOW MI/d
P1	Llyn Brianne	-	68.2
P2	Ffynnon Nanto	0.23	-
P3	Tonn Borehole	0.70	-
P4	Nantgaredig	227.30	136.40
P5	Manorafon	36.37	-
P6	Llyn-y-fan Fach	10.36	0.5

4.7 ABSTRACTION FOR DRINKING WATER (POTABLE) SUPPLY

General

Almost all abstractions for public water supply, or for private supplies to more than one dwelling, are authorised by licences granted under the Water Resources Act 1991. Exemptions from the requirement for a licence include most types of supplies to a single household, and all abstractions, regardless of use, from groundwater in large areas of North and West Wales.

Public water supplies are mainly taken from surface waters - rivers, streams and reservoirs - but groundwater sources can be important on a local scale. Private supplies are generally derived from springs and boreholes.

The NRA is not responsible for the quality of the raw water, nor of the delivered, treated water. However, it does have a duty to protect water quality and will specify protection zones around groundwater sources that seek to control certain potentially polluting activities. The Groundwater Protection Policy (Appendix 2) forms the basis for the NRA's activities in this area.

All abstraction licences specify volumes that the licence holder may take, but not exceed, and many contain conditions that restrict the impact of the abstraction on the environment and other abstractors. The exceptions are licences granted as "Licences of Right" in 1965, or "Licences of Entitlement" in 1990 where the legislation did not permit the NRA and its predecessors to restrict pre-existing abstractions.

In considering applications for new licences, the NRA must ensure that no derogation of existing abstractors occurs, and that the aquatic environment is properly safeguarded. The NRA does not guarantee that the authorised volume will be available at all times, nor that the water will be fit for the purpose for which it will be used.

Local Perspective

Most of the water abstracted from surface water sources in the catchment is for potable supply purposes. All such abstractions, for potable supply, receive normal physical treatment, chemical treatment and disinfection (equivalent to category A2 of the EC Directive on the Quality of Surface Water for Drinking (755/440/EEC)).

The primary surface water source is Llyn Brianne, completed in 1971 and filled by March 1972, which is used to regulate the Tywi during low flows and permit abstraction from the Tywi at Nantgaredig and at Manorafon near Llandeilo. Part of the abstraction at Nantgaredig supplies Capel Dewi Water Treatment Works (WTW) which is fed to Carmarthen and the lower Tywi valley. The majority of the Nantgaredig abstraction is transferred to Lower Lliw Reservoir (see Water Transfer section) and Felindre WTW to supply Swansea and the surrounding area as far east as Cowbridge.

The conditions on the abstraction licence require that the quantity of water released from Llyn Brianne is increased to match the quantity abstracted at Nantgaredig, when the natural flow in the Tywi at Nantgaredig falls below 682 Ml/d. During very dry summers the quantity released is further increased so as to maintain a minimum flow of 136 Ml/d in the Tywi downstream of Nantgaredig. In addition there is a reserve of 9092 Ml of water in Llyn Brianne for use, at the discretion of the NRA, to supplement river flows as necessary for environmental purposes.

Manorafon abstraction is only used in dry summers when it supplements the supply to Bryngwyn WTW.

The regulation of the Tywi system is controlled by an operating agreement made under Section 2 of the Water Resources Act 1991 between the NRA and Dŵr Cymru. Under this agreement, Dŵr Cymru own and operate the system on its behalf, thereby ensuring that the resource can be managed for the benefit of all water users and the environment. There is assessed to be 25 Ml/d of spare yield in the Tywi. Llyn Brianne was constructed with the intention of increasing its capacity at some future date from 61,000 Ml to 91,000 Ml, but there are no immediate plans for this enlargement.

Llyn-y-Fan Fach Reservoir was, until recently, a small direct supply reservoir which made use of a natural lake and the high rainfall (more than 2,000 mm/year) near the peaks of the Black Mountains. It supplied areas within the upper Tywi catchment and outside the catchment boundary.

Ffynnon Nanto, a small stream and spring source close to the Tywi/Teifi watershed, formerly supplied parts of the Teifi catchment but is now only licensed as an emergency source.

The only groundwater source is Tonn borehole near Llandovery which supplies the local area.

Objectives To manage the quality and volume of water resources so as to safeguard licensed and exempt abstractions and the environment. This includes the active enforcement of abstractions. The NRA will encourage abstractions to be made as far downstream in a river as possible and discharges to be made as close to the point of abstraction as is practicable.

To protect the quality of groundwaters by implementing the NRA's Groundwater Protection Policy.

Environmental Requirements

Water Quality The quality of water at licensed surface and groundwater abstractions should meet the standards set out in EC Surface Waters Directive (75/440/EEC) and the standards for Aesthetic Criteria.

Water Quantity To develop and implement a Regional licensing policy that will, at a catchment level, enable the NRA to manage water resources to achieve the right balance between the needs of the environment and those of abstractors, including protection from derogation.

Physical Features Abstraction and associated activities must not lead to an unacceptable reduction in or alteration to the physical habitats required by other uses.

Objectives

To manage the quality and volume of water resources so as to safeguard licensed and exempt abstractions and the environment. This includes the active enforcement of abstractions. The NRA will encourage abstractions to be made as far downstream in a river as possible and discharges to be made as close to the point of abstraction as is practicable.

To protect the quality of groundwaters by implementing the NRA's Groundwater Protection Policy.

Environmental Requirements

Water Quality

The quality of water at licensed surface and groundwater abstractions should meet the standards set out in EC Surface Waters Directive (75/440/EEC) and the standards for Aesthetic Criteria.

Water Quantity

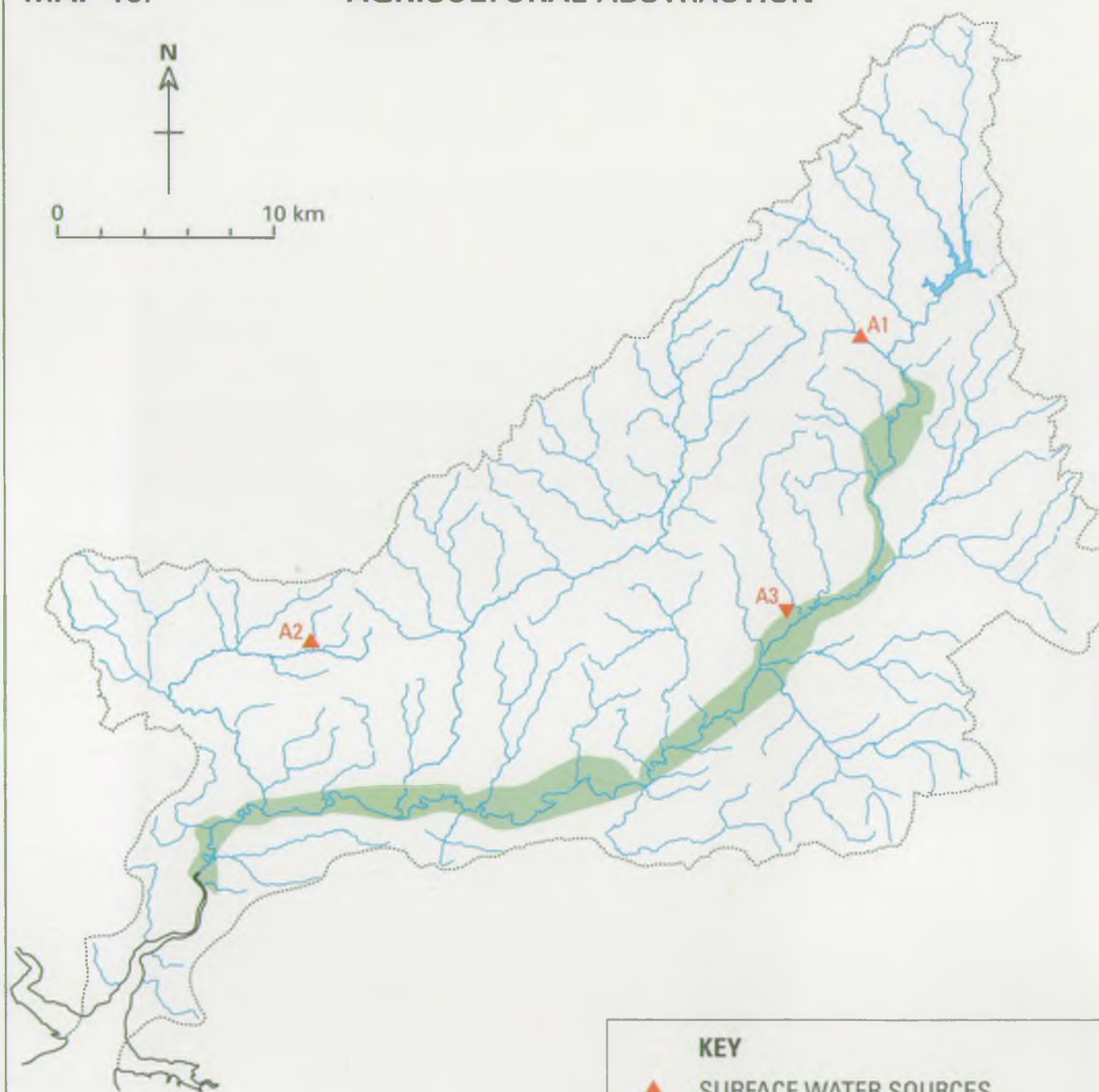
To develop and implement a Regional licensing policy that will, at a catchment level, enable the NRA to manage water resources to achieve the right balance between the needs of the environment and those of abstractors, including protection from derogation.

Physical Features

Abstraction and associated activities must not lead to an unacceptable reduction in or alteration to the physical habitats required by other uses.

MAP 16.

AGRICULTURAL ABSTRACTION



KEY



SURFACE WATER SOURCES



GROUNDWATER SOURCES



AREA WITHIN WHICH GROUNDWATER ABSTRACTIONS ARE LICENSABLE

MAP REFERENCE	PRINCIPAL AUTHORISED ABSTRACTIONS	QUANTITY MI/d
A1	Spray irrigation	0.001
A2	Fish farm	3.637
A3	Spray irrigation	0.227

4.8 ABSTRACTION FOR AGRICULTURAL SUPPLY

General

All abstractions for agricultural purposes, apart from some small (less than 20 cubic metres per day) general agricultural uses from surface waters, require an abstraction licence. This category of Use deals with abstraction from groundwaters and surface waters for agricultural purposes. This includes general stock watering, use around the farm and crop spraying, as well as for spray irrigation and fish farming.

However, large areas of North and West Wales are exempted from the licensing requirement for abstractions from groundwater (wells and boreholes) regardless of use.

All abstraction licences specify volumes that the licence holder may take, but not exceed, and many contain conditions that restrict the impact of the abstraction on the environment and other abstractors. The exceptions are licences granted as "Licences of Right" in 1965, or "Licences of Entitlement" in 1990 where the legislation did not permit the NRA and its predecessors to restrict pre-existing abstractions.

In considering applications for new licences, the NRA must ensure that no derogation of existing abstractors occurs, and that the aquatic environment is properly safeguarded. The NRA does not guarantee that the authorised volume will be available at all times, nor that the water will be fit for the purpose for which it will be used.

Spray irrigation is a high impact use of a water resource and as such is more strictly controlled than other types of abstraction. This is because it takes place when flows are lowest and no water is returned to the river after use. The NRA encourages winter abstraction into storage and would not usually apply restrictions to winter abstracted water. The winter abstraction charges are only one-tenth of those for summer abstraction.

Fish farming can severely affect a watercourse by diverting a large proportion of the flow through the farm, leaving the river reduced in flow. The requirement for an adequate residual flow can restrict the viability of a fish farm.

Local Perspective

Most agricultural abstractions are small and, as such, do not require a licence. Groundwater has also been exempted from control by virtue of a Section 25 Order under the Water Resources Act 1963, for a large part of the catchment. However, abstraction from groundwater within the alluvium and glacial gravels that fill the Tywi valley does require a licence and there are 61 licences authorising abstraction for agricultural purposes mounting to a total of 113Ml/a

Agricultural land is used mainly for dairying and livestock production, and rainfall is normally plentiful (1,550mm/a) so there are only two spray irrigation licences in force.

There is only one licensed fish farm, at Llanllawddog.

Objectives

To manage the quality and volume of water resources so as to safeguard licensed and exempt abstractions and the environment. This includes the active enforcement of abstractions. The NRA will encourage abstractions to be made as far downstream in a river as possible and discharge to be made as close to the point of abstraction as is practicable.

To protect the quality of groundwaters by implementing the NRA's Groundwater Protection Policy.

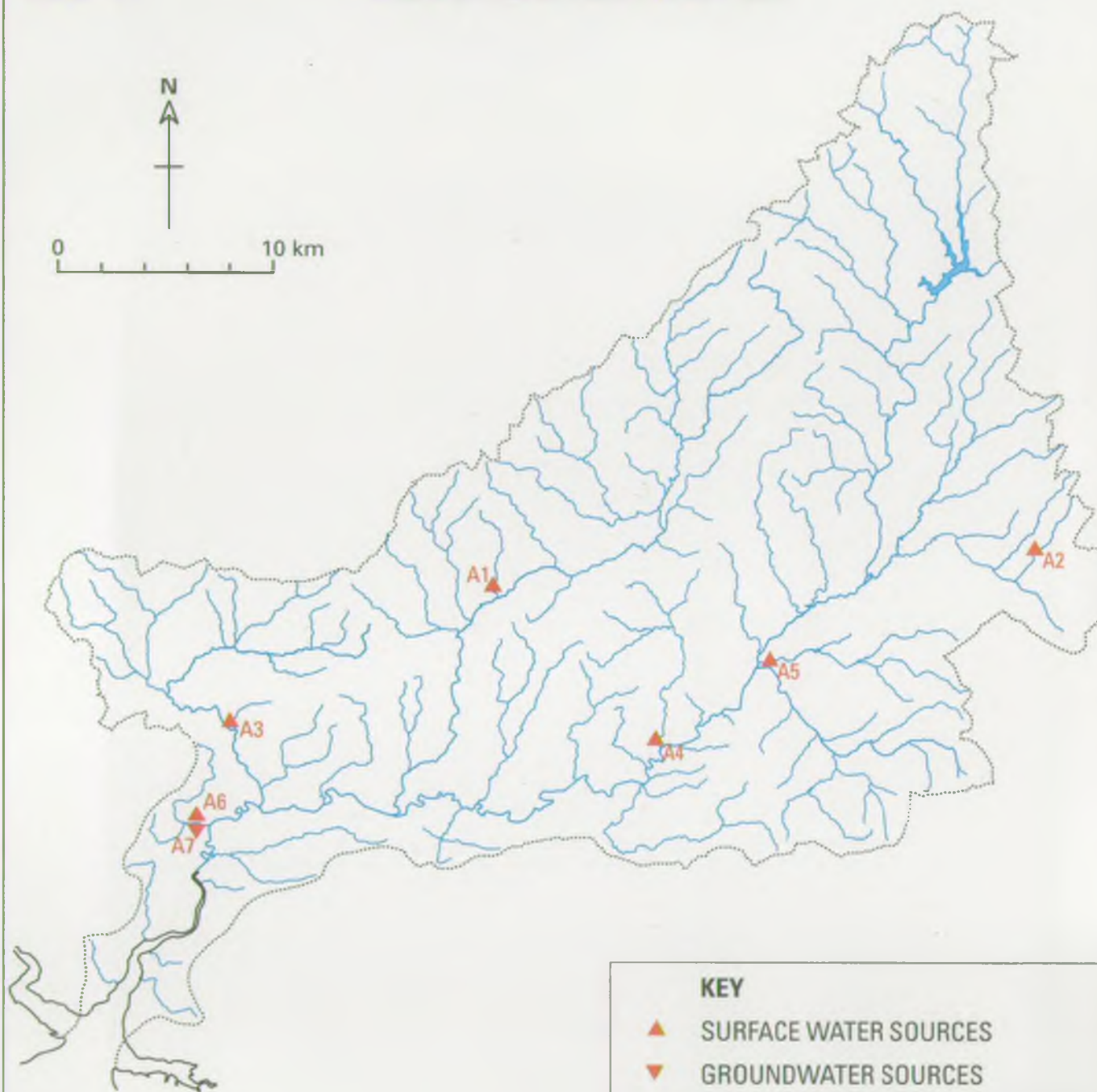
To minimise the impact on summer flows of spray irrigation and other forms of net abstraction

Environmental Requirements

- Water Quality*** - Waters will be required to comply with the standards set for Aesthetic Criteria, Dangerous Substances, where appropriate, and Agricultural Abstraction
- Water Quantity*** - The Authority will develop and implement a Regional abstraction licensing policy that will enable the effective management of water resources within the catchment. This will achieve the right balance between the needs of the environment, abstractors and other river users.
- Physical Features*** - Abstraction and associated activities must not lead to an unacceptable reduction or alteration to the physical habitats required by other uses.

