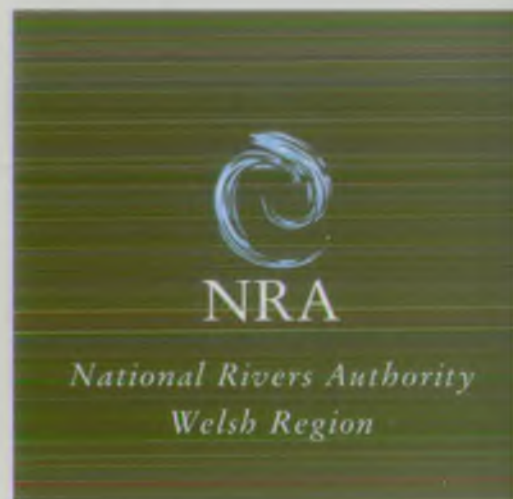


CLWYD CATCHMENT MANAGEMENT PLAN CONSULTATION REPORT: JULY 1994



**CLWYD CATCHMENT MANAGEMENT PLAN
CONSULTATION REPORT**

May 1994

**National Rivers Authority
Welsh Region**

ENVIRONMENT AGENCY



091992

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THE NRA'S VISION FOR THE CLWYD CATCHMENT

The Afon Clwyd catchment plan covers an area more immediately known for the coastal attractions of towns such as Llandudno, Colwyn Bay, Rhyl and Prestatyn, than for the river valley itself. But behind this important coastline lies a landscape of great beauty and high conservation interest within a predominantly agricultural catchment.

Away from the coastal belt the area is sparsely populated, with the only sizeable population centres being the towns of Ruthin and Denbigh. Water quality is generally very good, reflected in the surface and groundwaters abstractions made for drinking supplies, and supports important salmonid fisheries.

However, there are issues which must be addressed if the potential of the plan area is to be realised.

Surface and groundwater resources are finely balanced and only careful management will ensure that groundwaters are not in future depleted. Coastal water quality, important to the tourist industry, requires improvement through introducing new sewage disposal schemes whilst pollution prevention activity is essential towards reducing the number of agricultural and other incidents affecting freshwaters. Some of the acidification issues in upland waters will need to be resolved in conjunction with the forestry bodies.

The generally experienced decline in salmon and sewin fisheries could be partly ameliorated through opening up barriers to migration within the river system. There is also a need to make the area more accessible for those interested in more passive pursuits.

The NRA is thus faced with a considerable challenge in preparing the Clwyd catchment plan area for the 21st century. But it is not a challenge that the NRA can face alone, realisation of many of these aspirations will require the committed and enthusiastic co-operation of others.

Through working with all other agencies and representative bodies, the NRA hopes to achieve a shared vision of safeguarding water supplies, improving coastal and inland water quality, arresting and reversing the decline in migratory fisheries and expanding general access to the river system. All this must be achieved in harmony with those who live and work in the area, thus particularly requiring that the NRA is successful in influencing the planning processes of local government.

The achievement of this vision ultimately depends on all users working with the NRA to achieve a balanced approach to management so that the qualities of a pristine catchment can, as far as possible, be attained without interruption to economic and social progress.

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**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 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. 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

CMPs have the following common objectives:

- We want the Plans to provide a focus for the formation of agreements between water users about the future development of the catchment.
- We will use the Plans to provide a consistent and appropriate response to external pressures, including development proposals, to aid forward planning of development in the catchment and to strengthen links with the Planning Authorities.
- The Plans will enable us to be more effective and will help in the allocation of our resources and the resources of others.
- The Plans will provide a targeted Action Plan that will detail the measures required of the NRA, and others, to solve problems identified in the catchment.
- We may use the Plans to provide a framework to implement a new system of Water Quality Objectives (WQOs) under development at the Department of the Environment (DoE). These objectives will be use-related and may be given a statutory status following public consultation and agreement by the Secretaries of State.

We have adopted a multidisciplinary approach that requires the involvement of all our Departments and a large degree of cooperation with other organisations and the public to resolve problems and conflicts.

As users of the catchment, we want you to have an opportunity to contribute to our CMPs and so the production of each Plan has two separate phases, spread over two years.

Phase 1 In the Consultation Report we identify the legitimate and realistic 'Uses' of the catchment and promote protective targets. We also assess the current ability of the catchment to support the Uses and include a draft outline of the work required to remedy any identified problems. We distribute this document to the public as part of a wide ranging consultation procedure.

Phase 2 The Final Plan is produced after we have considered the comments received on the Consultation Plan and presents our Action Plan for the future management of the catchment. The Action Plan details the nature of the work required, the cost, timescale and responsible organisation(s).

The following system is used to produce each Catchment Management Plan:

1. Uses of the Catchment:

We identify existing and future uses and describe their key locations and details.

2. Catchment targets:

After reviewing the uses and their requirements we set overall targets for water quality, water quantity and physical features that are designed to protect the interests of identified water users.

3. Catchment status:

Areas where the catchment is unable to support identified uses are detected by analysis of existing information.

4. Issues and Options:

Finally we outline the issues relating to the identified problems and examine the options available to us. We identify people who are responsible for carrying out the remedial measures and then consult the public and other interested parties about our proposals.

5. Revision:

To produce a Final Plan we move forward from the Consultation Plan and take your comments into consideration. We also introduce an Action Plan that represents our *vision* for the catchment over the next 5-10 years. The contents of this Plan will, where this is possible, have been agreed between ourselves and any others who are implicated. There will also be information on the projected costs and timescales for the work that needs to be done.

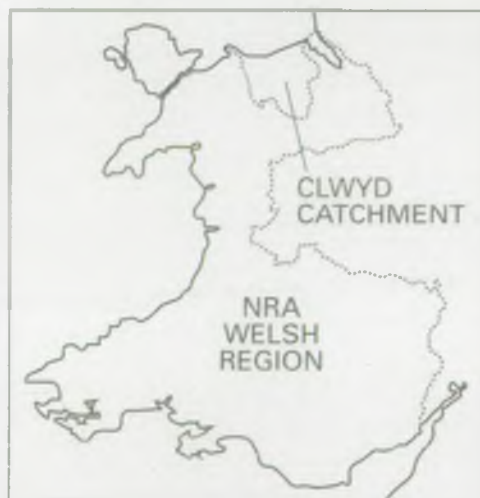
**2.0 AN OVERVIEW OF THE
CLWYD CATCHMENT**

MAP 1.

CLWYD CATCHMENT



0 10 km



KEY

..... CATCHMENT BOUNDARY

2.0 AN OVERVIEW OF THE CLWYD CATCHMENT

- 2.1 Introduction** The River Clwyd rises in the peaty uplands of the Clocaenog forest and meanders slowly through the picturesque Vale of Clwyd to discharge into Liverpool Bay at Rhyl.

The Vale of Clwyd, referred to in George Borrow's book 'Wild Wales' as a remarkably fertile area, is a downfaulted rift valley of Triassic age bounded to both the east and west by older and harder glaciated Silurian rocks. With lush green pastures surrounded by neat hedgerows it is noted for its dairy products, whilst in the upper reaches of the catchment to the west farming is mainly mixed sheep and beef.

Metalliferous mining dating back to early Roman times is evident in the west from Llanddulas to Llansannan, and in the east in the area surrounding Meliden. Despite the numerous mines spread throughout these parts, environmental degradation normally associated with this type of activity is not evident.

The tributary Elwy, which rises in the west above Gwytherin and which is augmented by the flow from the Aled, is in contrast to the Clwyd a flashy river with extremely variable flows. Despite the vast differences, both the Clwyd and Elwy are both well known fisheries for sea trout and brown trout.

The coastal attractions of this area include tourist resorts such as Rhyl and Prestatyn, the rugged splendour of the Great Orme at Llandudno, and the seclusion of the dunes of Gronant sands. Sadly, this once extensive dune system is disappearing.

- 2.2 Hydrology and Hydrogeology** The catchment of the River Clwyd is underlain by rocks which range in geological age from the Silurian to the Triassic period. Many of the topographical features in the area have been modified by ice sheets which flowed both from the south and north of the area tens of thousands of years ago. The retreat of these ice sheets left extensive coverings of boulder clay and outwashes of sand and gravel over the valley bottoms and low lying areas.

Further evidence of glacial activity can be seen in the accumulations of sand and gravel in the Wheeler valley and the numerous drumlins or mounds of glacial material west of Denbigh. These superficial deposits of varying thickness obscure the underlying solid geology.

Movements in the earth's crust have caused north to south faulting down either side of the Vale of Clwyd, producing a rift valley feature in which Carboniferous limestones and Triassic sandstones are bordered by Silurian mudstones and siltstones.

The rocks are markedly different in their resistance to erosion, with the older and harder Silurian rocks forming the high ground of the Denbigh Moors in the west and the Clwydian Hills to the east. Extensive deposits of glacial drift overlie the young Triassic and Carboniferous rocks in the main valley and coastal fringe to the north.

The structural composition of the rocks and their ability to form aquifers are also considerably different, with the more permeable sandstones showing higher storage capacities which provide large quantities of groundwater of potable quality for both public supply and river augmentation purposes. The utilisation of these groundwater resources requires careful management to ensure the long term sustainable yield is not exceeded.

Rainfall (illustrated on Map 3) shows a progressive fall in average annual precipitation from 1300mm on the Denbigh Moors to 700mm and less in the Vale and along the coast. However, rainfall over the area can be extremely variable indeed, as shown in June 1993 when 137mm fell in the low-lying Llandudno area in 3 hours, causing widespread flooding and destruction. The response of the rivers and streams to rainfall is markedly influenced by the geology and topography of their catchments, the rapid response and range of flow of the Elwy which passes over rocks of Silurian age contrasting greatly with the Wheeler which is groundwater supported in part. Thus flood problems are possible at St. Asaph and Llanddulas from the rivers that rise to the west of the catchment. This is especially so where these rivers flow onto the flat northern coastal strip. The vulnerability of the coastal area to fluvial and tidal flooding was clearly demonstrated during the Towyn flood disaster in 1990.

2.3 Flood Defence Flood defence activity within the catchment is concentrated upon the maintenance of tidal and fluvial defences, main river watercourses in relatively low lying areas and the operation of pumping stations at a number of urban and rural locations.

The principal flood plain of the River Clwyd is located between Bodfari and Ruthin, where the major tributaries the Ystrad and Clywedog join from the west.

Elsewhere in the catchment flood defence work consists mainly of shoal removal and river management schemes carried out when and where necessary. There are no major flooding problems where property is affected although the agricultural flood plains are inundated from time to time. There are, however, a few isolated cases of flooding to properties associated with ordinary watercourses within the catchment.

Flood defence is an important consideration in the planning process and the NRA will be actively involved in liaison regarding any proposed development in sensitive areas.

The NRA during 1993/94 is beginning to prepare maps that show the areas liable to flooding and which will be available as reference documents for the determination of Town and Country Planning applications by the Local Authorities.

A flood warning scheme, for the protection of property at St. Asaph from extreme events on the River Elwy, operates within the catchment. Tidal surge warnings are disseminated to local authorities along the coastal frontage.

**2.4 Fisheries
Conservation,
Recreation
and
Navigation**

The fisheries of the catchment are predominantly salmonid with good quality salmon and sea trout fishing available on the Rivers Clwyd and Elwy. Distribution of migratory salmonids is restricted by impassable barriers, notably Bontuchel weir on the Clwedog. Acid waters are confined to the head waters where the impact on fisheries is limited. The flashy nature of the Elwy following heavy rainfall and the unstable stream bed provide unfavourable spawning grounds.

Put and take trout fisheries are operated on a number of lakes in the catchment. Relatively few coarse fisheries are present, being confined to the coastal plain and reservoirs at the head of the Elwy system.

The landscape value of the catchment is high, with the Clwydian hill-range an Area of Outstanding Natural Beauty (AONB) in the east and the limestone headlands of the Orme in the west. The coastal sand dunes are the remnants of once extensive dune systems along the North Wales coast.

The river valleys, particularly those which are steeper sided, contain tracts of ancient woodland. Otters are present in the catchment, notably in the Dulas system. The relatively few significant wetland areas include upland acidic bogs and former lake basins.

Water based recreation is centred in the Clwyd estuary and on the coast adjacent to the resort towns. In the holiday season the marine lake at Rhyl is popular for boating, whilst sailing takes place at Aled Reservoir all the year round.

Public access is poor on the Elwy and middle reaches of the Clwyd, which restricts activities such as walking and bird watching.

The NRA does not have any responsibilities for navigation in the catchment. Rhyl Harbour can be entered from about half tide upwards, but only by small boats.

2.5 Water Quality Water quality in rivers covered in this Plan is generally very good, as recorded in the 1990 River Quality Survey. Water abstractions are generally made from undeveloped and undisturbed upland sources, but there are important groundwater sources at Ffynnon Asaph (Dyserth) and Llannerch (Trefnant).

The major industries within the catchment, agriculture and tourism, show great variability in seasonal requirement for drinking water supplies.

The coastal waters off Colwyn Bay, Prestatyn and Rhyl attract a large number of visitors in the summer months and compliance with the bacteriological standards of the EC Bathing Waters Directive is an important objective. A number of areas currently fail these standards each year and other areas have had variable compliance. Improvements to the present sewage disposal system at Rhyl are underway, whilst improvements required at Colwyn Bay in order to comply with the bacteriological requirements of the Bathing Waters Directive are yet to be implemented.

2.6 Land Use

The catchment is predominantly rural, with the population centred in 8 towns of population 3,500 - 25,000. The local population within the catchment is approximately 146,000 which, with the exception of the towns of Ruthin and Denbigh, is mostly located in the coastal resorts and along the main A55 Expressway.

The main agricultural uses consist of dairy farming in the fertile lowlands of the Vale of Clwyd, with mixed sheep and beef production in the less fertile upland areas. There are a number of afforested areas the largest of which is the Clocaenog forest at the headwaters of the Clwyd.

There is some industrial development consisting primarily of quarrying activities and there are a few fish farms. Other than agriculture and forestry, the catchment depends upon tourism centred round the coastal resorts of Rhyl, Colwyn Bay and Llandudno.

2.7 Infrastructure

The area is served by a reasonable network of trunk and main A roads between the main employment/population centres, with B roads linking smaller settlements. The completion of the A55 Expressway will significantly alleviate the traffic problems previously experienced, particularly those associated with tourism during the summer months.

Rail transport consists of the main London-Holyhead line which follows the coast of the catchment area.

2.8 Monitoring Network

The hydrological monitoring network within the area consists of raingauges, flow and level stations to record surface and groundwater levels within the aquifers, for the proper understanding and management of the water resources of the catchment. At present, the network consists of 14 raingauges and flow measuring stations and 7 observation borehole sites, which are being augmented by the addition of 2 further boreholes in the Vale and a further gauging station on the Clwyd. Two tidal recording stations are also situated at Llandudno and Rhuddlan.

A network of 46 monitoring sites is used to gather information on the chemical and biological quality of the rivers in the Plan Area.

Populations of young salmon and trout have been monitored throughout the catchment since 1985. Currently, a total of 40 sites are surveyed annually by electro-fishing.

The Clwyd Catchment Management Plan will be used to identify or rationalise monitoring requirements that are deemed necessary in the catchment.

2.9 KEY DETAILS

Catchment Details

Area	-	900km ²	
Population	-	(ESTIMATED)	Existing 1991 >146,000
Holiday Influx	-	(BED SPACES)	90,117

Topography

Ground Levels	Min Level	4 to 5M A.O.D.
	Max Level	500M A.O.D.
Tide Levels	Mean High Water Springs	- 5.07M A.O.D. (1)
		- 4.70M A.O.D. (2)
	Mean Low Water Springs	- 0.00M A.O.D. (1)
		- 3.30M A.O.D. (2)

(1) HILBRE ISLAND

(2) COLWYN BAY

Geology

West bank tributaries arise on hard glaciated Silurian rocks. The main Clwyd valley is a downfaulted rift feature with younger rocks of Triassic age underlying glacial superficial deposits. To the east the valley is bounded by the older Silurian rock formations.

Administrative Details

County Councils	-	CLWYD COUNTY COUNCIL GWYNEDD COUNTY COUNCIL
District Councils	-	ABERCONWY B.C., COLWYN B.C., GLYNDWR D.C., RHUDDLAN B.C., DELYN B.C.
National Parks	-	NONE
NRA	-	WELSH REGION - NORTHERN AREA
Water Companies	-	DŴR CYMRU WELSH WATER
Public Sewage Treatment Works	-	51

Main Towns and Populations (1991 Census)

RHYL	-	24,909
PRESTATYN	-	17,115
ABERGELE	-	9,698
COLWYN BAY	-	9,424
DENBIGH	-	8,528
LLANDUDNO(Part)	-	7,500
RUTHIN	-	5,011
PENRHYN BAY	-	3,571

Water Quality Classification

Very Good	-	111.5km	Poor	-	None
Good	-	31.5km	Bad	-	None
Fair	-	0.4km			

Estuary Classification

Good	-	7.2km	Poor	-	None
Fair	-	None	Bad	-	None

Water Resources

Surface Water: Main River Clwyd supported by groundwater augmentation. River Aled tributary supported by releases from Aled Isaf reservoir.

Ground Water: Aquifers in the Triassic Sandstone, Carboniferous strata and superficial deposits.

Flood Protection

Length of Main River in catchment	-	323.22km
Length of Main River Within Internal Drainage District	-	3.80km
Length of Adopted Ditch within Internal Drainage District	-	1.13km
Length of Flood Banks Maintained by NRA	-	40.50km
Area at Risk of Flood (Tidal or River)	-	5,000Ha

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

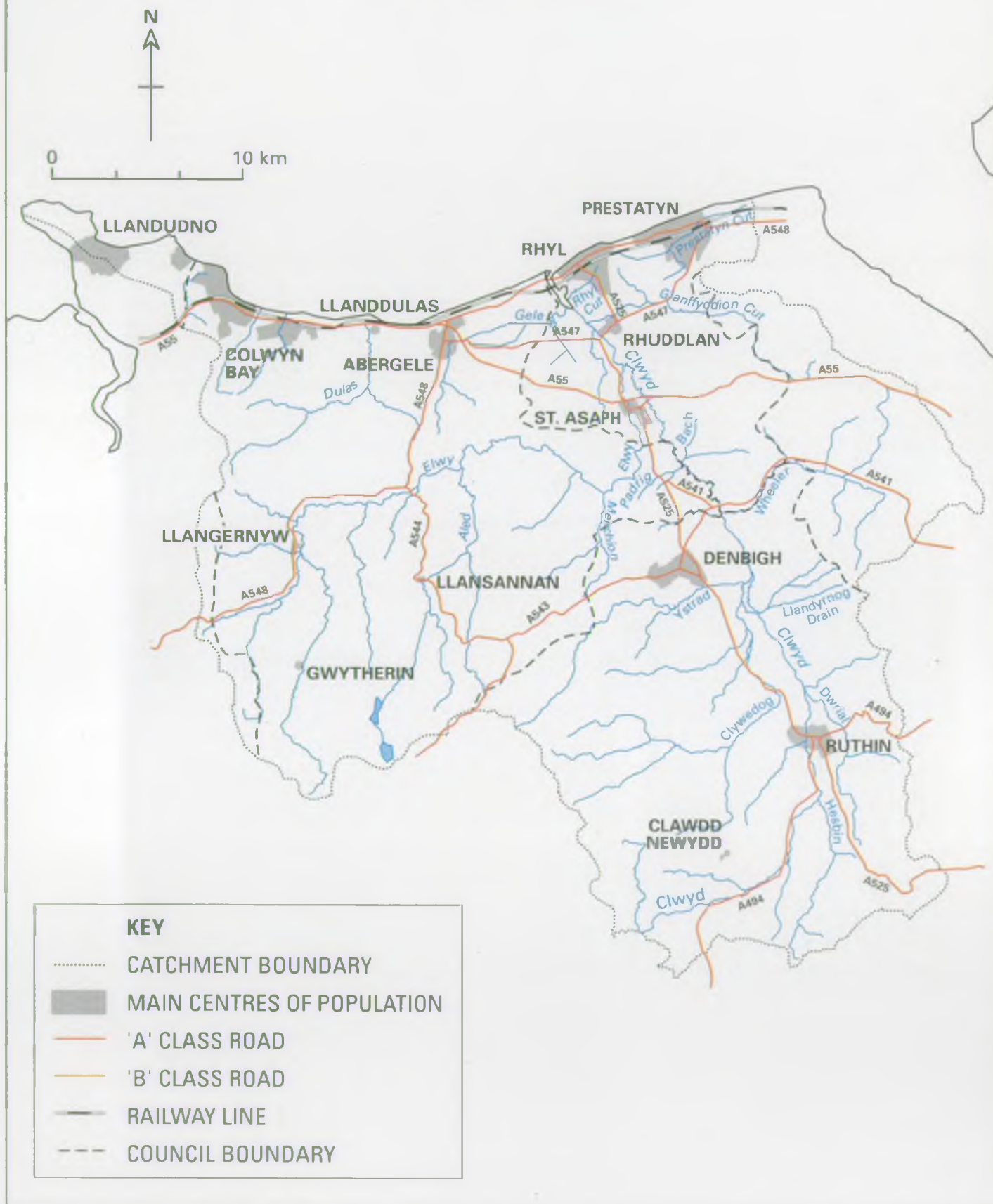
Salmonid	-	99.5km
Cyprinid	-	None

3.0 THE USES OF THE CLWYD CATCHMENT

The following sections catalogue the legitimate uses of the Clwyd 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 4. 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.

MAP 2.

URBAN DEVELOPMENT



3.1 URBAN DEVELOPMENT (including road, rail and airport)

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 Planning Authorities (LPAs) on development proposals and formal applications 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 within the catchment. The Plan identifies all legitimate uses within the catchment, as well as conflicts, so that these issues 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 in relation to development through the planning consultation process and, although the final decision on planning matters rests with the planning authority, Government planning guidance confirms the need to take account of the NRA's comments.

The NRA has produced Guidance Notes for LPAs on the methods of protecting the water environment through their Development Plans. The NRA proposes that, where appropriate, the LPAs should apply these Notes when producing their own Plans.

Local Perspective The vast majority of the catchment of the Clwyd river system lies within the County of Clwyd, although the headwaters of three tributaries of the Elwy arise in Gwynedd. The Plan area also includes a number of smaller river systems which flow towards the North Wales coast between Great Ormes Head and Point of Ayr (excluding tributaries of the Dee estuary). Development Plans are at various stages of preparation by Planning Authorities within the catchment and are summarised in Table A:

**TABLE A - CURRENT STATUS OF DEVELOPMENT PLANS WITHIN
THE CLWYD CATCHMENT**

<u>Administrative Council</u>	<u>Development Plan Status</u>
Gwynedd County Council	GCC Structure Plan - adopted November 1993.
Aberconwy Borough Council	Work on draft not due to start until April 1994 at earliest.
Clwyd County Council	CCC Structure Plan - Second alteration prepared. Public consultation commenced April 1994.
Colwyn Borough Council	Draft District Wide Plan - deposit expected Spring 1994.
Glyndwr District Council	Formal adoption of District Wide Plan expected Spring 1994.
Rhuddlan Borough Council	Borough Wide Plan adopted 20th September 1993.
Delyn Borough Council	Borough Wide Plan adopted 20th October 1993.