MAP 17.

INDUSTRIAL ABSTRACTION



KEY

- ▲ SURFACE WATER SOURCES
- ▼ GROUNDWATER SOURCES

MAP REFERENCE	PRINCIPAL AUTHORISED ABSTRACTIONS	QUANTITY Ml/d
A1	Unspecified industrial	0.064
A2	Timber treatment	0.002
A3	Readymix concrete	0.009
A4	Tannery	0.025
A5	Llangadog creamery	2.728
A6	Food processing	1.491
A7	Food processing	1.391

4.9 ABSTRACTION FOR INDUSTRIAL SUPPLY

General

All abstractions used for industrial or commercial purposes must be authorised by a licence granted under the Water Resources Act 1991. However, large areas of North and West Wales are exempted from the licensing requirement for abstractions from groundwater (wells and boreholes), regardless of use.

All abstraction licences specify volumes that the licence holder may take, but not exceed, and many contain conditions that restrict the impact of the abstraction on the environment and other abstractors. The exceptions are licences granted as Licences of Right in 1965, or Licences of Entitlement in 1990 where the legislation did not permit the NRA and its predecessors to restrict pre-existing abstractions.

In considering applications for new licences, the NRA must ensure that no derogation of existing abstractors occurs, and that the aquatic environment is properly safeguarded. The NRA does not guarantee that the authorised volume will be available at all times, nor that the water will be fit for the purpose for which it will be used.

Local Perspective

Industry within the Tywi catchment is closely related to the farming and forestry activities that exist in the area. These food processing and similar industries are not large users of water and their demands can be met from sources within the catchment. The locations and types are shown on Map 17.

Additional demand for industrial water in the catchment is met by public water supply from Dŵr Cymru.

Objectives

To manage the quality and volume of water resources so as to safeguard licensed and exempt abstractions and the environment. This includes the active enforcement of abstractions. The NRA will encourage abstractions to be made as far downstream in a river as possible and discharges to be made as close to the point of abstraction as is practicable.

To protect the quality of groundwaters by implementing the NRA's Groundwater Protection Policy.

Environmental Requirements

Water Quality

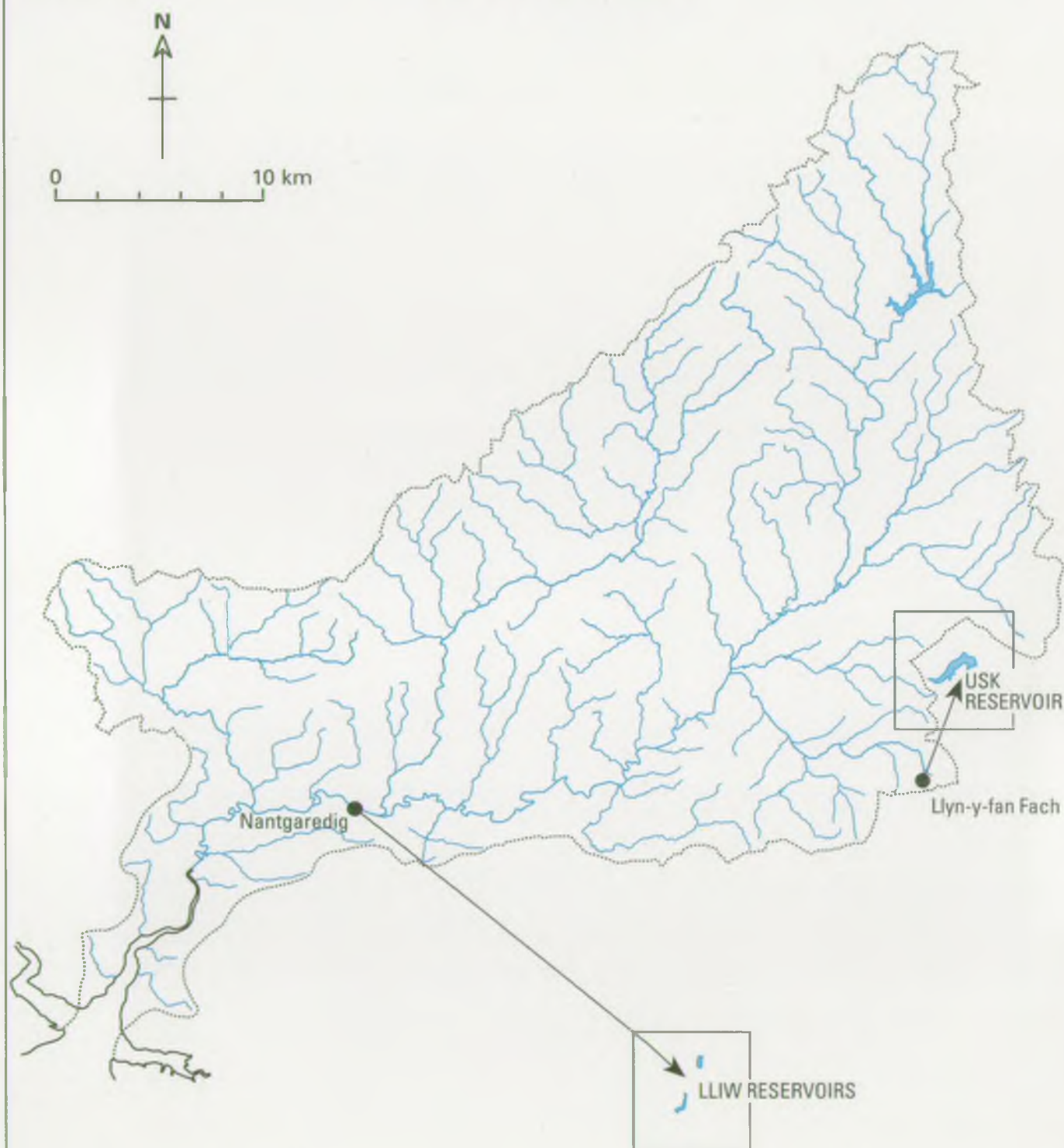
For industrial abstractions the standards for Aesthetic Criteria will be met and there should be no deterioration in water quality compared to when the abstraction licence was granted.

Water Quantity The Authority will develop and implement a Regional abstraction licensing policy that will enable the effective management of water resources within the catchment. This will achieve the right balance between the needs of the environment, abstractors and other river users.

Physical Features Abstraction and associated activities must not lead to an unacceptable reduction in or alteration to the physical habitats required by other uses.

MAP 18.

WATER TRANSFER



4.10 ABSTRACTION FOR WATER TRANSFER

General

Abstractions from reservoirs and boreholes may be used directly, or may be transferred elsewhere, within or outside, the catchment. Transfers clearly represent a nett loss to the immediate area and so their impact is generally mitigated by the release of regulation or compensation water during periods of low flow. All transfers are subject to abstraction licences.

Local Perspective

The majority of the water abstracted from the Tywi at Nantgaredig is pumped into the lower of the Lliw Reservoirs. These reservoirs, as well as acting as a source of supply in their own right, act as balancing reservoirs on the Tywi abstraction. The reservoirs then feed the Felindre Water Treatment Works (WTW), from which water is supplied to Swansea and other parts of South Wales. The use of Lower Lliw Reservoir as storage prior to treatment allows variable pumping from the Tywi to take advantage of cheap electricity. In the past this has resulted in pumping at night during the week and continuous pumping at weekends. During 1993, Dŵr Cymru have been carrying out trials of alternative pumping regimes to reduce costs with the introduction of new electricity pricing structures. When the quality of water in the Lliw Reservoirs is poor, the abstraction from Nantgaredig can go to Felindre WTW.

Another water transfer that is under consideration involves water from the Llyn-y-Fan Fach source. As this is a high altitude source, gravitational flow could take water into the headwaters of the Usk Reservoir and be used to supplement the Usk water resource system. The Usk Reservoir, via Bryngwyn WTW, presently supplies large areas around Llandeilo, whereas Llyn-y-Fan Fach supplied the upper catchment.

Objectives

To manage the quality and volume of water resources so as to safeguard licensed and exempt abstractions and the environment. This includes the active enforcement of abstractions. The NRA will encourage abstractions to be made as far downstream in a river as possible and discharges to be made as close to the point of abstraction as is practicable

Environmental Requirements

Water Quality

Water transfer should not adversely affect water quality in either the donor or receiving catchment.

Water Quantity

To develop and implement a Regional licensing policy that will, at a catchment level, enable the NRA to manage water resources to achieve the right balance between the needs of the environment and those of abstractors, including protection from derogation.

Physical Features Physical features must not be altered in a way that might preclude water transfer at suitable locations.

Water transfer should not lead to alterations of the physical habitat to a degree that might affect other uses, in either the donor or receiving catchment.

4.11 ABSTRACTION FOR WATER POWER

General

The energy of flowing water can be used to generate hydroelectricity, or to provide the power to drive millwheels. Both uses are growing in popularity in the search for sources of renewable energy, and as old mills are restored. However, the very large volumes of water diverted away from the river can have a significant effect on the in-river flora and fauna and other users of the watercourse, particularly where the points of abstraction and return are remote from each other.

For this reason, the NRA would usually require a minimum residual flow to be left within the river to protect the legitimate needs that would be affected. New licences are normally time limited and are subject to an agreed volume of derogation - otherwise the NRA could not grant any new licences upstream because all the resource was committed to the hydropower user.

All hydropower abstractions require an abstraction licence.

Use of water for hydropower can result in appreciable changes in the flow regime, and these can have a large impact on the downstream channel and its flora and fauna.

All abstraction licences specify volumes that the licence holder may take, but not exceed, and many contain conditions that restrict the impact of the abstraction on the environment and other abstractors. The exceptions are licences granted as "Licences of Right" in 1965, or "Licences of Entitlement" in 1990 where the legislation did not permit the NRA and its predecessors to restrict pre-existing abstractions.

Local Perspective

Water power is not presently used within the Tywi catchment to generate electricity. However, the potential of Llyn Brianne as a source of hydro-electric power has been recognised since its construction. Many investigations into the development of this site have been carried out but the schemes have not been found to be economically justifiable to date. Financial incentives and constraints are forever changing and a scheme may yet become economically viable.

The NRA would require, firstly, that any scheme would recognise that the primary purpose of Llyn Brianne is a water supply reservoir and, secondly, that environmental assessment of the scheme should indicate no adverse impact on the environmental and recreational use of the Tywi and its corridor.

Objectives

To manage the quality and volume of water resources so as to safeguard licensed and exempt abstractions and the environment. This includes the active enforcement of abstractions. The NRA will encourage abstractions to be made as far downstream in a river as possible and discharges to be made as close to the point of abstraction as is practicable.

Hydro-power developments that restrict the ability to use upstream water resources will be opposed unless the licence authorising the abstraction for hydro-power is subject to an agreed volume of derogation and a time limit.

Environmental Requirements***Water Quality***

Water quality should not be affected by power generation and associated activities to a degree which compromises other uses.

For industrial abstractions the standards for Aesthetic Criteria will be met and there should be no deterioration in water quality compared to when the abstraction licence was granted.

Waters will be required to comply with the standards set for Aesthetic Criteria, Dangerous Substances, where appropriate, and Agricultural Abstraction.

Water Quantity

The Authority will develop and implement a Regional abstraction licensing policy that will enable the effective management of water resources within the catchment. This will achieve the right balance between the needs of the environment, abstractors and other river users.

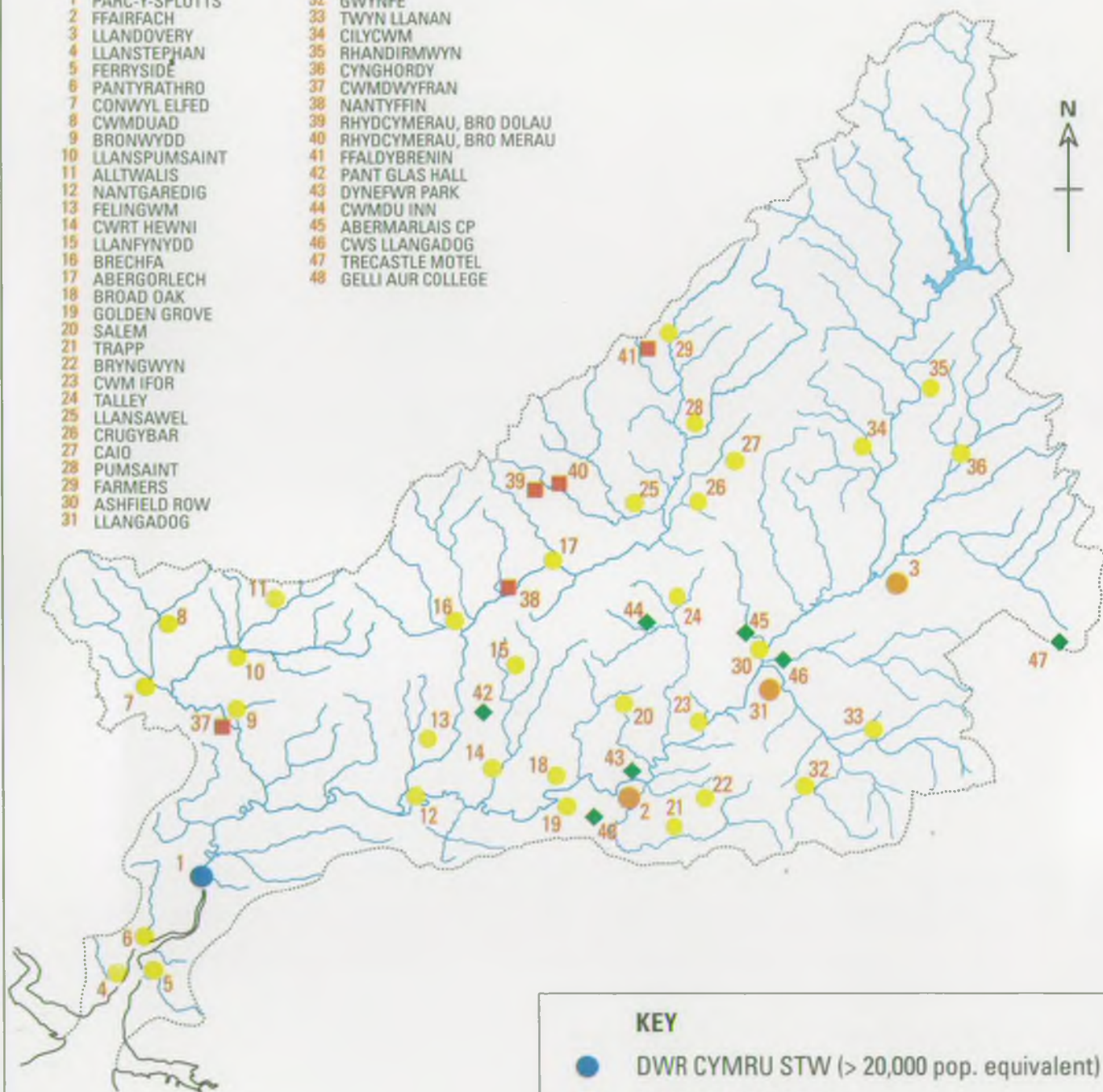
Physical Features

The physical characteristics of the river channel should not be altered to a degree that compromises other uses.

MAP 19.

SEWAGE EFFLUENT DISPOSAL

- | | | | |
|----|---------------|----|------------------------|
| 1 | PARC-Y-SPLOTT | 32 | GWYNFE |
| 2 | FFAIRFACH | 33 | TWYN LLANAN |
| 3 | LLANDOVERY | 34 | CILYCW |
| 4 | LLANSTEPHAN | 35 | RHANDIRMWYN |
| 5 | FERRYSIDE | 36 | CYNGHORDY |
| 6 | PANTYRATHRO | 37 | CWMDWYFRAN |
| 7 | CONWYL ELFED | 38 | NANTYFFIN |
| 8 | CWMDUAD | 39 | RHYDCYMERAU, BRO DOLAU |
| 9 | BRONWYDD | 40 | RHYDCYMERAU, BRO MERAU |
| 10 | LLANSPUMSAINT | 41 | FFALDYBRENIN |
| 11 | ALLTWALIS | 42 | PANT GLAS HALL |
| 12 | NANTGAREDIG | 43 | DYNEFWR PARK |
| 13 | FELINGWM | 44 | CWMDU INN |
| 14 | CWRT HEWNI | 45 | ABERMARLAIS CP |
| 15 | LLANFYNYDD | 46 | CWS LLANGADOG |
| 16 | BRECHFA | 47 | TRECASTLE MOTEL |
| 17 | ABERGORLECH | 48 | GELLI AUR COLLEGE |
| 18 | BROAD OAK | | |
| 19 | GOLDEN GROVE | | |
| 20 | SALEM | | |
| 21 | TRAPP | | |
| 22 | BRYNGWYN | | |
| 23 | CWM IFOR | | |
| 24 | TALLEY | | |
| 25 | LLANSAWEL | | |
| 26 | CRUGYBAR | | |
| 27 | CAIO | | |
| 28 | PUMSAINT | | |
| 29 | FARMERS | | |
| 30 | ASHFIELD ROW | | |
| 31 | LLANGADOG | | |



KEY

- DWR CYMRU STW (> 20,000 pop. equivalent)
- DWR CYMRU STW (> 1,000, < 20,000 pop. equivalent)
- DWR CYMRU STW (< 1,000 pop. equivalent)
- ◆ PRIVATE WORKS
- HOUSING ACT WORKS

4.12 SEWAGE EFFLUENT DISPOSAL

General

In Wales most sewage effluent discharged into freshwaters has been treated in a sewage treatment works (STW) or smaller facility such as a septic tank. However, some untreated sewage is occasionally discharged into rivers from overflows on the sewerage system. The overflows act as safety valves to stop the treatment works being overloaded or the sewerage system damaged. They are designed to operate only under storm conditions when river flows are very high. All these types of discharge are regulated by the NRA which issues, and monitors compliance with, consents to discharge. In order to protect the water environment these consents may contain conditions that variously specify the quantity, quality or circumstances of effluent discharge. In Wales Dŵr Cymru handles the bulk of sewage effluent discharged to freshwaters, although the greater number of STWs are privately owned.