CLWYD CATCHMENT - POPULATION FIGURES**(1991 CENSUS)**

<u>Administrative Council</u>	<u>Population</u>	<u>Main Towns</u>
Aberconwy Borough Council	- 11,071*	- Llandudno (part) Penrhyn Bay
Rhuddlan Borough Council	- 54,512	- Rhyl Prestatyn
Colwyn Borough Council	- 53,516	- Colwyn Bay Abergele
Glyndwr District Council	- 23,490	- Denbigh Ruthin
Delyn Borough Council	- 3,644	-
TOTAL:	- 146,233	
* Estimated		

The total population within the catchment is 146,233. Development of and allocation for further housing is chiefly within the coastal area and in particular the settlements of Colwyn Bay, Kinnel Bay, Towyn, Rhyl and Prestatyn.

A number of Business Parks have been proposed or are currently being developed, most notable of which is the 52.6ha St. Asaph Business Park which traverses the boundary between the Colwyn and Rhuddlan Borough Council areas.

Tourism is a major industry within the catchment, with coastal areas attracting millions of visitors annually. The local economy of these areas has to some extent become dependent for its livelihood on tourism with, for example, around 10% of the labour force in Colwyn being employed in the tourist sector. The coastal waters at Llandudno, Colwyn Bay, Sandy Cove, Rhyl and Prestatyn have been identified under the EC Bathing Water Directive. There are in excess of 90,000 bed spaces available for visitor accommodation throughout the whole catchment.

Development within the catchment has in recent years become increasingly leisure/tourism orientated. Major developments in this category include a golf course, hotels and proposals for a leisure and conference centre complex at Rhewl Quarry, Ruthin. Interest has also been shown in developing harbour/marina complexes at Foryd Harbour, Rhyl, and Llanddulas.

Other major development proposals within the catchment include a 4650 m² food superstore and 6500 m² non-food Retail Park between Rhyl and Rhuddlan.

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 and its users.
- To ensure that development does not impact on the water environment to a degree that threatens life and property.

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 should be incorporated into developments.

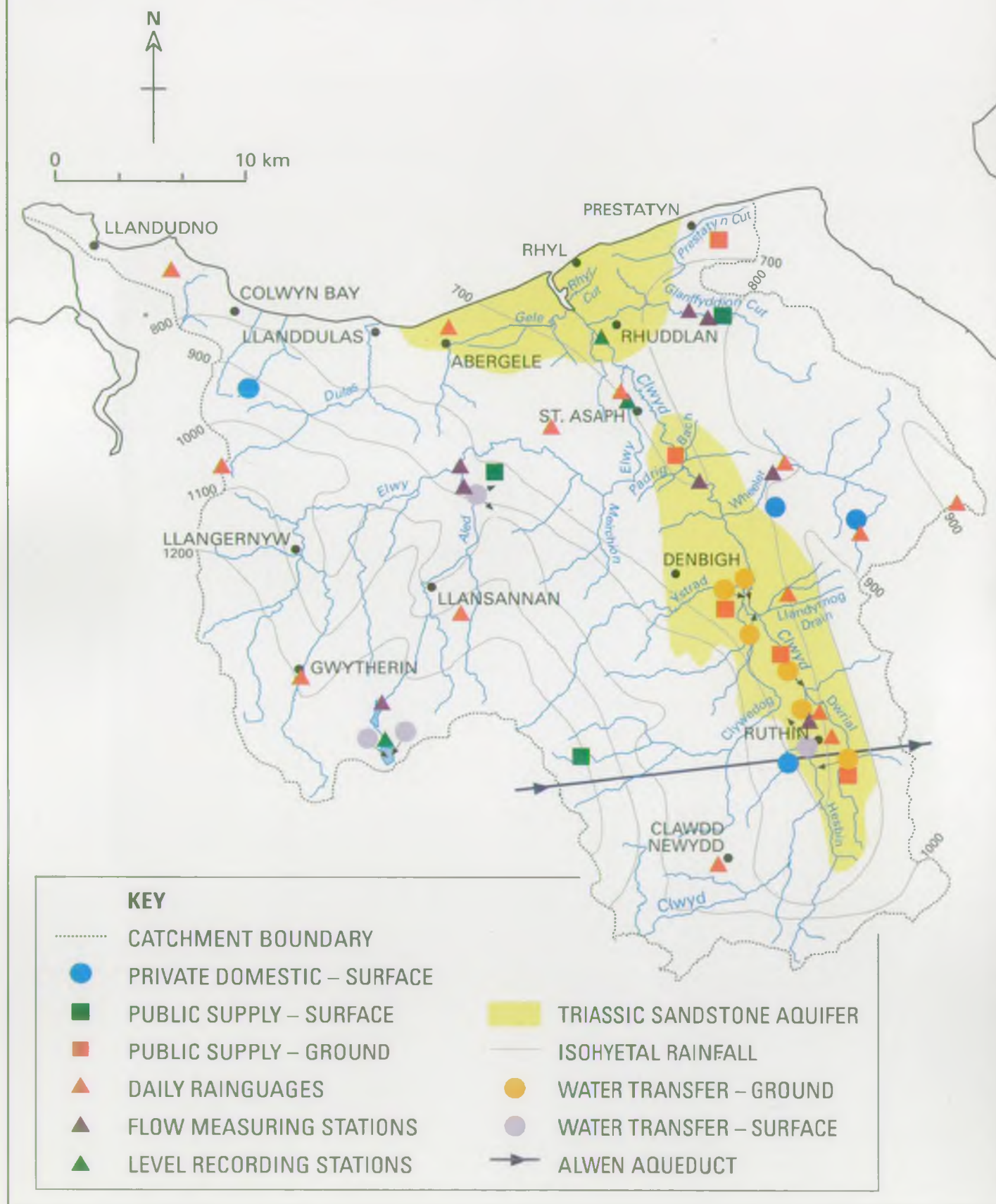
Water Quantity

- Surface and groundwaters should be protected 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.
- Any work that is needed to reduce the risk of flooding created by a development should be 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.

ABSTRACTION FOR POTABLE SUPPLY



3.2 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 surface and groundwater sources that seek to control certain potentially polluting activities. The Groundwater Protection Policy (Appendix 1) 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

Potable Water is abstracted by the statutory water company, Dŵr Cymru Welsh Water (DCWW), and to a much lesser extent by individual properties that are not connected to the mains. Potable abstractions are made from surface sources and from aquifers in the Triassic sandstone, Carboniferous limestone and superficial deposits which overlie the solid rocks.

Surface Water

Water is abstracted from three surface water locations in the catchment by DCWW for domestic and other uses. These sources are licensed to abstract in total 5240 Ml/a (mega-litres per annum). The local demand for water exceeds this so additional water is imported along the Alwen aqueduct from the Alwen water treatment works in the Dee catchment.

In the west the reservoir complexes of Llyn Aled, with catchwaters, and Aled Isaf are used to regulate the flow of the River Aled under the terms of an Operating Agreement between DCWW and the NRA under Section 20 of the Water Resources Act 1991. Downstream, near the confluence with the Elwy, abstractions are made at Bryn Aled to the Plas Uchaf reservoir which also receives water from Dolwen. Water gravitates from here to Glascoed water treatment works near St Asaph where it is also mixed with groundwater from the Llannerch Park abstraction site adjacent to the Clwyd.

The four domestic abstractions from surface sources to serve isolated properties amount to 18.0 Ml/a.

Groundwater

The exemption from licensing for groundwater abstractions mentioned above is restricted to the Silurian strata in the Clwyd Plan Area.

Apart from one borehole into the Carboniferous limestone strata which contains water in fissures, all the groundwater abstractions for public water supply are made from the much more prolific water bearing strata of the Triassic sandstone which underlies the Vale of Clwyd for much of its length. Under the terms of an Operating Agreement, DCWW utilise boreholes at Efail Newydd, Ruthin, Plas-yr-Esgob, Llanynys, Llwyn Isaf and Glanywern to support the flow of the Clwyd. The 4,932 Ml/a of water abstracted from groundwater is then treated before being put into supply at Llannerch Park. Only relatively small quantities of groundwater are abstracted by individual properties for domestic requirements. The majority of the remaining licences are principally concerned with agricultural use and amount to 7Ml/a.

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 water to be returned as close to the point of abstraction as is practicable.

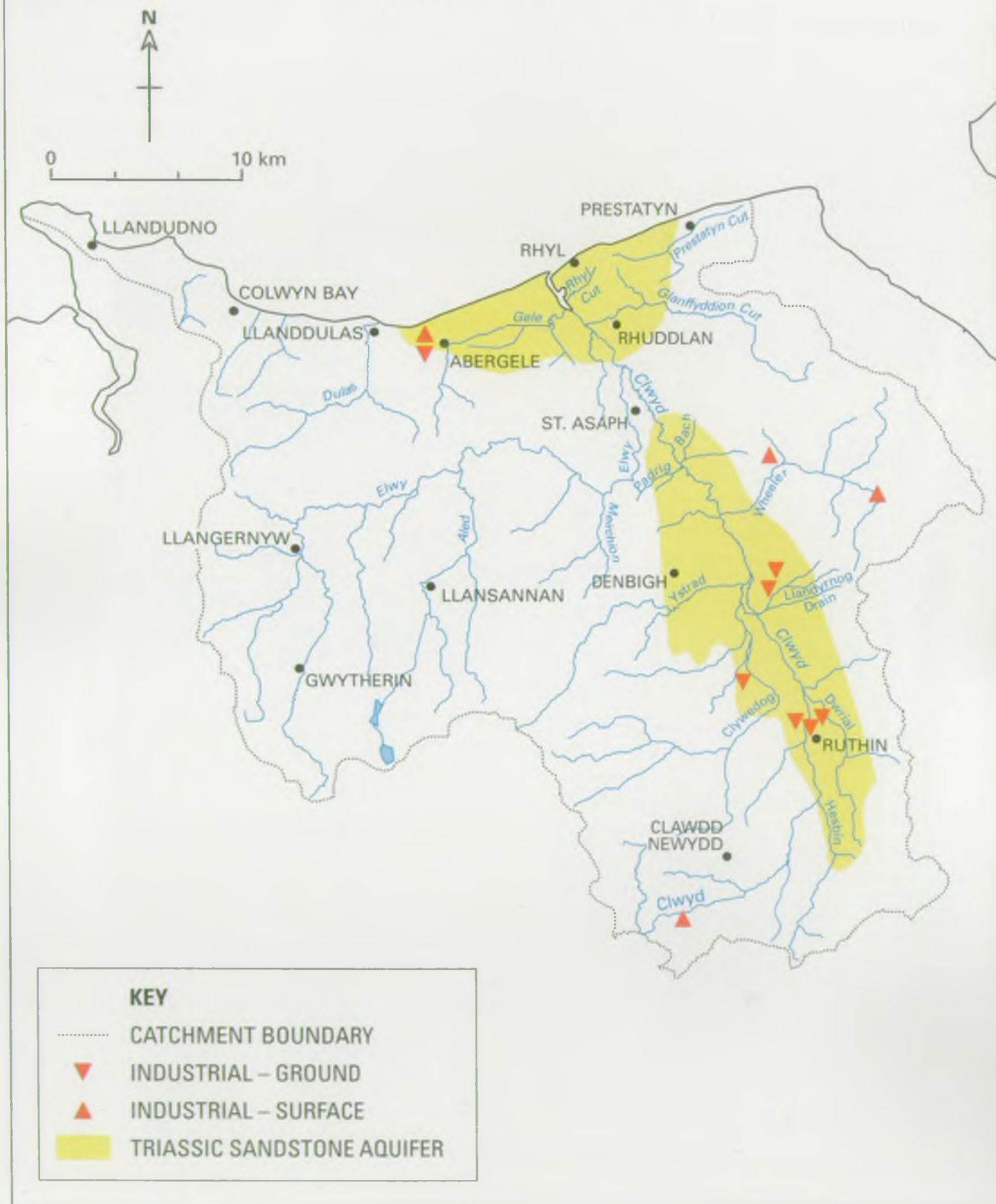
- To protect the quality of groundwaters by implementing the NRA's Groundwater Protection Policy.