Coastal discharges are also generally owned by Dŵr Cymru although few of them receive the level of treatment associated with freshwater discharges.

In Welsh Region, the continuing improvement in sewage effluent treatment and disposal facilities will be the subject of Dŵr Cymru's second Asset Management Plan (AMP2), which is being produced in close liaison with the NRA. This plan has regard to the terms of the EC Urban Wastewater Treatment Directive and other statutory obligations and covers the period 1995-2015. Consequently, the NRA has, over the past two years, assessed the environmental impact of every Dŵr Cymru owned STW discharge and those from Combined Sewer Overflows (CSOs) in order to provide a basis for establishing AMP2 priorities. Any sewage effluent related issues identified within this CMP will be considered within the agreed AMP2 programme.

Increasing quantities of sewage sludge are being disposed of by surface spreading onto, or injection into, farmland. This is a direct result of implementation of a commitment by the U.K. Government to cease sewage sludge dumping at sea by 1998. A waste disposal licence is not required for land spreading provided the sludge application is beneficial to the land. The contractor is expected to provide details of the sludge application to the Local Authority under provisions in the Sludge (Use in Agriculture) Regulations 1989. It is considered essential that sludge disposal to land is performed by competent operators if surface and groundwater pollution is to be avoided.

Local Perspective

Sewage treatment works (STWs) are dispersed throughout the catchment, the majority serving communities with populations less than 1000. All Dŵr Cymru, Local Authority and the more significant private works are routinely monitored by the NRA. Capital works have been carried out in recent years at many works which has resulted in improved effluent quality. The largest works, Parc-y-Splotts, serves a population of over 20,000 and provides only primary settlement of sewage before discharging to the Tywi estuary at Johnstown. This discharge has been implicated, as a contributory factor, in water quality problems in the estuary (see Section 3, Part 1). Improvements to this works have been identified by the NRA and Dŵr Cymru has been advised that a scheme should be programmed at an early stage in the AMP2 programme, commencing in 1995. There will nevertheless be a requirement for additional treatment at the works to comply with the requirements of the EC urban Wastewater Treatment (UWWT) Directive. This requires installation of at least secondary treatment by the year 2000.

Premature operation of some combined sewer overflows (CSOs), particularly in the urban areas, generates intermittent water quality problems. A survey was undertaken in 1992/93 to assist in identification of unsatisfactory CSOs. The NRA is currently promoting the need for improvements to such overflows on a Regional basis via the CSO strategy. This will form the basis for identifying priorities for investment by Dŵr Cymru in CSO improvements within AMP2.

The general lack of mains sewerage in the catchment necessitates sewage effluent disposal to septic tanks and small private works for many communities. In many cases, effluents from these can be discharged to land, through appropriately designed and constructed soakaway systems, where ground conditions permit.

Objectives

To control the disposal of treated and untreated sewage effluent and sewage sludge in a way that protects other water uses.

Environmental Requirements.**Water Quality.**

No deterioration in the quality of water above discharges, beyond that assumed when setting the consent for an authorised discharge.

No deterioration in water quality, below the area of mixing for the discharge, which causes detriment to other uses.

Water Quantity.

Consent conditions will be derived taking into account the upstream dilution available under average and dry weather flow conditions.

The Authority will develop and implement a Regional licensing Policy, which will enable the effective management of water resources within the catchment. This will achieve the right balance between the needs of the environment, abstractors and other river users.

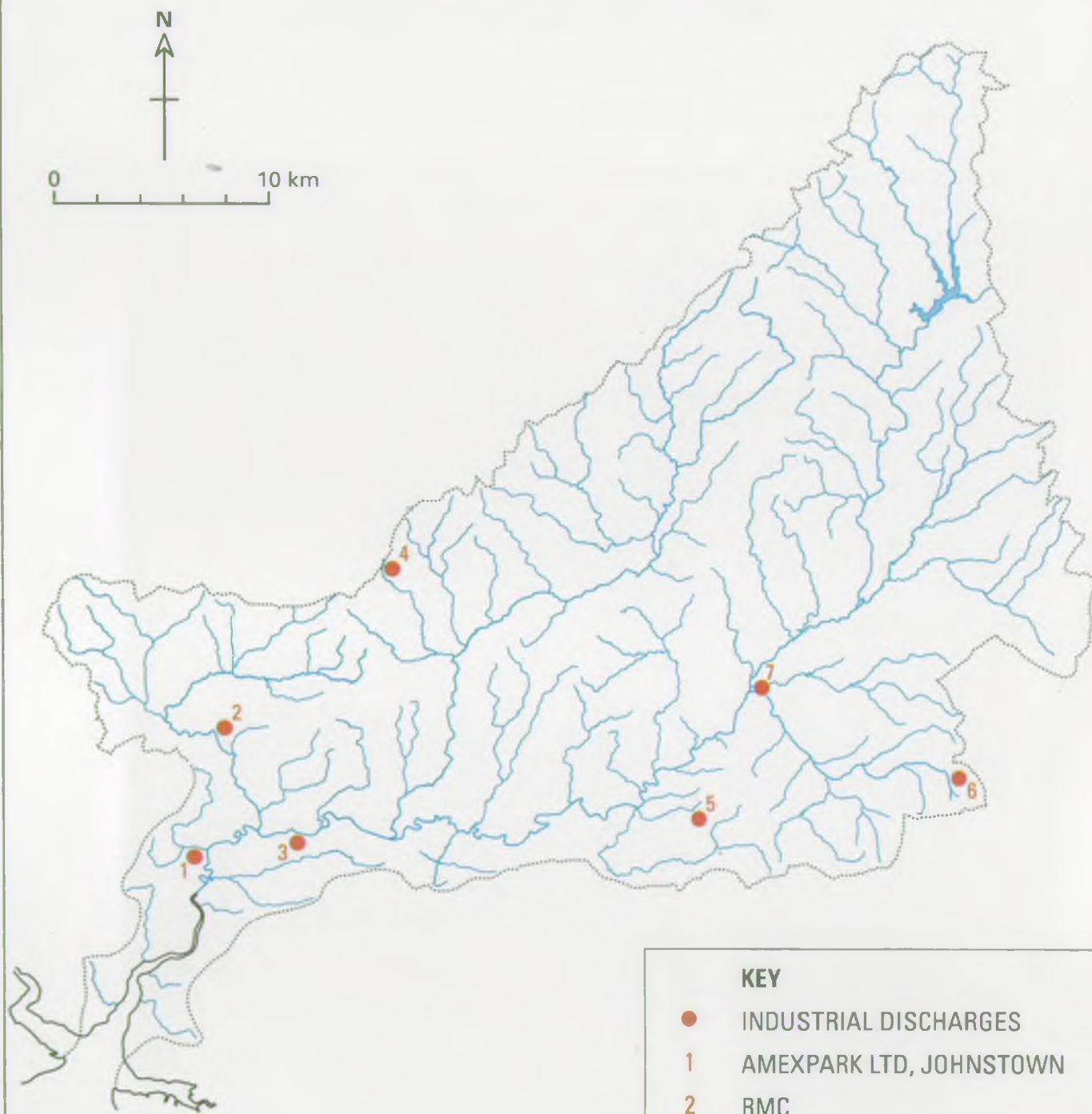
Physical Features.

No discharge of sewage from overflows should occur at sewer flows less than those specified in consents.

No reduction in the quality of the physical habitat should occur as a result of the discharge of sewage effluent or construction of the outfall works.

MAP 20.

INDUSTRIAL EFFLUENT DISPOSAL



KEY

- INDUSTRIAL DISCHARGES
- 1 AMEXPARK LTD, JOHNSTOWN
- 2 RMC
- 3 CAPEL DEWI WTW
- 4 BRECHFA FILTERS
- 5 BRYNGWYN WTW
- 6 LLYN-Y-FAN FACH FILTERS
- 7 CWS CREAMERY

4.13 INDUSTRIAL EFFLUENT DISPOSAL

General

In many places it is necessary to dispose of liquid wastes from industry into fresh and coastal waters. However, the material discharged can be highly polluting and close control is therefore vital if the water environment is to be protected.

At most sites the NRA controls pollution from industrial effluents by a system of consents to discharge. However, where a site is subject to Integrated Pollution Control (IPC) any discharges will be authorised by Her Majesty's Inspectorate of Pollution (HMIP), in close consultation with the NRA. Within this framework the NRA will seek to ensure that any authorization issued is consistent with protecting the Uses of the receiving water and also the broader commitment to the reduction of dangerous materials in the environment. Where pollution prevention measures are stated by HMIP these must also be consistent with NRA pollution prevention policy.

Trade effluent is discharged to sewers with the permission of the sewerage undertaker (Dŵr Cymru in Welsh Region) and is then subject to the sewage effluent treatment and disposal controls outlined in Section 4.12.

Local Perspective

The catchment is predominantly rural in nature, supporting limited industrial activity. The Co-operative Wholesale Society premises at Llangadog, which specialises in the production of canned milk products (a prescribed process under Section 28 of the Environmental Protection Act 1990), has consent to discharge combined sewage and trade effluent to the Tywi.

Amexpark Ltd, at Johnstown (Carmarthen), treat domestic sewage from the Llangunnor and Pensarn areas of Carmarthen Town, together with leachates from Nant-y-Caws, Wernddu and Withyhedge domestic waste disposal sites (outside of the Tywi catchment) and cooling water from Alcoa, Swansea. Proposals to receive other types of wastes at the plant are dealt with under the waste disposal licence application procedures, by the waste regulation department of the local authority. The treatment plant provides primary sedimentation, biological filtration and secondary sedimentation, producing a good quality effluent which is discharged into the Tywi estuary.

There are a number of other small industrial units located in the catchment, few of which presently require a consent to discharge. The majority of premises are agriculture / forestry related businesses. A small concrete production plant is located between Cwmdwyfran and Conwyl Elfed, which discharges site drainage into a nearby leat. Process wash-waters are re-circulated and re-used.

Dŵr Cymru has a Water Treatment Works (WTW) at Capel Dewi, Carmarthen and drainage from the filter backwash drying lagoons is consented. A discharge of filter backwash water to the Cib, from Bryngwyn WTW, Ffairfach, has recently ceased following automation. However, a discharge from the works may recommence, pending suitable relocation of the outfall.

There are large agrochemical stores at Llangunnor, Johnstown and Pontarsais which pose risks of serious acute pollution incidents. All sites which store chemicals, oils etc. are routinely inspected by the NRA to encourage adoption of adequate safeguards against any significant risk of pollution.

Objectives To control the discharge of liquid industrial waste to prevent pollution that would affect other Uses of the water.

Environmental Requirements

Water Quality Discharges should comply with all conditions stated within discharge consents. This will be enforced by the NRA.

There should be no deterioration in water quality above the discharge below that assumed when the discharge consent was calculated.

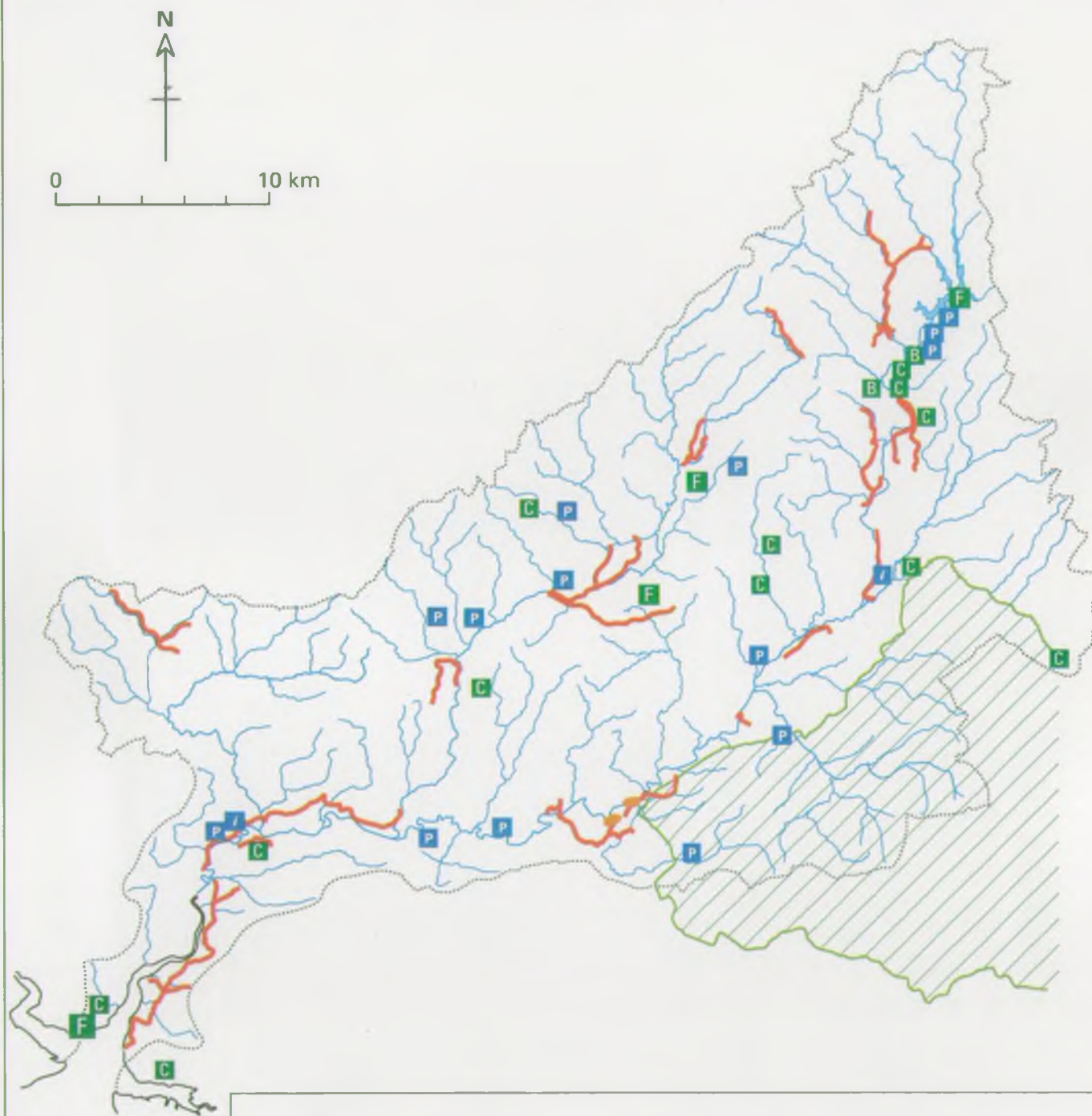
Water Quantity Consent conditions will be derived taking into account the upstream dilution available under average and dry weather flow conditions.

The Authority will develop and implement a Regional Licensing Policy, which will enable the effective management of water resources within the catchment. This will achieve the right balance between the needs of the environment, abstractors and other river users.

Physical Features No alterations should be made to the river channel which would reduce the mixing of the effluent and receiving water.

MAP 21.

BASIC AMENITY



KEY

- C CAMPING/CARAVAN SITES
- I INFORMATION CENTRES
- P CAR PARKS/PICNIC SITES
- B RSPB RESERVES

- BRECON BEACONS NATIONAL PARK
- COUNTRY PARKS
- PUBLIC FOOTPATHS
- F MAIN AMENITY SITE

4.14 BASIC AMENITY

General Basic amenity relates to those activities that are principally land based but could by their nature, attract people to the river environment. Examples include walking, picnicking and bird watching. The main areas of concern are therefore the general aesthetic acceptability of the river corridor, access and public safety.

Local Perspective *The Tywi catchment is an area renowned for its natural beauty and the diversity of its landscape. Variations in land use and topography throughout the catchment, and its essentially rural character, create a mosaic of environments which are attractive both to wildlife and people, and create a wealth of recreational opportunities.*

Walking, sightseeing, pony trekking and bird watching/nature study are widely practised throughout the catchment, particularly in the Llyn Brianne area. The catchment is well served by footpaths and bridleways but river bank access is generally poor and there are few formal facilities for picnicking adjacent to the river. The beauty of the mouth of the estuary, as it broadens into Carmarthen Bay, attracts many visitors.

Objectives To maintain the watercourse so that the public enjoyment of bankside environment is not impaired.

To provide safe and easy access to the waterside without unreasonably constraining other Uses.

Environmental Requirements

Water Quality. Water quality should comply with the targets for Aesthetic Criteria which effectively define the minimum water quality acceptable for any water body.

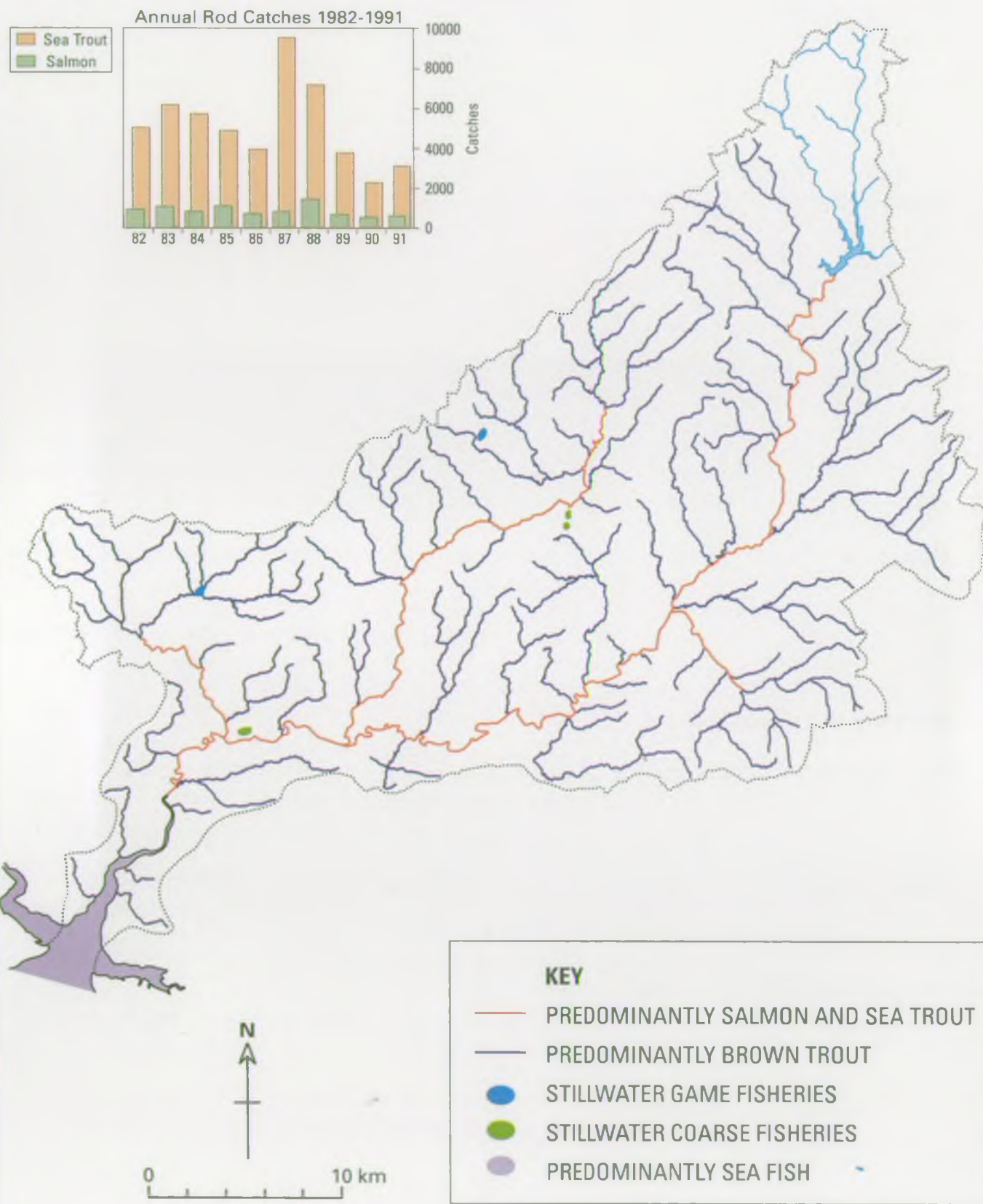
Water Quantity The Authority will develop and implement a Regional abstraction licensing policy that will enable the effective management of water resources within the catchment. This will achieve the right balance between the needs of the environment, abstractors and other river users.

Physical Features An appropriate network of riverside paths and access points should be maintained and, where appropriate, promoted.

The development of recreational sites should be promoted at suitable locations as opportunities arise.

MAP 22.

ANGLING



4.15 ANGLING

General

This section deals with the recreational activity of fishing with rod and line, rather than the protection of fish stocks. The latter are dealt with in the Fisheries Ecosystem section.

In many ways the requirements for angling are very similar to those for the basic amenity use. However the NRA has formal responsibility towards angling, and issues rod licences that are a legal requirement for fishing for any freshwater fish. The income generated by licence sales contributes to fisheries management costs.

Traditionally, in Wales, game fishing for salmon and trout has been the predominant form of freshwater angling, although coarse fishing for other freshwater species is locally popular in many areas. Angling for sea fish takes place at many sites covered by Catchment Management Plans. However, the NRA has neither control of, nor responsibility for, sea angling and it is not covered specifically in CMPs.

Local Perspective

The Tywi is widely recognised as one of the premier sea trout fisheries in the United Kingdom, producing an annual average declared rod catch (1982-1991) of 5,214 fish. A good number of large fish in the 12lbs to 18lbs range are reported regularly each year. Although less well regarded as a salmon river, the Tywi is routinely within the top three salmon rivers in Wales, producing a reported annual average rod catch (1982-1991) of 768 fish.

The fisheries are owned and controlled by many interests including private individuals, land owners, angling associations and corporate interests. Eleven Angling Clubs own and/or lease waters on the Tywi and the majority of these, together with many private fishery owners, are represented by the Carmarthenshire Fishermens Federation (CFF). The best of the sea trout fishing occurs during the months of May and July and for salmon between August and October. The salmon and sea trout rod fishing season is between March 20th and October 17th and that for brown trout between March 3rd and September 30th. Brown trout are present in all but the very smallest of watercourses, but the best fishing is to be found on the larger tributaries.

A number of privately owned stillwater trout and coarse fisheries have been established throughout the catchment which offer day ticket fishing for visitors. However, Llyn Brianne has not been developed as a sport fishery due to restrictions imposed by the Llyn Brianne Order.

The lower estuary provides good beach fishing for sea fish, particularly for bass and flatfish, although angling by boat is prohibited between May 1st and October 31st under the Bass Regulations and the SWSFC Byelaws.

Objectives To ensure that the water environment can sustain angling at least at its current distribution and quality.

Environmental Requirements

Water Quality. The standards relating to Aesthetic Criteria should be maintained so that the enjoyment of the waterside is not diminished. Fish stocks are protected by the provisions in the Fisheries Ecosystem use.

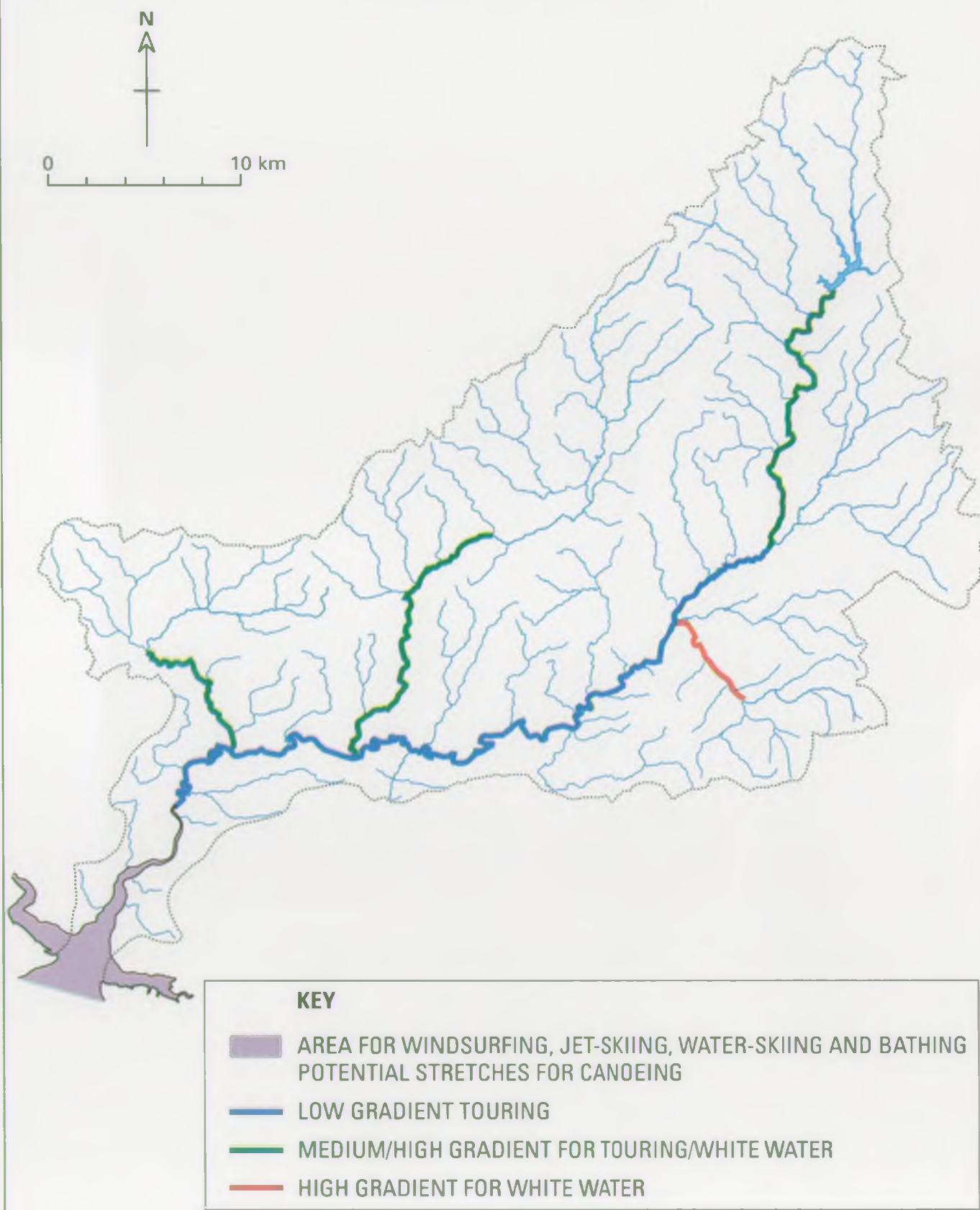
Water Quantity. The Authority will develop and implement a Regional abstraction licensing policy that will enable the effective management of water resources within the catchment. This will achieve the right balance between the needs of the environment, abstractors and other river users.

Physical Features. Safe access to and from the waterside should be promoted.

The waterside features required for angling should be maintained and developed.

MAP 23.

WATER SPORT ACTIVITY



4.16 WATER SPORTS ACTIVITY

General

Waters used for sports and recreation fall into two broad categories; Identified Bathing waters and Water Contact/Recreational Use waters. Each category is treated separately below.

It is possible that in the future this Use will be included within the proposed scheme of Water Quality Objectives being developed by the DoE.

Identified Bathing Waters :

To be identified by the Department of The Environment (DoE)/Welsh Office (WO) as falling within the terms of the EC Bathing Waters Directive (76/160/EEC), waters must have met several criteria that include: high numbers of bathers, first aid facilities, life guards and toilets. Identified waters are required to achieve the mandatory bacteriological standards of the EC Directive and are sampled according to the DoE/WO guidelines during the bathing season (May to September inclusive). In Wales, these are exclusively saline waters.

Water Contact/Recreational Use Waters:

All waters where water sports occur, other than identified bathing waters, fall into this second category. These could include rivers, stillwaters, estuaries and coastal water and may support activities such as canoeing or water-skiing where total immersion is likely, or other non-immersion based recreation. Bathing may also take place. *It should be noted that the NRA does not recommend bathing in freshwaters.*

Local Perspective

The middle and lower reaches of the main river Tywi, including the estuary, are ideal for touring canoeing. Some parts of the upper river between Llyn Brianne and Llandovery, and some of the major tributaries, notably the Sawdde, are suitable for white water canoeing under high flow conditions. However, there is no public right of navigation above the tidal limit, and currently no access agreements exist between the Welsh Canoeing Association and land or fishery owners within the catchment. There is, therefore, occasional conflict between canoeists and fishery interests, principally during the angling season and during the spawning season in salmonid spawning areas.

Windsurfing, water-skiing and jet-skiing are practised in the lower estuary. The potential of Llyn Brianne as a water sports site has yet to be explored, though any activity would have to comply with the terms of the Llyn Brianne Order (1968).

Bathing is sporadically carried out in several places within the catchment, but there are no sites designated for bathing under the EC Bathing Waters Directive.

Objectives To ensure that the catchment is maintained to an appropriate standard to support bathing in Identified Waters, and other water sports to at least their current levels of use at existing locations.

Environmental Requirements

Bathing in Identified Waters:

Water Quality At Identified Bathing Waters (EC Directive), water quality should conform with the mandatory standards contained within the EC Bathing Waters and Dangerous Substances Directives and should meet the appropriate standards for Aesthetic Criteria.

Physical Features Promotion of safe and easy access to and from Identified Bathing Waters.

Water Contact/Recreational Use Waters:

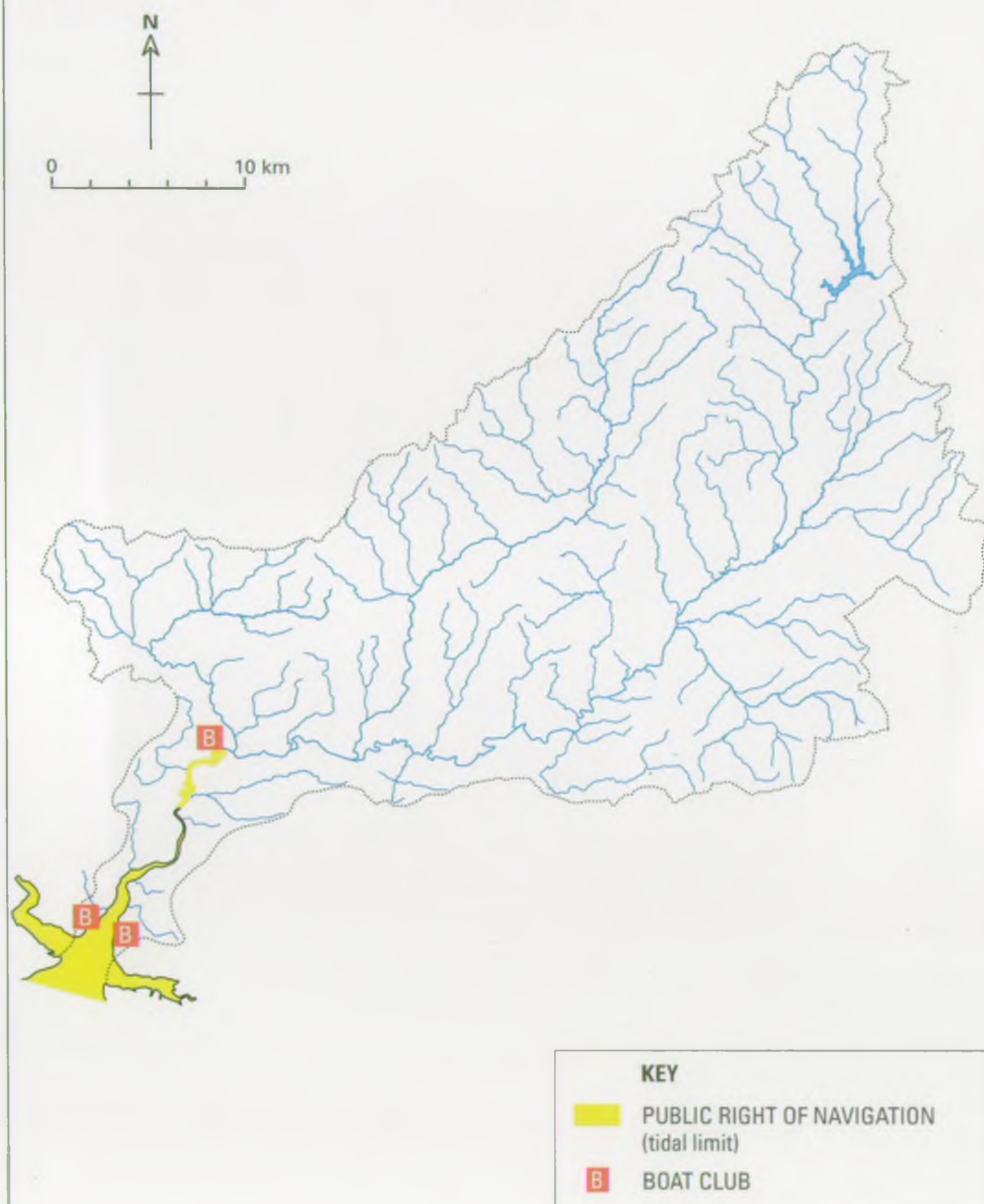
Water Quality Where such marine waters are used for immersion sports, including bathing, the NRA will be guided by the mandatory standards contained within the EC Bathing Waters Directive in assessing water quality requirements for Catchment Plans. The NRA is unable to set bacteriological standards in CMPs for freshwaters where immersion sports or bathing take place but will apply the general Aesthetic Criteria used throughout this report.