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 | - | 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 4.

INDUSTRIAL ABSTRACTION



3.3 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

The exemption from licensing for groundwater abstractions mentioned above does not apply in the Clwyd catchment. Eleven licences are in force which allow abstractions from surface and groundwater for industrial purposes. The licences are for a variety of purposes such as cooling where a large proportion is returned, sand and gravel washing and bottling processes where little of the water is returned. The seven industrial abstractions from groundwater aquifers are licensed for 426 Ml/a, whilst the remaining four licensed abstractions from spring and surface waters amount to 141 Ml/a.

Objectives

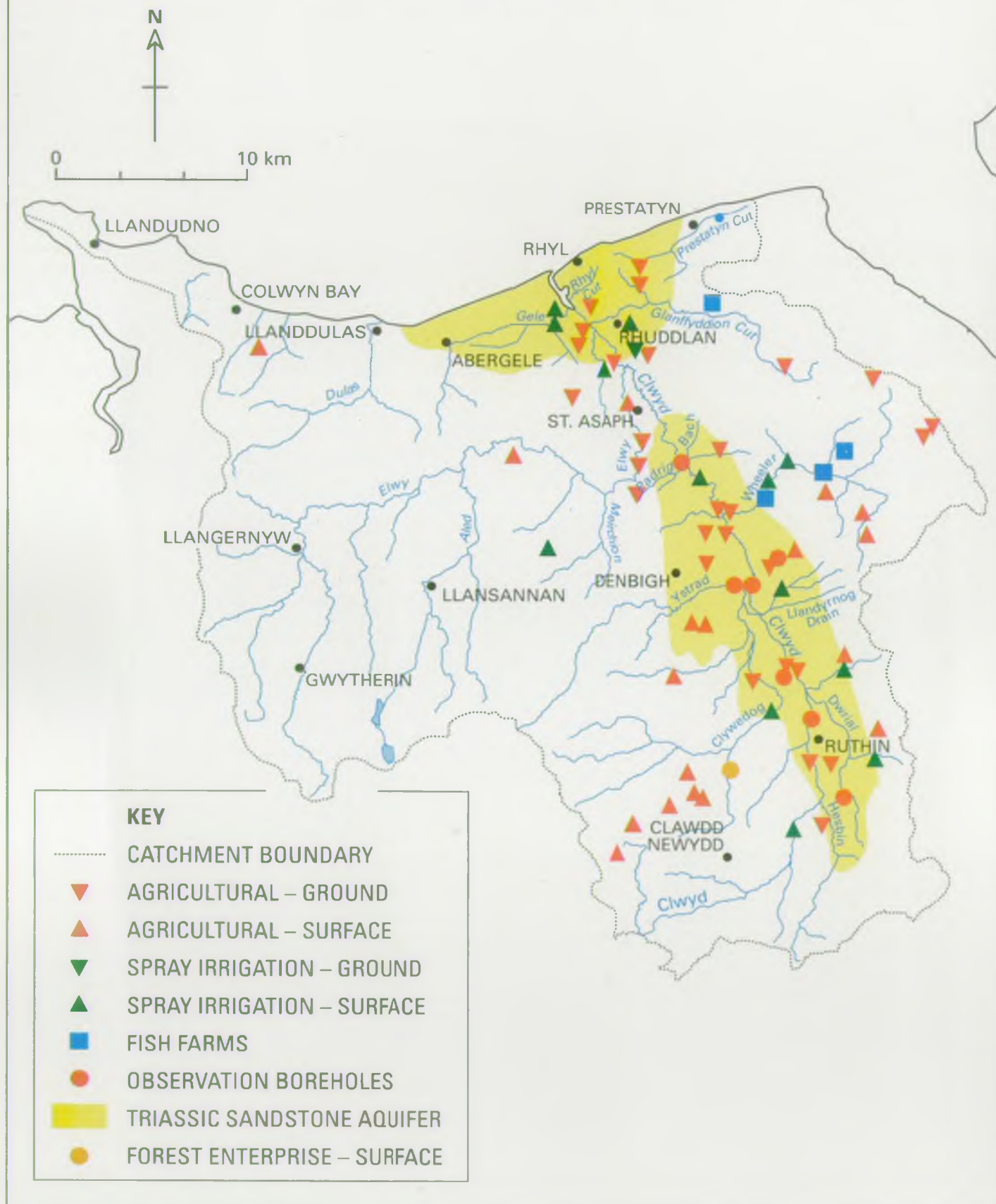
- To manage the quality and volume of water resources so as to safeguard licensed and exempt abstractions, and the environment. This includes the active enforcement of abstractions. The NRA will encourage abstractions to be made as far downstream in a river as possible and water to be returned as close 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 5.

AGRICULTURAL ABSTRACTION



3.4 ABSTRACTION FOR AGRICULTURAL SUPPLY

General

All abstractions for agricultural purposes, apart from some small (less than 20 cubic metres per day (M^3/d)) 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

There are 66 licensed abstractions in the area for general agricultural use, spray irrigation and fish farming which are made from both surface and groundwater sources.

There are 18 licensed abstractions from surface waters amounting to 48 Ml/a. There are also 9 from limestone, 9 from superficial deposits and 10 from sandstone deposits, amounting to 16, 37 and 45 Ml/a respectively.

Fourteen licences of 24.2 Ml/a in total are held for spray irrigation from surface sources. No water is returned to these sources following this category of use and the water is required specifically during times of low flow. For these reasons the Water Resources Act 1991 gives the Authority additional powers to curtail or reduce these abstractions if sources are stressed.

Similarly, fish farms which need uninterrupted abstraction require strict controls by means of abstraction licences (and discharge consents), which take account of the environmental requirements of the streams affected. In the Clwyd catchment, there are five active fish farms, four of which are abstractors, requiring an annual licensed abstraction of 16,262 Ml/a.

Objectives

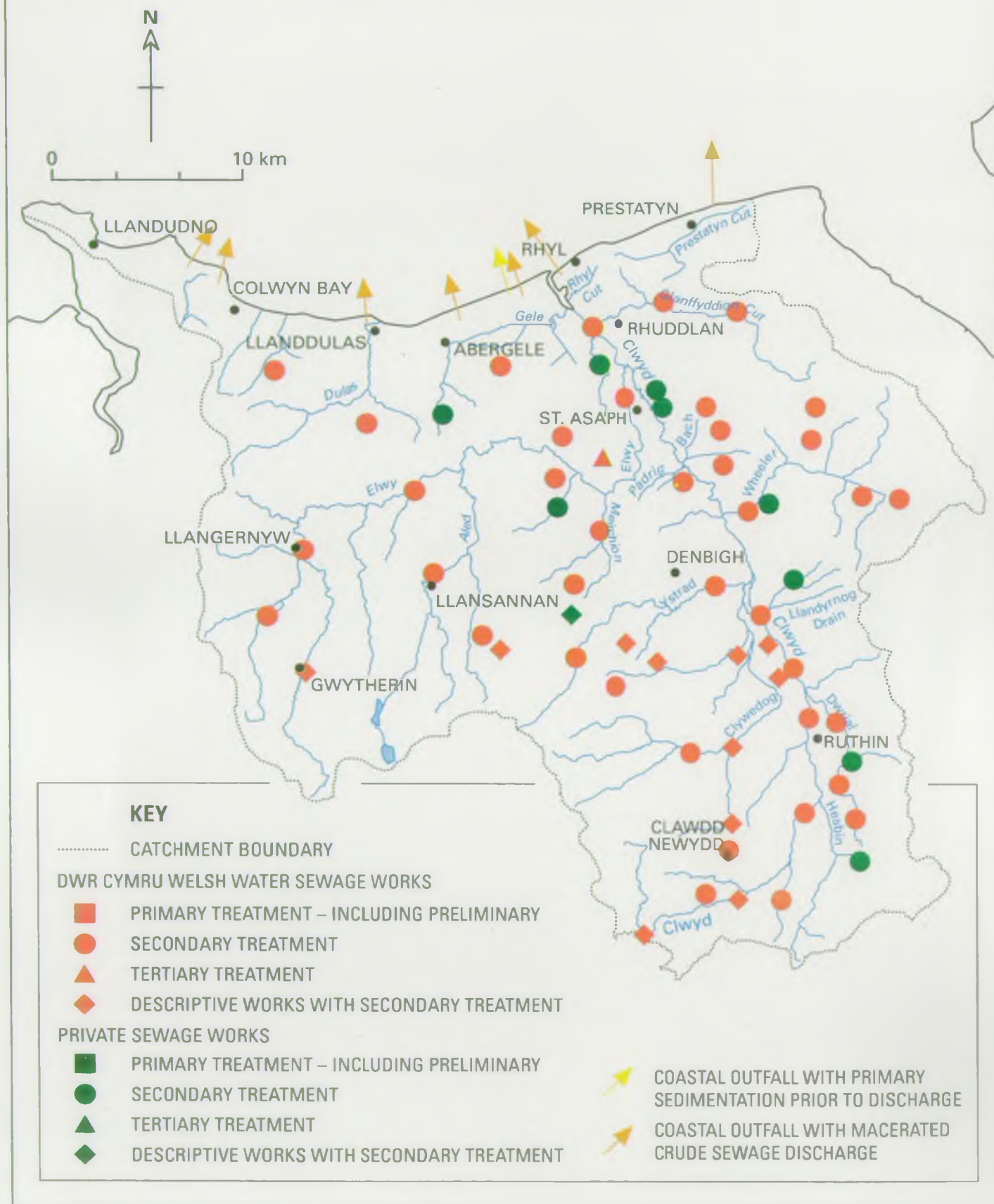
- To manage the quality and volume of water resources so as to safeguard licensed and exempt abstractions and the environment. This includes the active enforcement of abstractions. The NRA will encourage abstractions to be made as far downstream in a river as possible and water to be returned as close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

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 | - 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 6.

SEWAGE EFFLUENT DISPOSAL



3.5 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 only operate 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 DCWW 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 DCWW 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 DCWW 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 DCWW 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 UK 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 There are 51 sewage disposal works operated by DCWW in the catchment which are all monitored by the NRA. In addition, there are 5 works owned and maintained by Colwyn B.C. and Rhuddlan B.C. and 5 privately owned sites that are monitored to ensure compliance with discharge consent conditions.

Where works fail to meet consent standards or impact on water quality to a degree that affects legitimate uses of the water, the NRA will seek improved maintenance and/or impose stricter standards.

The most significant impact of sewage is evident in the bathing waters off Rhyl and Kinnel Bay/Sandy Cove where the bathing waters consistently fail to achieve the required water quality standards. Occasional failures also occur at Prestatyn and Colwyn Bay.

Improvements scheduled for completion by 1995 should ensure compliance at Rhyl, Kinnel Bay/Sandy Cove and Prestatyn.

Improvements at Colwyn Bay to ensure compliance are likely to be completed by 1998.

Inland, the River Clwyd downstream of the Ruthin sewage treatment works has deteriorated from a Fisheries Ecosystem Class 1 to Fisheries Ecosystem Class 5 river, for a stretch of some 2km. The river also fails the EC Freshwater Fish Directive standards for ammonia for an 8km stretch due to the Ruthin STW discharge.

Improvements have been given a high priority to ensure that the long term river quality objective of Fisheries Ecosystem Class 1 will be achieved.