Water Quantity The NRA is currently developing an abstraction licensing policy that will take account of the flow requirements of different uses in an objective and structured way. Meanwhile the NRA will seek to protect the range of flows that reflect as natural a regime as possible.

Physical Features To protect and, when possible, improve access to contact/recreation waters.

MAP 24.

BOATING



4.17 BOATING

General Boating is regarded as the use of boats for pleasure, rather than commercial purposes, and includes rowing, sailing and powered boats where no significant water contact is involved. Where no right of navigation exists, access to and use of the water is by formal or informal agreement of the land/fishery owners and the NRAs concern is principally for the participants' enjoyment of the activity.

Local Perspective *Boating is confined to the estuary below Carmarthen, as the upstream limit of public navigation rights coincides with the tidal limit just above the town. Sailing and power boating are widely practised throughout the estuary, which is utilised by three boat clubs, namely the Tywi Yacht Club based at Ferryside, the Tywi Boat Club at Llanstephan and the Carmarthen Boat Club at Carmarthen.*

Representatives of the three clubs, and also the St. Clears Boat Club, form the Carmarthen Bar Navigation Committee which is registered with Trinity House and vested with buoy laying powers. Individual clubs have their own local rules and regulations but there is no Byelaw-making body. Carmarthen Town and District Councils have no active regulatory role although there is a Water Safety Committee and the Mayor of Carmarthen is also Admiral of the Port of Carmarthen.

Objectives To ensure that waters in the catchment can support boating and related activities to at least their current levels of use at existing, provided there is no detriment to other uses.

Environmental Requirements

Water Quality The provisions for Aesthetic Criteria should be complied with.

Water Quantity The Authority will develop and implement a Regional abstraction licensing policy that will enable the effective management of water resources within the catchment. This will achieve the right balance between the needs of the environment, abstractors and other river users.

Physical Features Areas used for boating should be protected from development that would constrain this use.

The encouragement and promotion of safe access points for boating, where appropriate

4.18 NAVIGATION

General

Navigation is considered to be the use of pleasure and commercial craft in waters that fall under the general control of the NRA where a right of navigation exists. This includes the maintenance of navigation aids (such as buoys, perches and marks) which are required for the safe passage of vessels.

In Wales the navigation authority is usually the local port or harbour authority who will liaise with the NRA. However, in the Dee estuary the NRA is the navigation authority.

While the NRA is not the navigation authority for either of the two freshwater rights of navigation that exist in Wales it may under certain circumstances introduce byelaws to control navigational use of a river. The NRA must also pay regard to the needs of those rights of navigation that do exist.

Local Perspective

Fishing vessels and small inshore craft are the main categories of vessel using the estuary. Although larger vessels used to pass upstream as far as Carmarthen Quay, siltation of the channel prevents such passage. there is a public right of navigation to the tidal limit just above Carmarthen town.

The NRA has no responsibility for the provision of navigation aids in the Tywi Estuary; this falls within the jurisdiction of Trinity House. Representatives from the four boat clubs in the area sit on the Carmarthen Bar Navigation Committee which has buoy laying powers vested in it by Trinity House. Neither the Committee nor the Carmarthen Town and District Councils exercise any statutory control over activities in the estuary through Byelaws, although the individual clubs do have their own local rules and regulations.

Objectives

To maintain or help in the maintenance, as appropriate, of navigation to standards specified in the navigation orders.

Environmental Requirements

Water Quality

Compliance with the standards for Aesthetic Criteria should be achieved.

Water Quantity

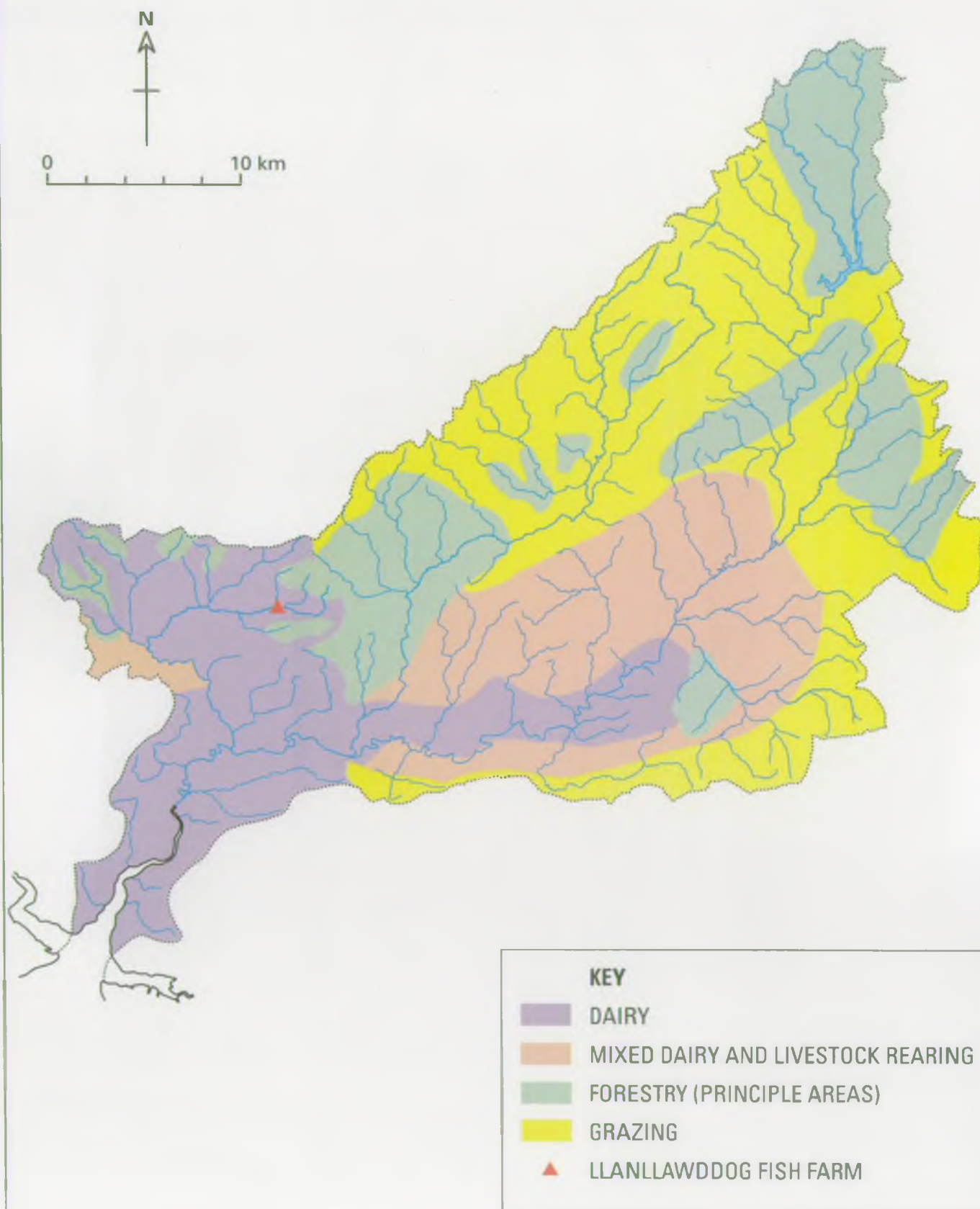
To develop and implement a Regional licensing policy that will, at a catchment level, enable the NRA to manage water resources to achieve the right balance between the needs of the environment and those of abstractors, including protection from derogation.

Physical Features Where waters under the control of the NRA are used for navigation there shall be no obstruction to the passage of vessels.

Any maintenance of navigation channels or aids to navigation should take into account other uses of the water.

MAP 25.

AGRICULTURAL ACTIVITY



4.19 AGRICULTURAL ACTIVITY

General

The processes and by-products of agriculture are a major potential threat to the water environment, especially in more intensively cultivated areas. Key areas of concern to the NRA include:-

- pollution by animal and other agricultural wastes;
- contamination of groundwater and surface waters by fertilisers and other agro-chemicals;
- the effects of land drainage on water tables and water courses;
- the impact of uncontrolled stock grazing on river banks;

Where there is a specific discharge of effluent from a farm site this will be dealt with via the general discharge consenting process described in the discharge uses sections. However, the highly polluting nature of agricultural waste normally precludes this option and the NRA's approach is aimed at control at source by minimising the volumes of effluent produced and stored. Often it is background pollution caused by large numbers of diffuse discharges that causes the most significant impact and these are of greater concern to the NRA. Consequently the NRA has worked closely with farming organisations to develop waste handling guidelines that seek to control this type of pollution. The Authority can also enforce legal minimum standards for new silage, slurry and agricultural fuel oil installations. In key areas a programme of farm visits by NRA staff helps to alert farmers to potential and existing problems.

The NRA issues codes of practice for the use of fertilisers, herbicides and pesticides to protect the water environment and in certain places (Nitrate Sensitive Areas) may control the application of fertilisers to protect groundwater supplies.

The NRA encourages farmers to fence riverbanks to prevent uncontrolled access by stock. Cattle and sheep can severely damage riverbanks in a way that can lead to channel instability, increased flood risk and a marked reduction in the fisheries and conservation value of the river.

Fish farming can severely affect a watercourse by diverting a large proportion of the flow through the farm, leaving the river reduced in flow. The requirement for an adequate residual flow can restrict the viability of a fish farm.

Local Perspective *Large dairy units predominate in the floodplain areas of the catchment, with mixed dairy/livestock rearing predominating in the middle reaches. Poor soil conditions in the uplands, particularly north of Llandovery, favour livestock rearing on rough grazing or improved pastures. Each type of farming activity can give rise to particular water quality problems.*

A rolling programme of farm inspections is underway to help minimise the risk of pollution from agricultural sources. This programme includes targeted visits to: areas of intensive land use; areas with a history of pollution problems; locations where biological surveys demonstrate impact and upstream of drinking water intakes.

A fish farm is located at Llanllawddog, which is consented and monitored by the NRA.

Objective To protect the water environment from the potential adverse effects of agricultural activity.

Environmental Requirements

Water Quality All consented discharges should comply with the conditions expressed in the consent. This will be enforced by the NRA.

The codes of practice for the handling and use of Pesticides, Herbicides and Fertilisers should be strictly followed.

Where applicable, the management practices set out for Nitrate Sensitive Areas should be strictly followed.

The Code of Good Agricultural Practice for the Protection of water should be complied with as should the Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) Regulations 1991.

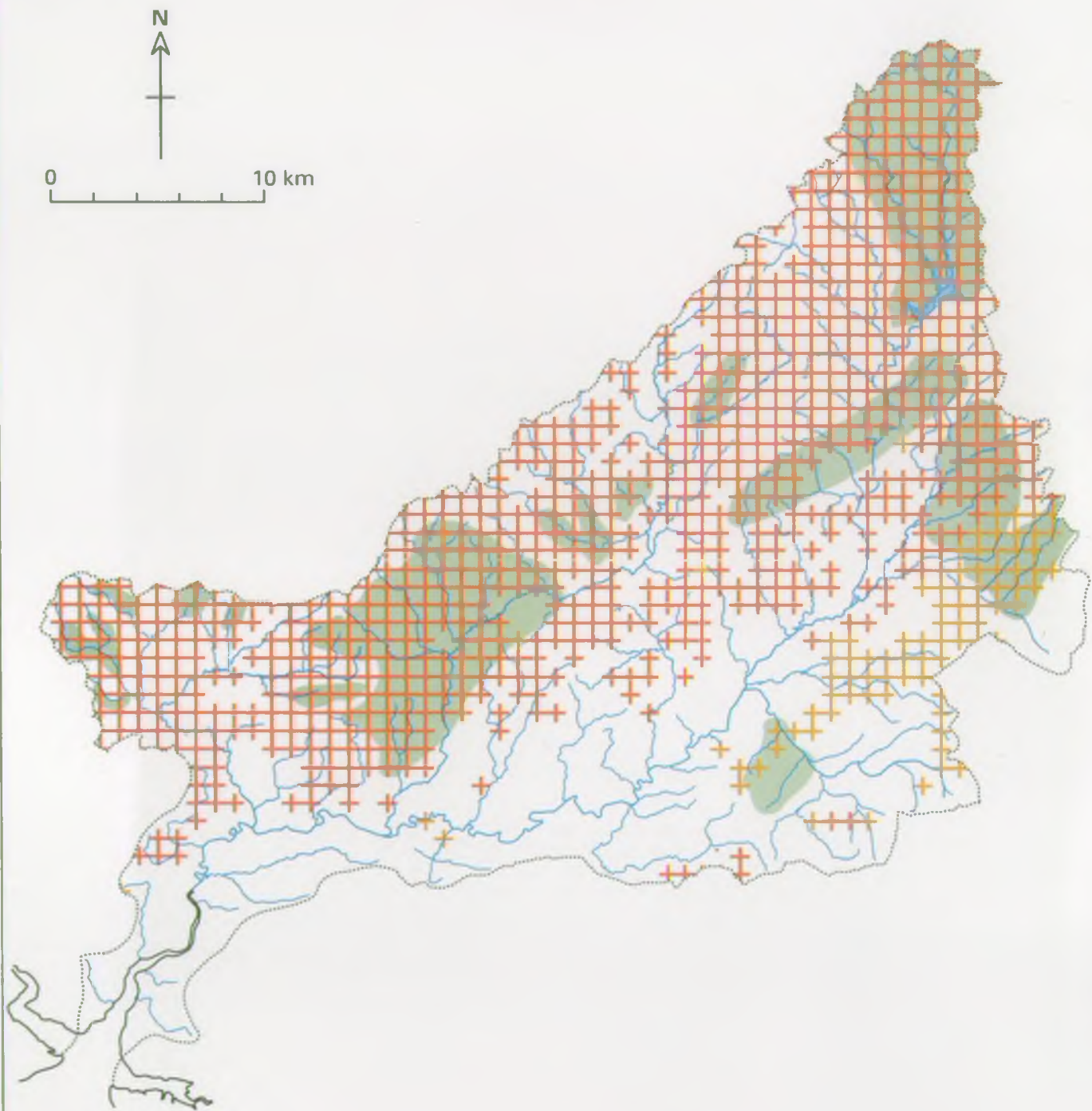
Water Quantity The Authority will develop and implement a Regional abstraction licensing policy that will enable the effective management of water resources within the catchment. This will achieve the right balance between the needs of the environment, abstractors and other river users.

Physical Features Land drainage activity should not adversely affect the fishery and conservation value of rivers.




Agricultural processes should not lead to a reduction in the quality of physical habitats of fishery and conservation value nor increase river instability or flood risk.

MAP 26.

FORESTRY



KEY

-  CONIFEROUS FORESTRY
-  ACID SENSITIVE AREAS – HIGH RISK
-  ACID SENSITIVE AREAS – LOW RISK

4.20 FORESTRY

General

As a result of successive Government policies, the use of land for coniferous forestry has increased dramatically over the past 40 years. However, it has become increasingly apparent that in certain circumstances, conversion of land to coniferous forest can have a range of adverse impacts on the water environment. These include:-

- Increased sediment load and run-off rate to rivers that can increase the flood defence maintenance requirement and may also destroy key conservation features.
- Increased water use by the trees can also reduce the baseflow in the streams and rivers in the catchment.
- In sensitive areas water quality can become too acid for fish and other wildlife to survive, as the dense tree canopy increases the effects of acid deposition often referred to as 'Acid Rain'.

Consequently the NRA has worked closely with the Forestry Authority and others in the production of Forests and Water Guidelines that are designed to minimise impact of forest management on the water environment. While forest development is outside the normal planning process, some local authorities have decided to produce Indicative Forestry Strategies that will outline the future of managed forests in England and Wales. The NRA is an informal consultee on these strategies, but is pressing for a more formal role in this and other aspects of forest planning.