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

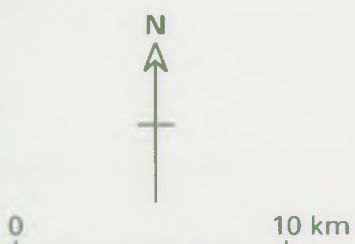
- Consent conditions will be derived taking into account the upstream dilution available under average and dry weather flow conditions.

- 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.

INDUSTRIAL EFFLUENT DISPOSAL



3.6 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 authorisation 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 (DCWW in Welsh Region) and is then subject to the sewage effluent treatment and disposal controls outlined in Section 3.5.

Local Perspective

The plan area is predominantly rural in nature supporting only a small number of industries including quarries, glass manufacturers, concrete products and mixing plants.

A number of improvement works have been undertaken, in consultation with the NRA, at quarries within the Plan area. These have included the installation of settlement facilities to reduce the environmental impact of trade effluent discharges. Consultation has also resulted in the introduction of process water recycling at a number of sites, with subsequent cost benefit.

The five fish farms within the catchment require water of high quality. Most rear brown or rainbow trout for the stocking of other fisheries or to supply fish for the table market, but Marian Mill Fishery at Dyserth supplies juvenile trout for further rearing at other units. Three of these farms are to be found on the River Wheeler or its tributaries.

The fish farms have abstraction licences and discharge consents, with conditions attached which ensure the environmental requirements of the streams are protected.

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

Environmental Requirements

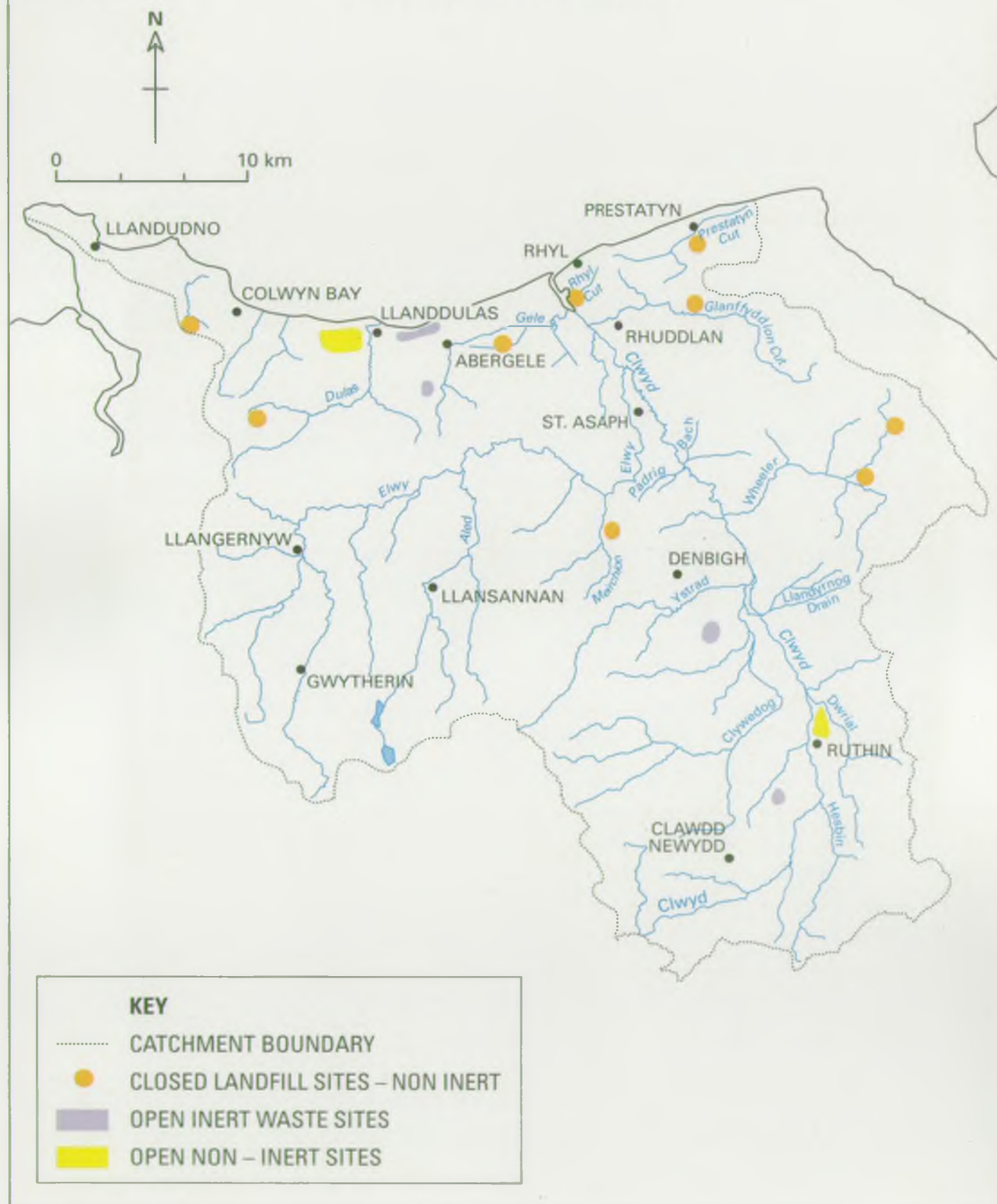
- Water Quality**
- Discharges should comply with all conditions stated within discharge consents. This will be enforced by the NRA.
 - There should be no deterioration in water quality above the discharge below that assumed when the discharge consent was calculated.

- 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.
 - Suitable provision should be made to prevent the escape of stock to the wild and the trapping of wild stock within the farm. Where appropriate this will be enforced by the NRA. Similarly provision should be made to prevent the spread of diseases and alien species.

MAP 8.

SOLID WASTE DISPOSAL



3.7 SOLID WASTE DISPOSAL (LANDFILL)

General The tipping of domestic and industrial refuse 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 groundwaters. 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 all applications for landfill waste disposal licences.

Local Perspective The NRA advises the local Waste Regulatory Authorities (WRAs) on all matters pertaining to waste disposal site licensing.

There are currently six active sites in the Plan area. The largest of these is operated by ARC Greenways at Llanddulas and receives waste from Aberconwy, Colwyn and Rhuddlan Borough Councils areas. A significant amount of groundwork has been undertaken to ensure that any leachate generated is fully contained on site. This is particularly important given that the Llysfaen Fault (a geological feature) transects the site, as any escape of leachate could enter the Dulas Valley Spring and subsequently pollute the River Dulas, an important salmonid fishery.

The NRA is currently assessing the possible pollution potential of the closed landfill site at Ddol Uchaf, Afonwen. There is also a proposal to extend the life of the landfill site at Lon Parcwr, Ruthin. Leachate containment and the engineering details of capping the waste mass to reduce leachate generation are aspects of the proposal currently being considered.

Objectives

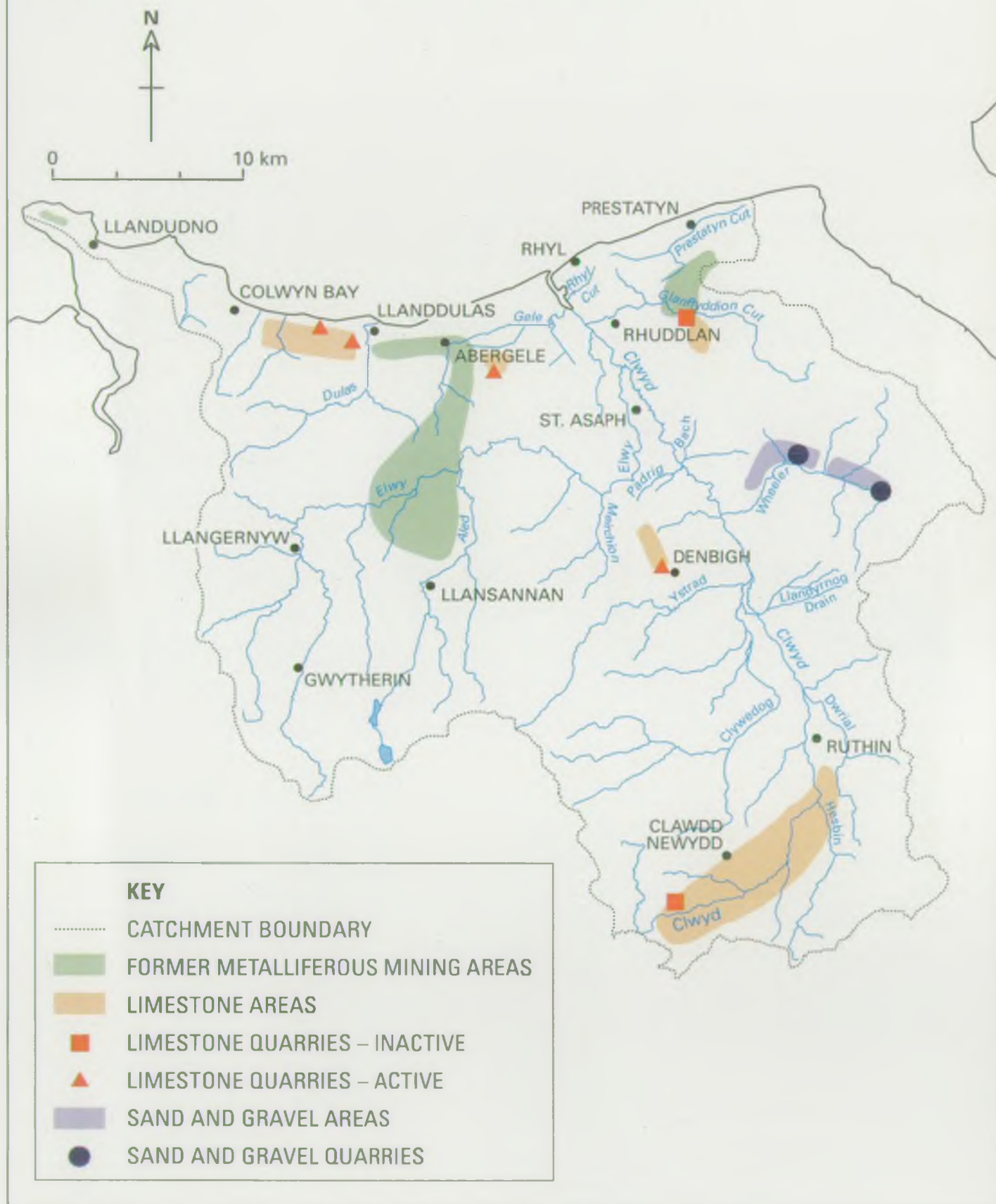
- To ensure that waste disposal sites are designed and operated in a way that does not adversely affect other uses of surface or groundwater.

Environmental Requirements

- Water Quality** - Waste disposal sites must be designed and managed to prevent liquid effluent from adversely affecting the quality of surface and groundwaters.
- Where appropriate waste disposal sites must comply with prohibition notices or discharge consent conditions. This will be enforced by the NRA.
- 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 9.

MINERAL EXTRACTION



3.8 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 severe problems locally.

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 its merits.

Local Perspective

Metalliferous Mining

A considerable amount of mining activity has occurred within the Plan area since Roman times. Whilst there are no active mines at present, the minerals extracted included copper, lead, zinc and iron. To the west, mining activity was centred on a belt running southwards from the Llanddulas area through to Llansannan, where mineralisation of the Carboniferous limestone and Silurian rocks occurred. To the east,

former lead mine workings are still visible at Meliden. Whilst mining activity was undertaken at some 30 or more sites, the majority of those workings were small-scale and have not resulted in a legacy of large areas of mine spoil and associated problems for the aquatic environment. The most noticeable effects are from those sites near Dyserth, where river silts have been found to have elevated levels of lead. Nevertheless the rivers are still able to support a thriving brown trout population.