A survey of the soil types and geology in England and Wales has been undertaken by the Institute of Terrestrial Ecology. This highlighted areas in the Welsh Region where afforestation may pose a risk to water quality. This 'indicative' information will be used to screen consultations received on future forestry developments. Forestry proposals which relate to any sensitive areas shown on the map opposite will be considered on a case by case basis, by the NRA.

Local Perspective

A significant proportion (15%) of the catchment is dominated by coniferous forestry, totalling an area of some 20,000 ha. Much of this forestry is in the upland section of the catchment. Forest Enterprise has the largest landholding including Brechfa, Tywi and Crychan Forests. Upland soils in this area are prone to acidification, and this is exacerbated by coniferous afforestation.

Acidification studies around Llyn Brianne, which commenced in 1981, have assessed the various processes involved. A variety of land management techniques and liming strategies, that may have potential in the future for ameliorating the effects of surface water acidification, have also been assessed. These, and other specific studies, identified the upper Tywi catchment to be particularly susceptible to surface water acidification. This culminated in a direct lake liming project of Llyn Brianne by the NRA. Following an initial 850 tonne dose in 1991, subsequent bi-annual applications of 500 tonnes have reduced acid water effects on 17km of the river downstream of Llyn Brianne. A long-term commitment to liming will be dependent upon adequate funds being made available within the NRA and/or from other interested bodies (the annual cost of liming is £51,000 - 1993/94 figures).

Map 26 indicates the areas of the Tywi catchment that have been shown to be sensitive to acidification by the ITE soil survey.

Objective To protect the water environment from the potentially adverse effects of forestry.

Environmental Requirements

Water Quality The provisions of the Forests and Water Guidelines should be complied with in all cases to minimise the impact of forestry on water quality.

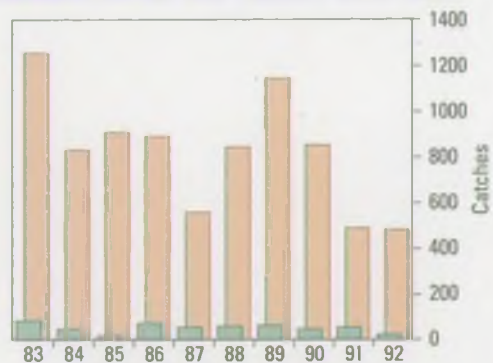
Water Quantity The Authority will develop and implement a Regional abstraction licensing policy that will enable the effective management of water resources within the catchment. This will achieve the right balance between the needs of the environment, abstractors and other river users.

Physical Features The provisions of the Forests and Water Guidelines should be complied with in all cases to minimise the impact of forestry on the physical environment

MAP 27.

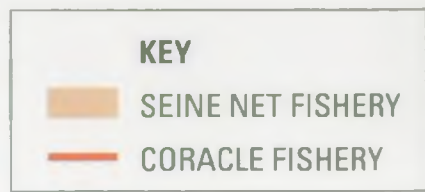
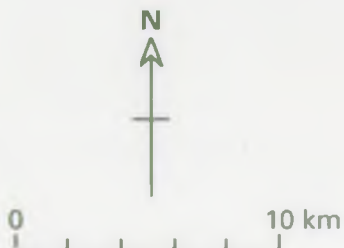
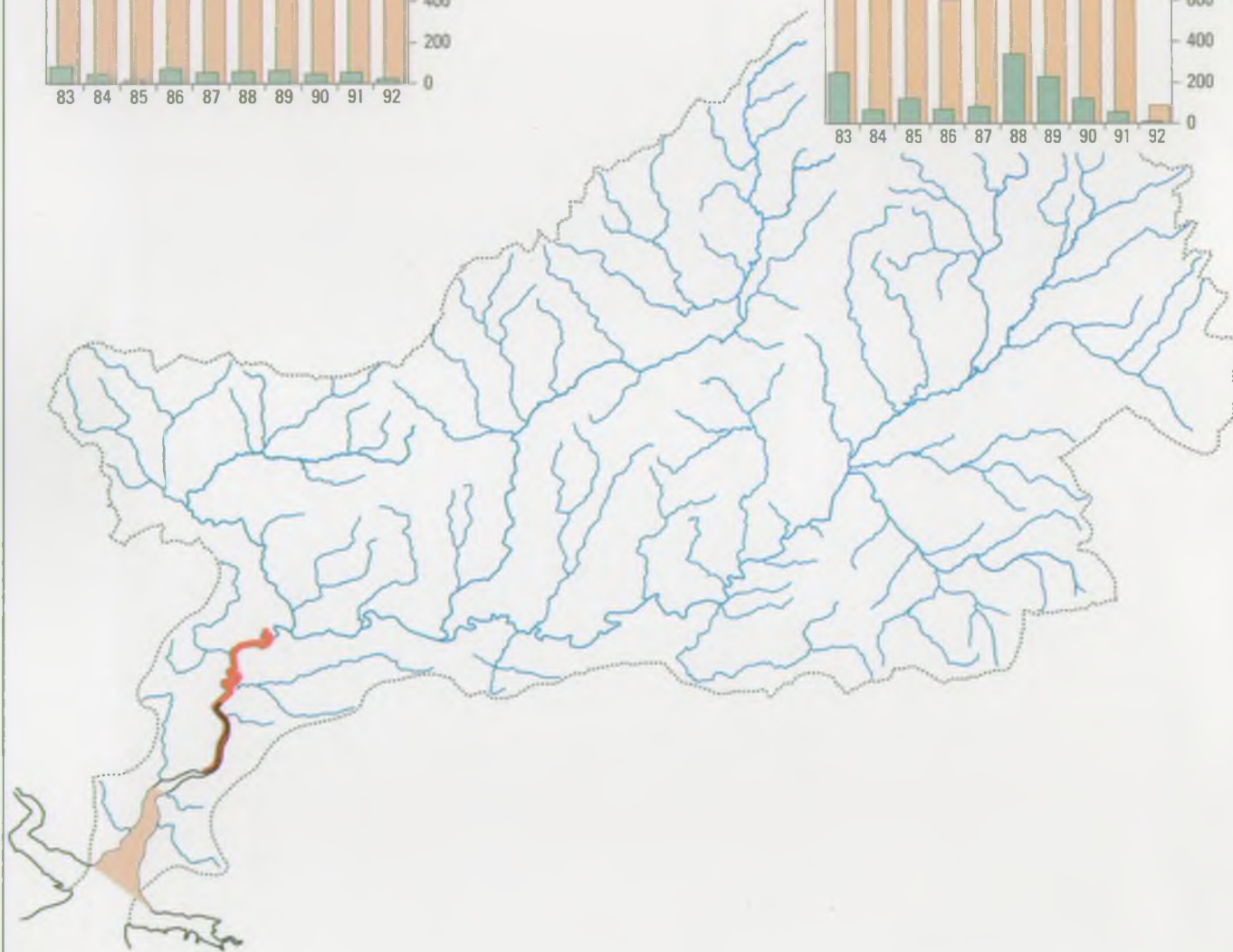
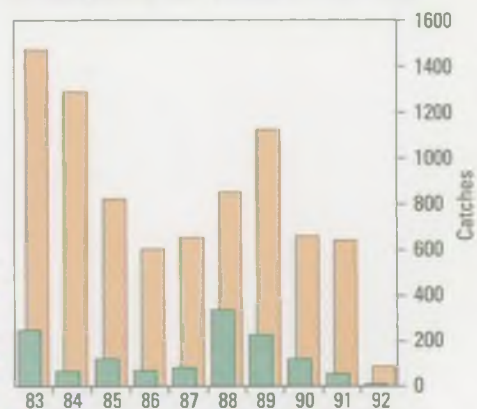
COMMERCIAL FISHING FOR SALMON AND SEA TROUT

Annual Coracle Net Catches 1983-1992



Sea Trout
Salmon

Annual Seine Net Catches 1983-1992



4.21 COMMERCIAL FISHING FOR SALMON, TROUT, FRESHWATER FISH AND EELS

General

This Use is principally concerned with the use of nets and other types of gear to catch migrating eels, salmon and trout or other freshwater fish. While fish can be caught commercially in freshwaters with rod and line this is still considered as angling and is covered by the rod licensing system. Other than sea fisheries, which are described in the preceding section, migrating adult salmon and sea trout are the main quarry for commercial fisheries in Wales and these are restricted to coastal waters and estuaries. The number of these fisheries is closely controlled by Net Limitation Orders that are designed to maintain stocks. The NRA licenses commercial salmonid fisheries within the terms of the Orders and enforces its provisions. In many places the fishing techniques allowed reflect local culture, and consequently in Wales there is a very wide variety of fishing methods employed. These range from coracles and nets to ranks of fixed traps.

The capture of eels and non-salmonid freshwater fish, other than by rod and line, is also licensed by the NRA. While there is no limit to the number of licences that can be issued, the NRA specifies certain methods that can be employed, and may refuse to issue a licence for a location if it feels that fish stocks could not support the fishery, or that the migration of salmon and trout could be impaired.

Local Perspective

Two commercial fisheries for salmon and sea trout exist on the Tywi estuary. Nine licences are issued annually for the operation of seine nets in the Ferryside/St. Ishmaels area and 12 licences for the coracle fishery downstream from Carmarthen. The season extends from the 1st March to the 31st August in any year and fishing is not permitted between 6.00 am on Saturday through to 12.00 noon on the Monday. During the period 1983-1992, the average annual catch for the seine nets was 132 salmon and 818 sea trout, with 52 salmon and 831 sea trout for the coracle nets.

Objectives

To ensure that commercial fishing takes place in a manner that does not over-exploit fish stocks or interfere with other legitimate uses of the water environment.

Environmental Requirements

Water Quality

Since the well-being of fish is dealt with in the Fishery Ecosystem section the protection of the working environment of commercial fishermen will be considered here. Consequently, water quality will be required to comply with the standards for Aesthetic Criteria.

Water Quantity The NRA is currently developing an abstraction licensing policy that will take account of the flow requirements of different uses in an objective and structured way. Meanwhile the NRA will seek to protect the range of flows that reflect as natural a regime as possible.

Physical Features To enforce the provisions of the Net Limitation Orders to ensure that stocks of salmon and sea trout are not endangered by commercial fishing.

To license and control commercial fishing for eels and non-salmonid freshwater fish to protect stocks.

To minimise conflict between the requirements of different fisheries.

Access points for commercial fisheries should be protected.

4.22 COMMERCIAL, HARVESTING OF SEA FISH AND SHELLFISH

General. Commercial fishing for sea fish and shellfish is controlled by a variety of laws and EC Directives. The NRA has some responsibility for each type of fishery although this is often shared with others, such as Local Authorities, Sea Fisheries Committees and the Ministry of Agriculture, Fisheries and Food (Welsh Office Agriculture Department, in Wales).

Sea Fisheries Sea fisheries are regulated by local Sea Fisheries Committees who control fishing sites and methods using bylaws that are drawn-up, where appropriate, in consultation with the NRA.

In Wales the Welsh Office monitors fish stocks and catches and is responsible for the registration of fishing vessels and enforcement of quotas.

Environmental Health Departments monitor the health and quality of fish flesh.

While the NRA has responsibilities in some coastal waters its principal concern is the protection of migrating salmon and sea trout, although in some places has powers (by agreement with local Sea Fisheries Committees) to enforce the protection of bass stocks in coastal waters.

Shellfisheries Like sea fisheries, shellfisheries (not including crabs, lobsters and other crustacea) are regulated by several different authorities, including the NRA. The shellfish themselves are protected by the provisions of the E.C. Shellfish Waters Directive that allows the NRA to protect and monitor water quality in designated shellfisheries. However, the Menai Strait is the only commercial shellfishery in Wales that has been designated under this Directive.

Shellfish are known to concentrate materials such as toxic algae, metals and pathogenic bacteria which can be harmful to people who eat them. Thus the quality of shellfish harvested for sale for human consumption is protected by the E.C. Shellfish Hygiene Directive that is administered by environmental health departments and MAFF (Welsh Office Agriculture Department, in Wales). So far about 30 sites in Wales have been designated under this directive.

Local Perspective *Following the introduction of MAFF Bass Conservation Area Regulations and South Wales Sea Fisheries Committee Byelaws, virtually no commercial fishing for sea fish is now carried out in the estuary, with the exception of a small number of stake nets on the foreshore which catch predominantly flatfish and mullet*

Shellfish, predominantly cockles and mussels, are harvested commercially in the lower estuary. Cockles occur on the foreshore at Ferryside and south of Llanstephan Castle with the main mussel bed being located south of St. Ishmaels.

Objectives To maintain and where possible enhance, marine and shellfisheries.

To protect migrating salmon and sea trout from interference by marine fishing activities.

Environmental requirements

Marine fisheries

Water Quality Discharges to coastal waters should be controlled so that standards for Aesthetic Criteria and Dangerous Substances are complied with.

Physical Features Marine fishing activities should not interfere with the migration of salmon or sea trout.

The physical marine environment should not be altered in a manner that would affect migratory fish stocks.

To enforce statutory measures that protect bass and other sea fish stocks, where appropriate.

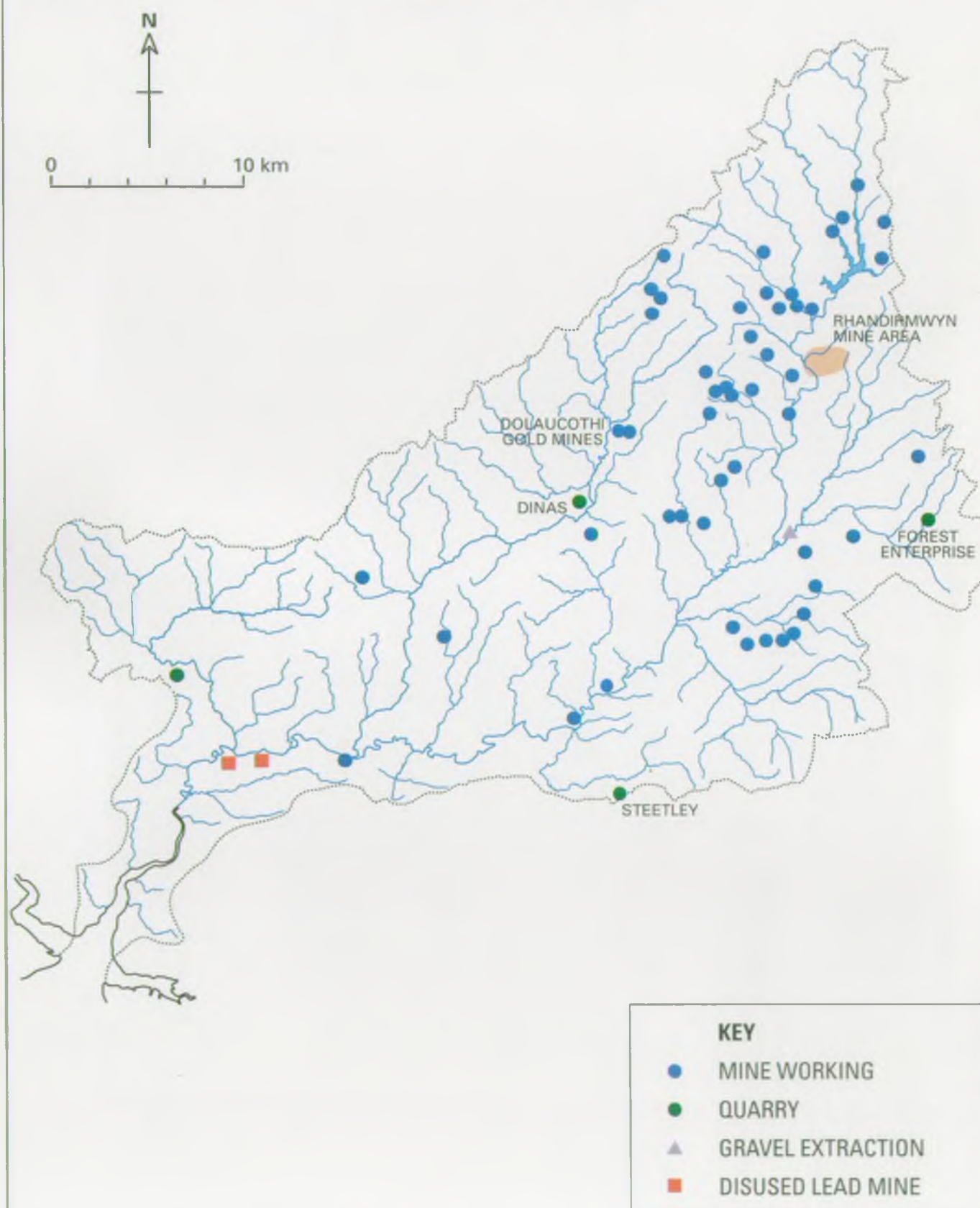
Shellfisheries

Water Quality Water quality at shellfisheries designated under the E.C. Shellfish Waters Directive should comply with the appropriate standards. The Shellfish Hygiene Directive has no associated target classes and therefore no Environmental Requirements can be set.