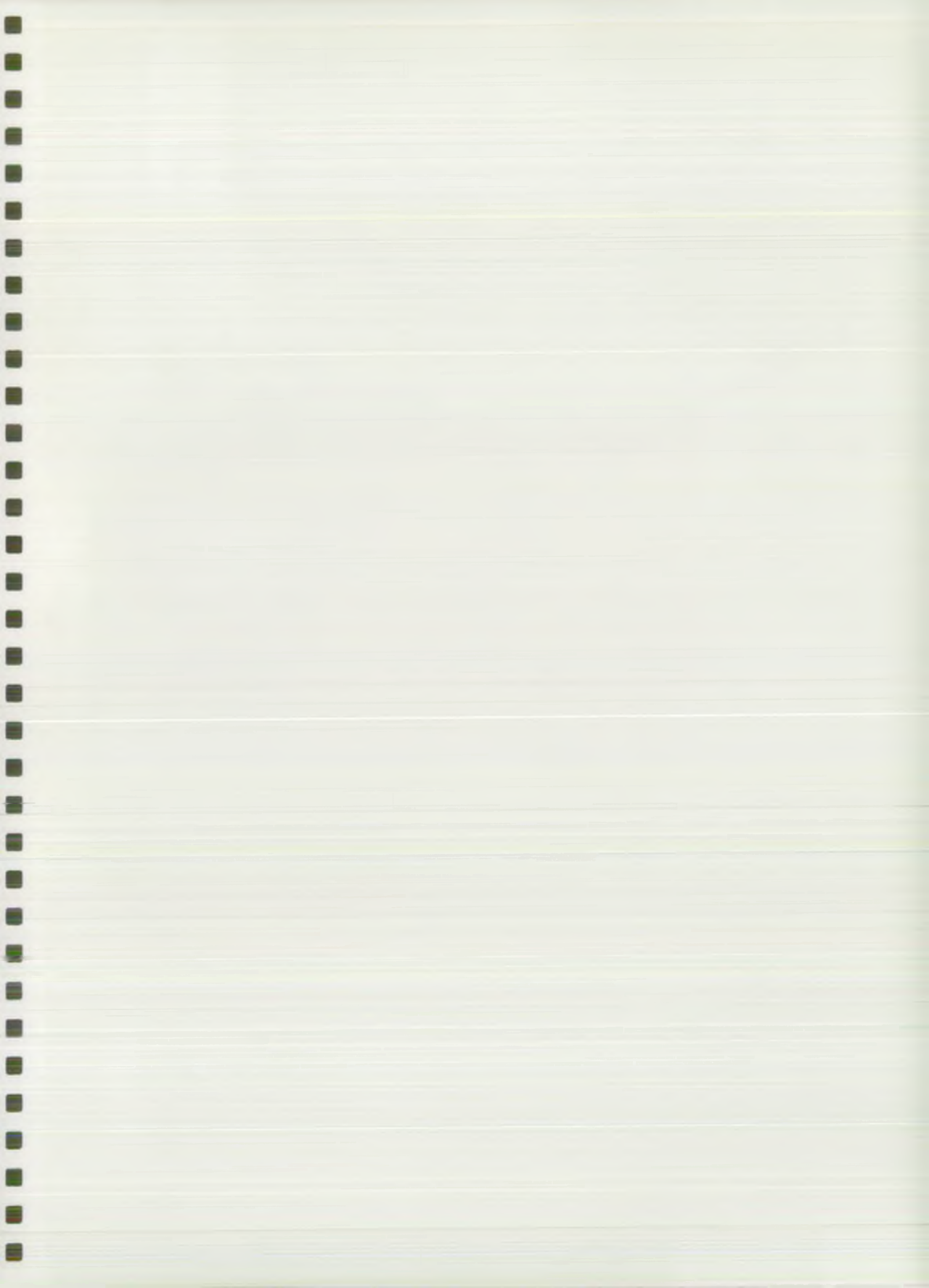
Quarrying

There are a number of active limestone and sand quarries which cater for the construction industry. Because of its purity the limestone, plays a key role in the metallurgical industry at home and abroad. A number of companies have implemented schemes to reduce to an acceptable limit solids loadings in their discharges to the aquatic environment. More schemes are currently under discussion for implementation in 1994.

- | | | |
|-------------------|---|-----------------------------------------------------------------------------------------------------------------------------------------|
| Objectives | - | 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. |



MAP 10.

AGRICULTURAL ACTIVITY



3.9 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.

Local Perspective

The Vale of Clwyd is renowned for its fertility, lying as it does in a rift valley with relatively low rainfall. The uplands support sheep and beef production, with dairying the predominant husbandry in the lower lying land.

Agriculture has intensified in the past 20 years without, in some cases, comparable investment in effluent handling and storage facilities. The Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) Regulations 1991, have begun to set new standards of construction and management which will serve to reduce the incidence of agricultural pollution.

- Objectives**
- To protect the water environment from the potential adverse effects of agricultural activity.

Environmental Requirements

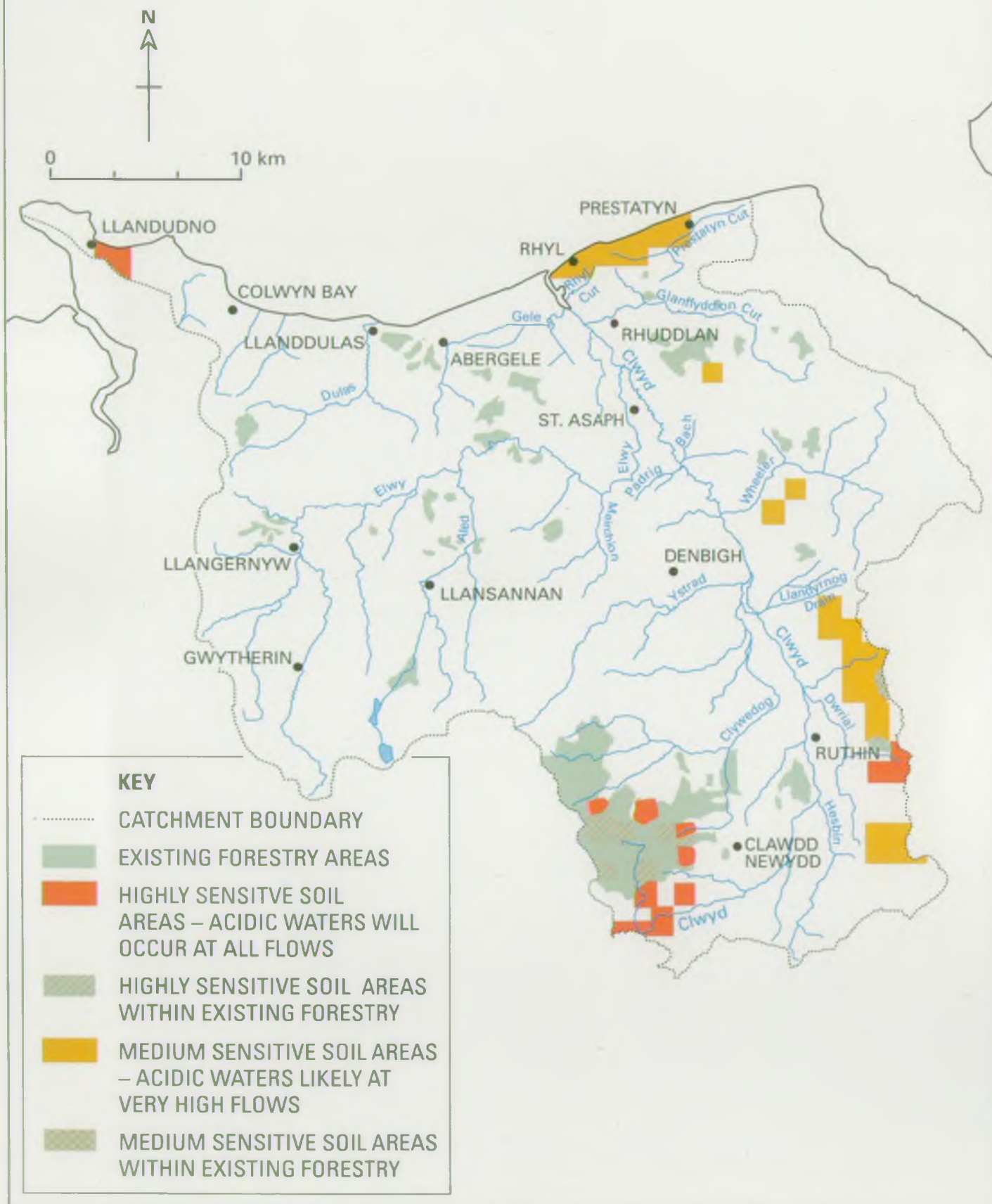
- Water Quality**
- All consented discharges should comply with the conditions expressed in the consent. This will be enforced by the NRA.
 - The codes of practice for the handling and use of Pesticides, Herbicides and Fertilisers should be strictly followed.
 - Where applicable, the management practices 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 11.

FORESTRY



3.10 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.
- 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 the 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

There are a number of afforestations within the Plan area, the largest of which is the Clocaenog Forest at the headwaters of the Clwyd.

The NRA is concerned about pollution problems arising from the discharge of silt into watercourses when stands of timber are harvested and temporary roads are constructed. The growing awareness of NRA concerns by Forest Enterprise, the operational company of the Forestry Commission, has resulted in constructive dialogue and action to implement pollution control measures to minimise the impact of timber harvesting.

Acidification occurs in the naturally peaty uplands of the Clwyd, Clywedog and Aled systems. However, the abundance of Carboniferous limestone provides adequate buffering which progressively reduces the effects downstream, thereby removing the potential for adversely affecting aquatic life.

Forest Enterprise is currently preparing Forest Design Plans which will cover forest management well into the next century. Clwyd County Council is currently preparing an Indicative Forestry Strategy, as outlined in Welsh Office Circular 61/92. This Strategy will aim to identify the constraints and opportunities for new planting areas. The NRA has already identified sites which fall into the following categories (as shown on map No. 11):-

1. Catchment areas where coniferous afforestation or forestry operations could have a detrimental effect upon important aquatic habitats or water quality.
2. Sensitive areas where further planting would increase the levels of acidification.

Further consultation will occur during the life of the Plan.

- Objectives**
- To protect the water environment from the potentially adverse effects of forestry.

Environmental Requirements

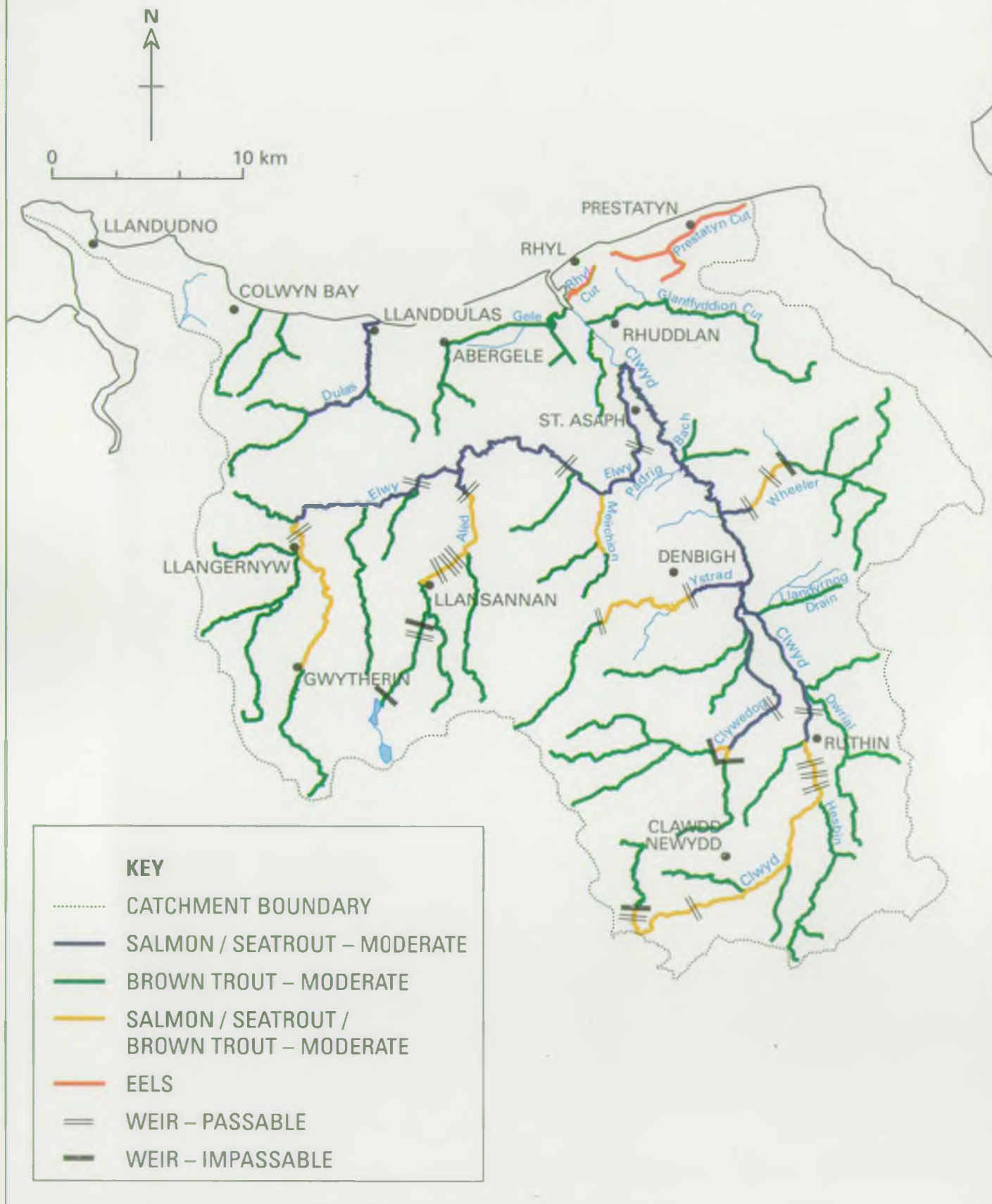
- Water Quality**
- That the provisions of the Forests and Water Guidelines should be complied with in all cases to minimise the impact of forestry on water quality.
- Water Quantity**
- The Authority will develop and implement a Regional abstraction licensing policy that will enable the effective management 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**
- That 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 12.

FISHERIES ECOSYSTEM



3.11 FISHERIES ECOSYSTEM

General The Fisheries Ecosystem Use addresses the whole water based ecosystem, although fish are used as key indicators of the general wellbeing of the river environment. Consequently there are six 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 Fishery Ecosystem Use will be the first to be included within the new Water Quality Objectives (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 Clwyd catchment is not among those 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 fish populations of the River Clwyd are principally salmonid. Brown trout are found throughout the system with salmon and sea trout limited to areas that are accessible to upstream migration. Particular areas of the catchment are favoured by salmon for spawning purposes e.g. the Aled (a tributary of the Upper Elwy) and the Clywedog on the Clwyd system. Sea trout are to be found spawning in the autumn in most locations where gravel is available, but often the highly mobile nature of the bed substrates, particularly on the Elwy, limits the production rate of young fish that can be achieved. Native brown trout stocks are generally small both in number and size. As natural production is inadequate to cater for angler demand, fishing clubs usually supplement stocks with larger hatchery reared fish, which can include both brown and rainbow trout.

Acidification problems occur at the head of the catchment, particularly the Upper Clwyd, Upper Clywedog and Aled system. Adequate buffering progressively reduces the effects downstream and therefore any potentially harmful impact on fish recruitment is generally limited and localised.

Eel stocks are prolific throughout, although they are generally small in size and have been found to be commercially unmarketable. A range of smaller fish species also populate the system, with the most abundant being bullhead, stone loach, lampreys and minnows.

In the tidal section below Rhuddlan Bridge a few marine species are to be found, including the grey mullet and small bass. In early May, salmon and sea trout smolts are abundant as they migrate down towards the sea. Byelaws are in force at this time of year to prohibit brown trout fishing and prevent indiscriminate removal by anglers. Flounders are also numerous as far upstream as Ruthin.

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 dependant 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. |

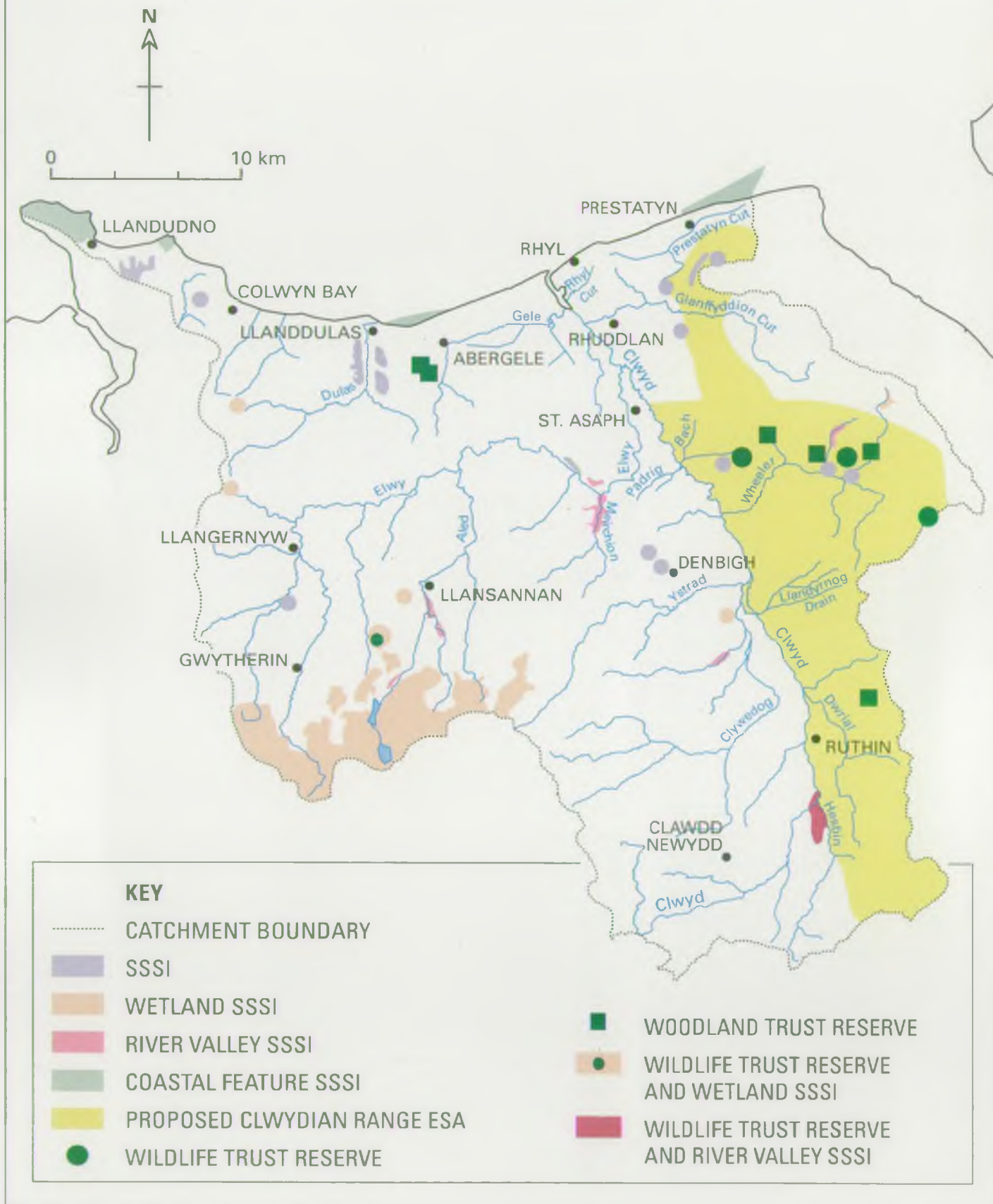
- | | | |
|-----------------------|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 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 13.

SPECIAL ECOSYSTEMS



3.12 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, 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 lifetime of this Plan. Proposals by the NRA and English Nature are being considered and will be the subject of separate public consultation.

Local Perspective

There are 32 Sites of Special Scientific Interest (SSSI) and 215 Sites of Nature Conservation Interest (SNCI) within the Clwyd catchment. Of the SSSIs 7 are or include river valleys, 7 are wetlands and 4 include coastal features.

Examples of river valleys include Meirchion Valley Woods, a mixed deciduous woodland on the west side of the catchment, and Coed Trefraith situated on the steep valley side of an eastern tributary of the Wheeler. The wetlands range from the upland acidic blanket bogs on Mynydd Hiraethog to former lake basins such as Llyn Creiniog and the wet woodland at Llwyn. The coastal sites are Gronant Dunes, Llanddulas beach and the Great and Little Ormes Heads.

The Great Ormes Head, separating the Clwyd from the Conwy catchment is of national importance both geologically and biologically. Gronant Dunes, separating the Clwyd from the Dee catchment, are the only significant remains of the once-extensive dune system of the North Wales coast.

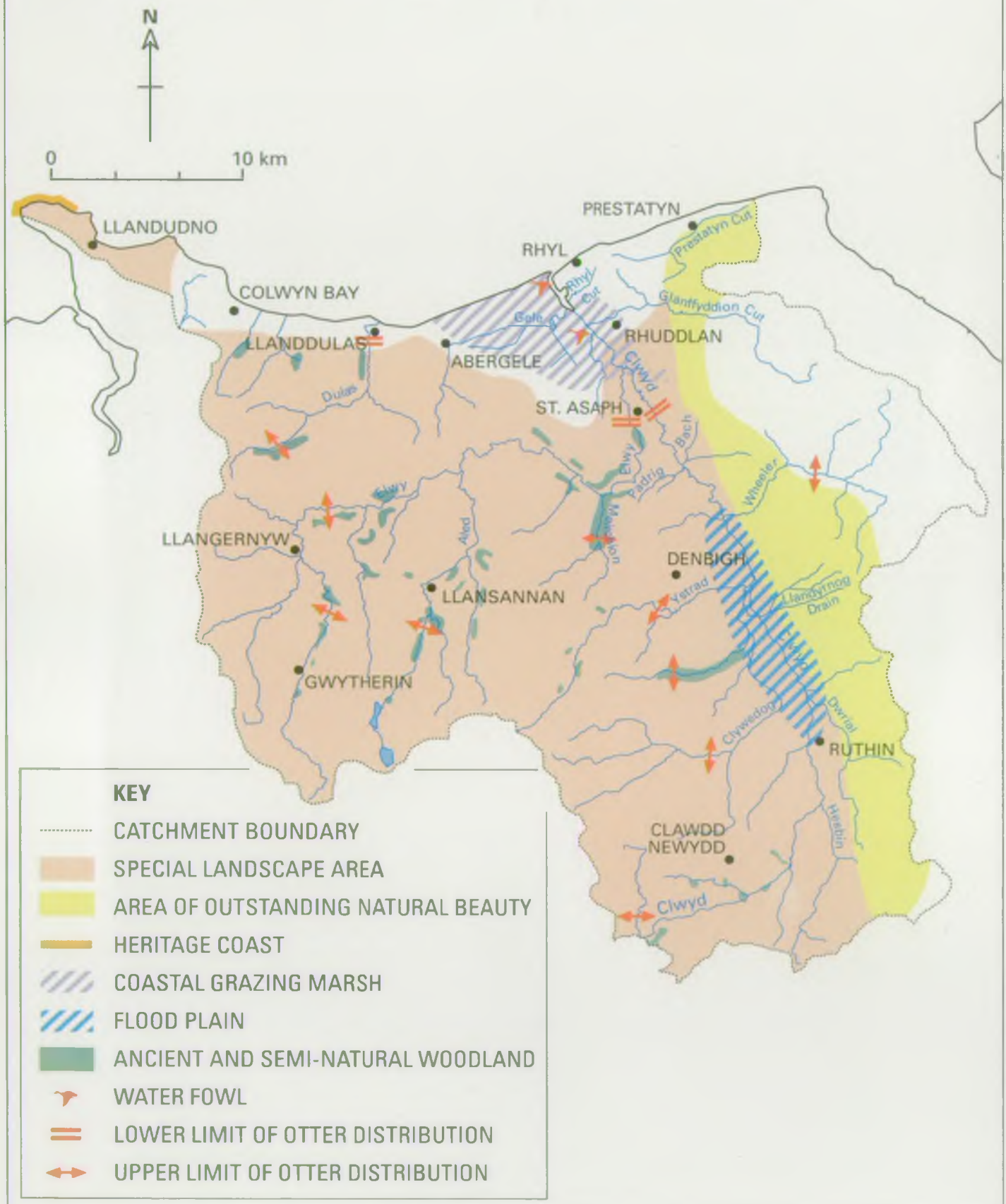
Other sites of ecological importance are the proposed Clwydian Range ESA (Environmentally Sensitive Area), the 5 Wildlife Trust Reserves, 6 Woodland Trust Reserves and the Forest Enterprise conservation area at Clocaenog.