Where a recognised commercial shellfishery has not been officially designated under the EC Shellfish Waters Directive, the NRA, for the purpose of setting informal targets for Catchment Plans, will be guided by the provisions of that directive.

MAP 28.

MINERAL WORKING



4.23 MINERAL EXTRACTION

General

Mineral extraction can affect surface and groundwaters in a wide variety of ways. Discharges from active quarries and mines can contain toxic and suspended materials that are harmful to aquatic life and are subject to the normal discharge consenting procedure described in the Discharge Uses section. However, discharges from abandoned mines are not adequately controlled by the law and may cause locally severe problems.

The exploitation of minerals can have major impact on water resources by altering groundwater flows and hence affecting streamflows. The removal of material from above the water table reduces the opportunity for natural filtering and attenuation of pollutants, which will consequently enter groundwater more readily. Summer springflows can be reduced as a result of the loss of the water storage capacity of the mineral that has been removed. Reclamation with impermeable materials will increase run-off and reduce the recharge of groundwaters by rainfall.

Open cast mining can be of particular concern to the NRA. These mines can also affect the fishery and conservation value of long lengths of diverted river as well as groundwater quality and quantity.

Gravel extraction may take place from the river channel or floodplains and is controlled by planning law and may also require a land drainage consent from the NRA. If works are not properly managed, the river channel can be seriously damaged by gravel removal.

In some areas land reclamation schemes may cause renewed problems as toxic metals are exposed or fine solids run off into watercourses. Consequently such discharges are licensed and monitored by the NRA.

All mineral workings are subject to general planning control and the NRA is a consultee on such applications and considers each application on a case by case basis.

Local Perspective

Approximately 100,000 tonnes of limestone aggregate are extracted annually from Steetly Quarry at Trapp. Dinas Quarry at Llansawel provides up to 60,000 tonnes of gritstone each year, mainly for use in road surfacing. Both sites have Her Majesty's Inspectorate of Pollution (HMIP) authorisation, which is required for prescribed processes as part of the system of Integrated Pollution Control introduced in April 1991 under Part 1 of the Environmental Protection Act 1990. Regulation is the responsibility of HMIP, although site inspections are carried out periodically by the NRA.

Forest Enterprise utilises limited amounts of gritstone for forestry road maintenance from a number of small borrow pits which are located within forestry areas. Sand is also extracted for forestry use from a site within Halfway Forest, Llandoverly.

Of greater significance, in terms of water quality, are the numerous abandoned metal mine workings, particularly in the upper catchment. Two of the most productive sites in South Wales were Dolaucothi gold mines and the Nant-y-Mwyn lead and zinc mines at Rhandirmwyn. The Romans are alleged to have excavated some 500,000 tons of rock from surface pits alone at Dolaucothi. The last period of commercial exploitation was between 1935 and 1938. Since the early 1940s the site has been occupied by the National Trust, in collaboration with the University of Wales, which has undertaken extensive site rehabilitation and development encompassing a visitor and field centre. An ongoing programme of mine inspections by the NRA will provide an opportunity to appraise any further developments proposed at Dolaucothi.

In the Rhandirmwyn area, large amounts of lead ore were mined between 1700 and 1900. Limited water quality studies carried out in the 1980s identified discrete, heavy metal enriched discharges from associated adits, shafts and spoil heaps. No exhaustive study has been carried out to assess metal loadings; however, the most significant discharges occur in the Nant-y-Bai and Nant-y-Mwyn. Dyfed County Council has recently commissioned a survey on the feasibility of reclamation works. Any proposals would require consultation with the NRA.

Historically lead was mined at Llangunnor and Capel Dewi but this ceased many years ago.

Gravel extraction on statutory main rivers requires NRA consent under the Water Resources Act 1991 (Byelaws). Due to the environmental impacts of these operations, extraction is limited to a six week period, from 15th August to 30th September. There are several locations where gravel is extracted for private use, but presently Llwyn Jack, just below Llandoverly, is the only site where gravel is extracted for commercial purposes.

Objective To ensure that mineral extraction and associated activity, including land reclamation, does not adversely affect the water environment.

Environmental Requirements

Water Quality All consented discharges must comply with the conditions stated within the consent. This will be enforced by the NRA.

There should be no deterioration in water quality above a consented discharge, from that assumed when the discharge consent was calculated.

Measures must be taken to prevent diffuse pollution that may arise from rainfall run-off.

Water Quantity

Mineral working and land reclamation should not have an adverse effect on surface and groundwater resources or the rights of water abstractors.

Physical Features

Mineral working, land reclamation and associated activity should not reduce the quality of the physical habitats available in the water environment.

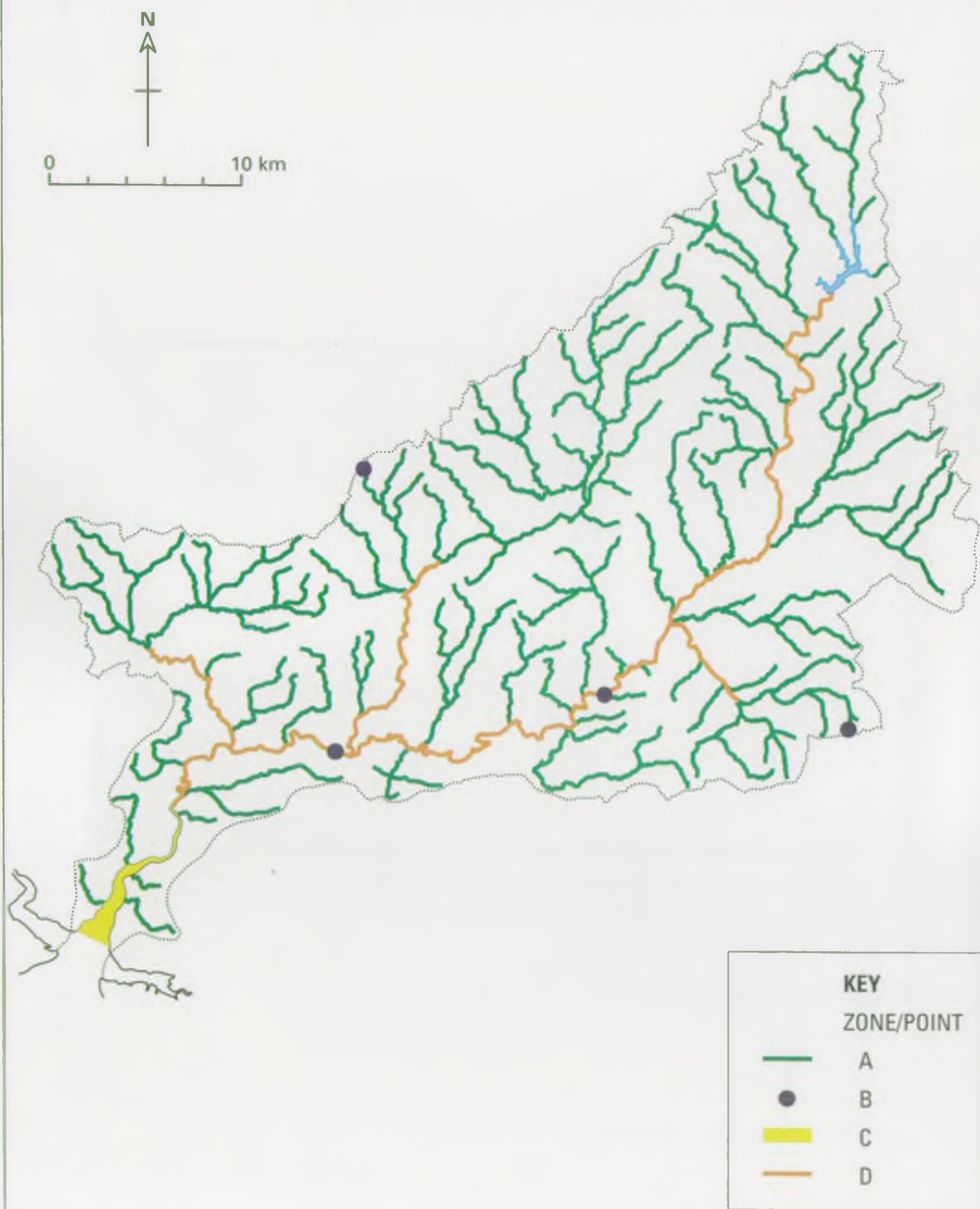
The aesthetic quality of restored landscapes should be in keeping with the overall nature of the catchment and reflect the local needs for amenity and recreation.

5.0 CATCHMENT TARGETS

In this Section, using objectives and requirements outlined for each Use, in Section 4, a variety of formal and informal catchment targets are set for Water Quality, Water Quantity and Physical Features. Different targets will be set for many places depending upon the most sensitive Use that has been identified. If the targets protect this Use, then others that are less sensitive will also be protected.

MAP 29.

WATER QUALITY TARGETS



5.1 WATER QUALITY TARGETS

General

There are two aspects of water quality assessment; the first relates to the classification of waters according to a graded system, the second to the measurement of achievement of specific targets. The first aspect has, for many years, involved using the former National Water Council (NWC) system where water quality classes range from excellent to very poor. In future this will be superseded by the General Quality Assessment Scheme currently under development within the NRA. The new system will also include biological and fisheries elements and will provide an overall snapshot view of river water quality across the country.

For Catchment Management Plans the performance of waters is assessed against specific water quality targets. The targets are set to protect specific Uses of the catchment and call on water quality standards that have been determined for each use. These standards are based on the existing sources of data, especially the EC Directive for Bathing Water, Freshwater Fisheries, Dangerous Substances and Urban Wastewater Treatment and are constructed to give a complete coverage of water chemistry. The targets set represent the most stringent water quality requirement and reflect the visionary concept of Catchment Plans.

Water Quality Targets for CMPs

For Catchment Management Plans the performance of waters is assessed against specific water quality targets. The targets are set to protect specific Uses of the catchment and call on water quality standards that have been determined for each use. These standards are based on the existing sources of data, especially the EC Directive for Bathing Water, Freshwater Fisheries, Dangerous Substances and Urban Wastewater Treatment and are constructed to give a complete coverage of water chemistry. The targets set represent the most stringent water quality requirement and reflect the visionary concept of Catchment Plans.

WQOs

In recognition of the benefits of this use-related approach to water quality management and assessment, the NRA has recommended a system to the Department of the Environment, which in line with the provisions of the Water Resources Act 1991, can give Water Quality Objectives (WQOs) a statutory basis. If the system is approved these Water Quality Objectives will be ultimately introduced to all catchments via the Catchment Planning programme.

Local Perspective

By considering the water quality requirements of each Use, three water quality zones, plus one point target, have been identified where the following water quality requirements apply:

CATCHMENT TARGETS

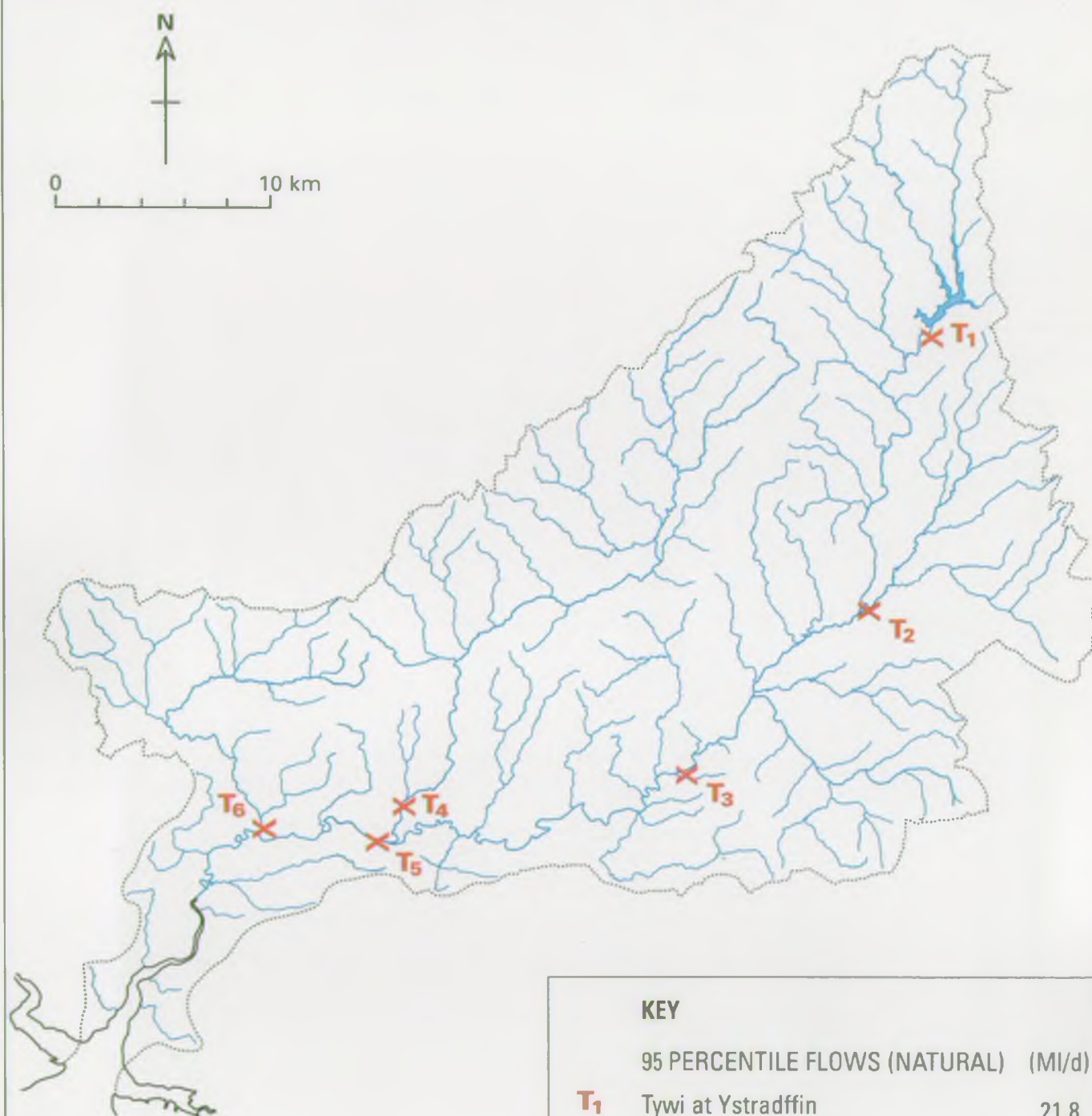
	Zone A	Point B	Zone C	Zone D
Suite 1: Aesthetic Criteria	*	*	*	*
Suite 2: List I Substances	*		*	*
Suite 3: Fisheries Ecosystem (#)	*		*	*
Suite 5: Bathing and Water Sports			*	*
Suite 6: Shellfish Waters			*	
Suite 7: Potable Abstraction		*		

* water quality suite applies.

Fe Class 1 standards have been set as targets for all rivers in the Tywi catchment, based upon the hierarchical FE Classification. Appropriate estuarial standards have been applied to the Tywi estuary.

MAP 30.

WATER QUANTITY TARGETS



KEY

95 PERCENTILE FLOWS (NATURAL) (MI/d)

T₁	Tywi at Ystradffin	21.8
T₂	Bran	15.5
T₃	Tywi at Manorafon	171.8
T₄	Cothi at Felin Mynachdy	67.5
T₅	Tywi at Capel Dewi	316.0
T₆	Gwili	38.3

5.2 WATER QUANTITY TARGETS

General

The implementation of the Water Resources Act 1963 required almost all types of abstraction to be authorised by a licence. Pre-existing abstractions had to be granted a Licence of Right in 1965 that reflected the historical abstraction regime and could not take into account its impact. Subsequently, licences have been granted only if they do not adversely affect existing abstractors and the environment, or if conditions can be imposed which restrict their impact.

The NRA takes a precautionary approach to the granting of new licences, and will only grant them if it is confident that the available resources are able to sustain the proposed abstraction in the long term without harm to the environment or existing abstractors.

The NRA currently is developing an abstraction licensing policy that will allow it to consider in a structured way the environmental needs of the river system and to balance these with the needs of abstractors.

A methodology for the assessment and prioritisation of rivers that suffer artificially reduced flows is already in use. In Welsh Region the production of Catchment Management Plans will aid this process.

The NRA will seek to balance the needs of existing and potential abstractors with those of the environment.

Local Perspective

The principal abstraction use of water in the catchment is for potable water supply. The Tywi between Llyn Brianne and Nantgaredig is used as the conduit for water abstracted at the downstream location. Regulating the Tywi affects the natural flow regime by increasing flows during dry weather and reducing flows in the autumn when the reservoir is refilling. The effect is greatest immediately downstream of the reservoir and is diminished as natural tributary flows enter the Tywi. Downstream from Nantgaredig the flow in the Tywi is reduced by the abstraction because much of the water abstracted is supplied to locations outside the catchment, and night-time flow rates are frequently lower than day-time flow rates.

Abstraction from the Tywi tributaries is relatively minor and hence the flows retain a natural regime.

The Tywi is an important river for salmonid fisheries, and therefore one of the primary targets is to balance the needs of fisheries with abstraction. Fundamental to this is the effective use of the reserve of water retained in Llyn Brianne for use by the NRA to provide artificial freshets.

Flow Requirements *In the absence of the policy to assess in-river needs for the watercourses within the catchment, the natural 95 percentile flows have been calculated to give an indication of the flows that should be the targets for protection when considering abstraction licence applications (see Map 30). The 95 percentile flow is that flow which one would expect to be exceeded 95% of the time on average. This is an estimate of the dry weather flow which the river would be at, or below, for 18 days per year on average.*

5.3 PHYSICAL FEATURES TARGETS

General

Many Uses are affected by the physical characteristics or features of the river and this is especially true of Uses related to wildlife and its conservation. The habitat requirements of the wildlife associated with rivers are too complex to allow simple targets to be set, even if such habitats could be effectively measured. Consequently until such a time as quantitative physical targets can be set, Catchment Plans will adopt the general theme that the abundance and diversity of physical features typical of the type of river, should be maintained and where possible, improved. This requires subjective assessment by trained staff. The NRA is also developing a habitat classification system and use related targets for physical features such as spawning and nursery sites for fish.

In a similar manner the physical features requirements of recreational Uses of waters cannot yet be quantified in order to set firm targets, again professional judgement must be used.

Flood Defence targets nearly all relate to physical features and the requirement for the river channel to contain certain specified flows at different points in its length.

Local Perspective

There are many Uses in the catchment which have their own physical features requirements. The following requirements are considered targets for the Tywi catchment:

Flood Defence

Operational Activity

The NRA will provide a cost effective flood defence service, as follows:

- *Protection of people and property from inundation by floodwaters:*
 - (a) *for domestic, commercial and industrial property against flood events up to 100 year frequency and;*
 - (b) *for land, against flood events up to 5 year frequency, depending upon land use.*
- *Provision of adequate outfalls to existing land drainage systems, to allow them to perform efficiently, where this is still required by landowners.*
- *Provision of suitable access for maintenance of the river/channel and sea/tidal/flood defences and for the construction of new defences as required.*

- *Maintenance of unobstructed river flow by the removal of silt and other obstructions, especially in urban areas.*
- *Continuous operation of flood defence structures to ensure adequate flood protection.*

The NRA will carry out all its flood defence works in an environmentally sensitive manner.

Regulatory Activity

- *The NRA, in its role as statutory consultee under the planning legislation, will advise the Local Planning Authorities on all flood defence matters, particularly with a view to encouraging planning authorities to use their planning powers to guide development away from flood risk areas.*
- *For particular developments, the NRA will aim to avoid development taking place:*
 - (a) *on land where flood protection standards are sub-standard or*
 - (b) *when an increase in flood risk would result.*
- *The NRA will exercise control, via its consenting powers, over all proposed developments which impact directly on main river channels and the adjoining land falling within 7 metres of the top of the bank. For all watercourses it will control any proposed culvert works or works that will obstruct flow.*

Fisheries

Through its operational, regulatory and advisory activities, and particularly in its role as a statutory consultee to the Local Planning Authorities, the NRA will endeavour to ensure that there is:

- *suitable habitat for fish breeding with an adequate distribution of potential redd sites and nursery areas.*
- *unimpeded access for migratory fish through the estuary and river to and from all potential spawning reaches (where appropriate), with adequate holding pools and cover throughout the catchment.*
- *effective fish screening on all abstractions and discharges (where necessary) to protect wild fish stocks and prevent escapement from fish farms.*

The NRA has declared its intention in its recently published Fisheries Strategy to set specific targets relating to fish stocks and spawning success. The results of continuing fisheries monitoring surveys in the catchment will assist in the determination of these targets, as will the data collected from rod and net catch returns.

Conservation

The NRA is currently developing a national habitat classification scheme. This scheme, and the results for the 1993 River Corridor Surveys, will assist in setting specific targets for conservation. Through its operational, regulatory and advisory activities, and particularly in its role as a statutory consultee to the Local Planning Authorities, the NRA will endeavour to ensure that:

- *the current diversity of natural features such as bankside features, wetlands, emergent vegetation, meanders, pools and riffles are maintained in order to conserve river corridors and safeguard landscape quality; improvements are effected and degraded features reinstated where possible. In order to achieve this, water fringe buffer zones should be fenced off wherever possible to protect waterside habitats from damage. Livestock watering points should be clearly defined to protect river banks from degradation.*
- *for each SSSI and NNR potentially affected by NRA activities a "standard of service" that will maintain, and if possible enhance, the conservation value of the site, is agreed with CCW.*
- *areas of degraded wetland and riverine habitat are identified and, where possible, restored to a level at which they support a range of species typical of similar habitats elsewhere in the catchment.*
- *the physical structure of archaeological sites and their settings is maintained and, where possible, enhanced, recognising the interdependence of many of the sites and monuments. Where unavoidable change occurs, the original detail of the site should be carefully recorded.*
- *the survival and, where necessary, reinstatement of threatened fish populations is promoted. This will include not only rare species (e.g. shad), but also specific local strains of more common native species.*
- *control of the spread of Japanese Knotweed and other alien weeds is undertaken as required under the Wildlife & Countryside Act 1981.*

Recreation

Through its operational, regulatory and advisory activities, and particularly in its role as a statutory consultee to the Local Planning Authorities, the NRA will endeavour to ensure that:

- *an appropriate network of riverside paths and access points is maintained and, where appropriate, promoted.*
- *protection is given to existing recreational sites, and that the development of new sites is promoted at suitable locations, as opportunities arise.*
- *consideration is given to the design of paths, access points and recreational developments, taking into account, wherever possible, the needs of the infirm and disabled.*
- *provision is made for both canoe touring and white water canoeing, where appropriate, within the catchment.*

Having identified and described the legitimate Uses in the Tywi catchment, and set targets to support them in terms of water quality, water quantity and physical features, the ability of the catchment to support these Uses has been assessed. Significant areas of conflict between legitimate Uses have been identified. The results of this analysis are presented in Section 3, Part I of this report.

APPENDICES

APPENDIX 1**THE GROUNDWATER PROTECTION POLICY**

The preservation of groundwater quality and quantity is a major objective of the NRA. Limiting the risk from pollution and over abstraction must be dealt with in a structured methodical manner.

The NRA has therefore produced a "Policy and Practice for the Protection of Groundwater" which provides advice on the management and protection of groundwater on a sustainable basis. The Welsh Region is implementing this national framework policy for the protection of groundwater which will effectively manage groundwater protection in the Tywi Catchment. This new policy deals with the concept of vulnerability and risk to groundwater from a range of human activities. It considers both source and resource protection, together with policy objectives of the NRA with respect to the threat to groundwater from abstraction, physical disturbance of groundwater flows, waste disposal, contaminated land, discharges to underground strata, disposal of sludges to land and diffuse pollution.

The implementation of the policy relies in part on the construction of a series of protection zone maps. Resource protection maps will be produced after consideration of vulnerability of groundwater based on the nature of the strata and type of soil and drift.

The Policy recognises three groundwater source protection zones.

Zone I (Inner Source Protection)

Immediately adjacent to the source area defined by a 50-day travel time from any point below the water table to the source (based on biological contaminant decay).

Zone II (Outer Source Protection)

Area defined by 400-day travel time (based on the delay and attenuation of slowly degrading pollutants).

Zone III (Source Catchment)

The complete catchment area of a groundwater source. The controls to be exerted on a given activity will be more stringent the more vulnerable the resource and the nearer the source.

APPENDIX 2**THE NATIONAL BIOLOGICAL CLASSIFICATION SCHEME (PROPOSED)**

A National biological classification scheme is currently being prepared as part of the General Quality Assessment (GQA) scheme (DoE 1992)*. The diversity of the aquatic macroinvertebrate fauna can reflect water quality and is useful in detecting intermittent reductions in quality, and pollution caused by chemical parameters that are not monitored. These events may not be detected by routine water quality monitoring because of their infrequent occurrence and short duration.

The proposed classification scheme would allow rapid comparison between chemical and biological quality for a given river and therefore highlight areas where disparity between the two occurs for further investigation.

The Tywi Catchment

Data from biological surveys carried out during 1990, 1991 and 1992 were classified using a prototype classification system. This scheme, called BAPC (BMWP** averages which parallel the chemical grading system), classifies sites according to the ratio of observed and predicted BMWP scores derived from family level identification of invertebrates. A class (a-f) was calculated for each site where biological information existed. This was then compared with the chemical classification for the respective site using the Regional application of an earlier version of the chemical component of the GQA scheme. Descriptions of the biological and water quality classifications used are provided overleaf.

* DoE/VO 1992: River Quality, The Governments Proposals: A Consultation Document.

** BMWP - Biological Monitoring Working Party.

General Quality Assessment Scheme for rivers

Class	Chemical Classification			Biological Classification	Aesthetic Classification	Nutrient Status Classification
	DO % sat 10%ile	BOD mg/l 90%ile	Ammonia mg N/l 90%ile	EQI (BAPC) (indicative - to be finalised)	Basic Amenity Score (indicative - to be finalised)	- to be developed
A	80	2.5	0.25	1.0	10	
B	70	4.0	0.6	0.8	8	
C	60	6.0	1.3	0.6	6	
D	50	8.0	2.5	0.4	4	
E	20	15.0	9.0	0.2	2	
F	<20	-	-	<0.2		

APPENDIX 3**GLOSSARY OF TERMS, UNITS AND ABBREVIATIONS****ABSTRACTION**

When someone takes water from a river, stream, spring, pond, lake or from groundwater they are 'abstracting' the water and they are making an 'abstraction'.

ALGAE

Simple plants which may be floating or attached. They can be microscopic or very large plants but they lack true stems. Like all plants, they are capable of photosynthesis. Algae occur in still and flowing water and are often discussed in the context of Eutrophication (see below).

AMMONIA

A chemical which is often found in water as the result of the discharge of sewage effluents. It is widely used to characterise water quality. High levels of ammonia adversely affect the quality and use of water for fisheries and abstractions for potable water supply.

AOD (ABOVE ORDNANCE DATUM)

Land levels are measured relative to the average sea level at Newlyn in Cornwall. This average level is referred to as 'Ordnance Datum'. Contours on Ordnance Survey maps of the UK show heights above Ordnance Datum.

AQUATIC ENVIRONMENT

The rivers, streams, lakes, ponds, springs and features that depend on natural waters such as bogs, wetlands and so on.

BOD

An abbreviation for Biochemical Oxygen Demand. This is an estimate of the rate at which biological and chemical processes use up the available oxygen.

CATCHMENT

The area of land draining to a defined point. In this plan, the Tywi catchment is the area of land which drains to the Tywi river and estuary as far as the headlands of Ginst and Tywyn points.

CLASSIFICATION/CLASSES

A way of placing waters in categories (classes) according to assessments of water quality based, for example, on measurements of the amount of particular chemicals in the water (especially BOD, dissolved oxygen and ammonia).

COARSE FISH

Freshwater fish other than salmon and trout.

CONSENT

A Discharge Consent is a statutory document issued by the NRA to indicate any limits and conditions on the discharge of an effluent to a controlled water.

Also a different statutory document issued by the NRA. Known as a Land Drainage Consent, it authorises works to the beds and banks of a river which have been approved by the NRA.

CONTROLLED WATERS

All rivers, lakes, groundwaters, estuaries and coastal waters to three nautical miles from the shore.

DANGEROUS SUBSTANCES

Substances defined by the European Commission as in need of special control. This is because they are toxic, accumulate and concentrate in plants and animals, or do not easily break down into less dangerous substances. They are classified as List I or List II.

DISSOLVED OXYGEN

The amount of oxygen dissolved in water. Oxygen is vital for life, so this measurement is an important, but highly variable, test of the 'health' of a water. It is used to classify waters.

ECOSYSTEMS

A group of animals and plants which live together within a certain type of surrounding or habitat (e.g. woodland, pond).

EC DIRECTIVE (Control)

A type of legislation issued by the European Community which is binding on Member States and sets standards and results to be achieved.

EUTROPHIC/EUTROPHICATION

Terms which describe water which is rich in nutrients or the process of enrichment. At worst, such waters are sometimes beset with unsightly growths of algae.

FAUNA

Animal life.

FISHERIES ECOSYSTEM

This is the name of the first of the Uses to be developed within the new Water Quality Objectives scheme being developed by the DoE, in conjunction with the NRA. It is designed to protect the general ecology of rivers and has six different classes of water quality (FE1-6) that can be set as objectives. The classes are hierarchical and are based upon the water quality requirements of different native fish species. Although the scheme has not yet been ratified by the Secretaries of State, Welsh Region of the NRA is using the proposed system to set **informal** water quality targets for CMPs.

FLORA

Plant life.

FRESHET

A naturally or artificially generated increase in river flow after a period of dry weather, having the effect of enhancing water quality and the aquatic environment eg. through improved levels of dissolved oxygen and flushing of accumulated debris and silt.

FRY

Fish which are less than 1 year old.

GAUGING STATION

A site where the flow of a river is measured. Sometimes a weir is used to assist the measurement.

HABITAT

The natural home of plants and animals. Different plants and animals have different needs, and so live in different habitats.

LEACHATE

Removal of soluble substances by action of water percolating through soil, waste or rock.

LIST I AND LIST II SUBSTANCES

European Community Directive 76/464/EEC aims to reduce pollution in controlled waters by certain dangerous substances. These consist of chemicals selected mainly on the basis of their toxicity, persistence and bioaccumulation. These substances are divided into 2 categories:

- List I substances are considered to be the most harmful. Pollution caused by these must be eliminated.
- List II substances are less harmful and pollution caused by these must be reduced.

m³/d

Short for cubic metres per day. There are 1000 litres in a cubic metre, and 1000-cubic-metres-in-a-megalitre (MI). In Imperial Units, there are 220 gallons in a cubic metre.

MACROINVERTEBRATE FAUNA

Small aquatic animals, such as insects, snails and worms which live in the river bed.

STATUTORY MAIN RIVER

A legal definition which defines particular rivers and streams on special maps. On the 'Main River', the NRA has permissive powers to construct and maintain defences and to control the actions of others through Byelaws and the issue of Consents. Any proposal that could interfere with the bed or banks or affect the flow of the river requires formal consent from the NRA.

MI/d

Short for megalitres per day, a standard international unit of measurement. There are a thousand cubic metres in a megalitre and one million litres in a megalitre. In Imperial Units, one megalitre is about 220,000 gallons.

PARAMETER

A general name for a characteristic or aspect of water quality. It is often a feature which can be described numerically.

PARR

Salmon which are 1 or more years old which have not yet gone to sea.

PERMISSIVE POWER

The NRA is given various powers to do things by a number of Acts of Parliament. Some of these powers are 'permissive', which means the NRA can do these things, but is not under a duty to do them. For example, NRA has permissive powers to construct flood defences, but does not have a duty to do this. In contrast, the NRA has certain statutory duties, i.e. things it must do, e.g. it must authorise abstractions, discharges and works to the bed or banks or main rivers.

POOL

A distinct, deeper area of slow flowing water, often with an eddying flow and often found between fast flowing stretches which are known as 'riffles'.

REACH

A length of a river.

REDD

Salmon excavate a depression in river gravels into which they lay their eggs. The eggs are then covered with gravel. This 'nest' is known as a 'redd'.

RIFFLE

Fast flowing shallow water with a distinctly broken or disturbed surface. Riffles are often found between pools.

RIVER CORRIDOR

A term which describes a stretch of river, its banks, and a varying amount of adjacent land that is affected by the presence of the river.

SALMONID FISH

Game fish, e.g. trout and salmon.

SMOLT

At a particular stage of their development, young salmon and sea trout migrate to the sea, and at this stage are known as smolts.

SPRING RUN

Salmon return from the sea to freshwater rivers when adults. They migrate up the rivers to spawn, and this upstream migration is known as the 'run'. There are two main periods of the year when the runs occur which are in spring and autumn. The spring run fish are generally larger than later-run fish, and are often more prized by anglers.

SSSI

Abbreviation for 'Site of Special Scientific Interest'.

SURFACE WATERS

This is a general term used to describe all the water features such as rivers, streams, springs, ponds and lakes.

TELEMETRY

River level stations record the levels every 15-minutes electronically at the gauging station. The telemetry system is a computer system that can contact these stations and ask it to send the level data back to the computer over the public telephone system. The computer then stores the data in its memory. The level data can then be converted to flows automatically by the computer. Some raingauge data is obtained in the same way.

WETLAND

Wet areas of a river catchment where the flora and fauna that live there are dependent on that 'wetness' for their survival.

95-PERCENTILE FLOW

The flow which one would expect to be exceeded 95% of the time on average. This is an estimate of the dry weather flow which the river would be at, or below, for 18 days per year on average.