- 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.
- 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 features standards will be the maintenance of existing conditions, unless otherwise specified.

MAP 14. CONSERVATION – ECOLOGY AND LANDSCAPE



3.13 CONSERVATION - GENERAL ECOLOGY AND LANDSCAPE

General — This section deals with the broader aspects of the conservation of — wildlife and landscape within the river corridor and associated wetlands.

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 or Special Landscape Areas.

Local Perspective The Clwyd estuary, which is canalised and embanked to the tidal limits, retains relatively small areas of saltmarsh on either side of the mudflats. Together with the wider coastal plain, the area is important for feeding and wintering waterfowl, particularly supporting nationally important populations of sanderling. Key estuarine issues include protection, enhancement and the alleged disturbance to shelduck creches caused by jet and water skiers.

Within the flood plain of the Clwyd, the channel is relatively unmodified and river management has generally been sympathetic with fencing and tree planting carried out routinely by the NRA. The planform of irregular meanders and fossil channel features contrasts with the sinuous nature of the Elwy, where channel migration is geologically constrained. In this catchment bed sediments are particularly mobile, with regular reworking of shingle banks. Along the Elwy use of lowland is largely pastoral, contrasting with the more arable use of the fertile Vale of Clwyd.

In the east, the upland acidic grassland and remnant heather moorland contrasts with the extensive blanket bog to the west, large areas of which have been degraded by coniferous afforestation.

Ancient semi-natural woodland remnants occur throughout the catchment, but are generally restricted to the steeper slopes of the upland valleys. Wetland occurrence and diversity is poorly described, but key habitats such as reedbeds, mires, ponds and wet grassland are relatively scarce. The shingle bank adjacent to the Gronant Dune system is of ornithological importance as Wales' only breeding site for little tern.

Beyond the coastal fringe, no major species issues have been identified within the catchment. Invertebrate populations are abundant and diverse although no rare species have been recorded. The normal range of river bird species are known to occur, although wader numbers are likely to be limited by the availability of wet grassland.

Recent Otter Survey Data (1991) indicates a significant increase in population on the Clwyd, Elwy and Dulas, with positive survey sites doubled since 1984.

Landscape quality throughout most of the Plan area is high, with both regional and national designations.

In order to facilitate environmental impact assessment of NRA operations and authorizations affecting the catchment, a strategic river corridor survey will be implemented in 1994/95. The survey records key biological and physical features of the river corridor in 500 metre reaches and makes recommendations for management. Significant enhancement measures identified will be fed into the NRA's Conservation Capital Programme on a prioritised basis.

- Objectives**
- To ensure that wildlife and landscape 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 site 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 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.

ARCHAEOLOGY AND HERITAGE



3.14 ARCHAEOLOGY AND HERITAGE

General This section deals with the conservation of archaeological and heritage features within and beyond the river corridor.

Heritage and features of archaeological interest are of great importance in many catchments and may attract a large number of visitors.

In carrying out its duties the NRA is required to have regard to protecting and conserving the archaeological and historic heritage.

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

Local Perspective There are over 150 SAMs within the catchment of the Clwyd but these represent less than 10% of all currently known sites. Furthermore, these sites are merely what remains today of a history which has helped to form the present landscape.

During the last 10,000 years the activities of successive generations of man have modified the environment. One of the most obvious examples on the Clwyd is the canalization of the main river from Rhuddlan down to the sea, which was carried out in mediaeval times when the castle was built.

Other activities have had less obvious effects, and evidence of them is more difficult to find. Deposits along the coastal strip are rich in the remains of human activity which has occurred since Mesolithic times 8,000 years ago. Bronze Age mines are found on the Great Orme and Iron Age hill forts along the Clwydian range.

Objectives - To ensure that archaeological and heritage features of interest including designated sites are protected and, where appropriate, accessible.

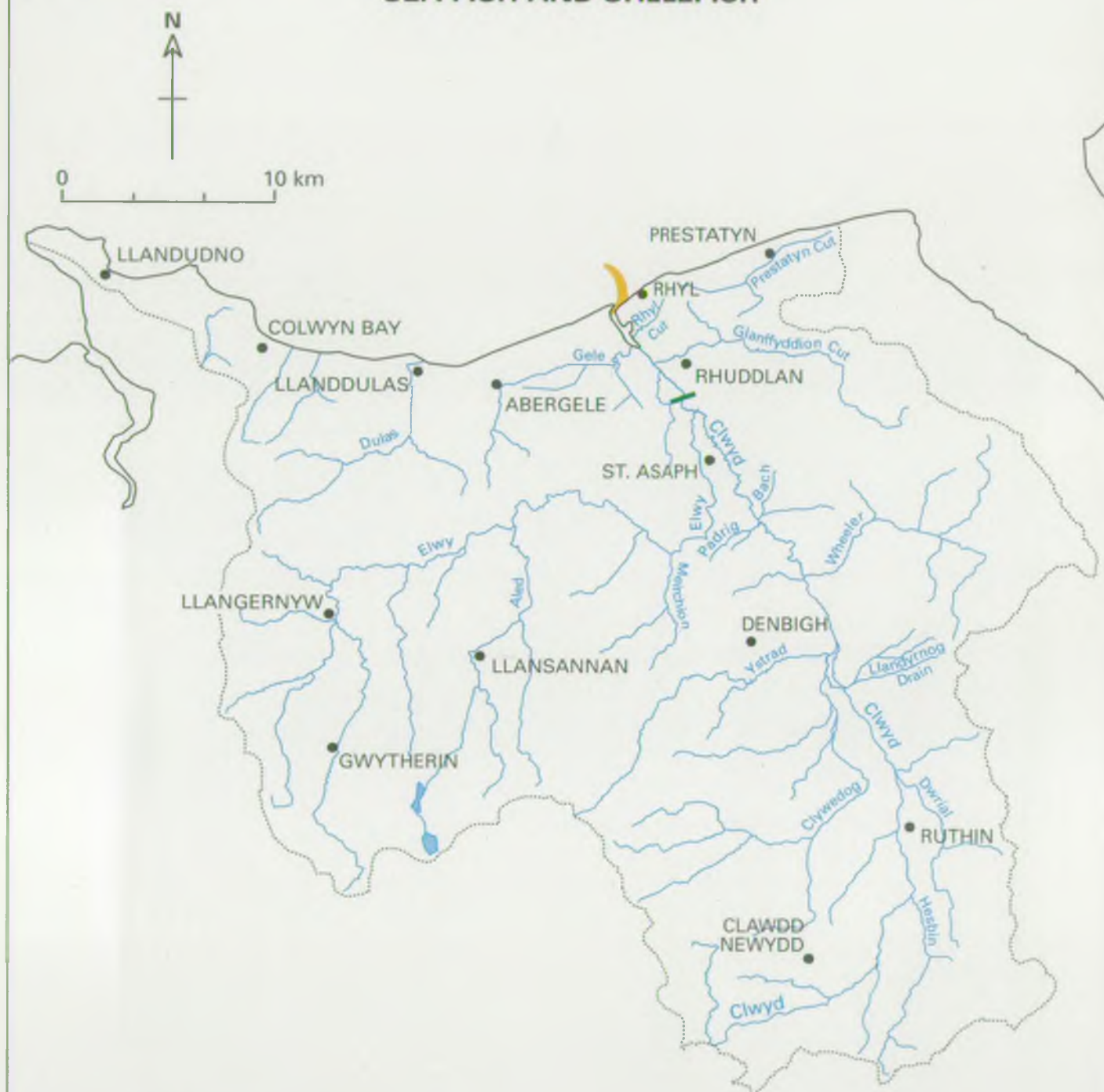
Environmental Requirements

Water Quality - It is unlikely that there could be any specific water quality requirements to protect archaeological or heritage sites although water around such public places should at least conform with the basic aesthetic standards.

- 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** - Sites and buildings of interest should, where cost-effective, be protected from damage by flooding and/or drought.
- There will be a need to protect features within the river corridor or associated wetlands which contribute to the archaeological interest.

MAP 16.

COMMERCIAL HARVESTING OF SEA FISH AND SHELLFISH



KEY

- CATCHMENT BOUNDARY
- AREA OF LICENSED SALMON NETTING
- UPPER TIDAL LIMIT

3.15 COMMERCIAL HARVESTING OF SEA FISH AND SHELLFISH FOR HUMAN CONSUMPTION

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 byelaws 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, in some places it 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 EC Shellfish Waters Directive (79/923/EEC) 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 EC Shellfish Hygiene Directive (91/492/EEC) which 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 Eight sling (drift) nets for salmon fishing are presently available for issue annually by the NRA, under the terms of a Net Limitation Order. These nets, which are controlled by byelaw, are allowed to operate between the 15th March and 31st August. Historically catches have been as high as 1900 salmon and 2400 sea trout per season but, in recent years, there has been a steady decline and more typical figures have been around 150 salmon and 400 sea trout. As a consequence of the reduction in fish numbers and the increased level of net licence charge, only three nets were taken up in the 1993 season.

Coastal netting is controlled by North Western and North Wales Sea Fisheries Committee (NWNWSFC) and byelaws agreed with NRA are in force to protect salmonids on their migrations into freshwater. This is achieved through designated areas around the Clwyd and Dulas estuaries where beach netting and drift netting are prohibited during the period 1st April to 30th November (inclusive). Elsewhere along the coastline such netting is permitted at all times within the terms of NWNWSFC byelaws. Any salmon or sea trout accidentally captured must be returned.

Little commercial sea fishing takes place along the coast. Sea angling activity centres on charter boats which are available for hire out of Rhyl and Rhos-on-Sea. Popular locations are the Constable and Hoyle Banks where species available include thornback rays, cod, whiting, bream, gurnard, mackerel, pollack and conger eel.

Beaches along the Gronant Dunes are famous for the winter catches of dabs and whiting and, in the spring the main target species are flounder and eel. Further west at Prestatyn and Rhyl, winter brings in codling, whiting, pout and dogfish. The sandy beaches of Colwyn Bay are predominant areas for flatfish, with the frosts in winter bringing in whiting and codling.

Shrimp fishing is pursued by push net fishermen on the beaches at Colwyn Bay, Abergele and Pensarn, and the occasional shrimp beam trawler operates in deeper water off Rhyl or the Dee estuary. No shell fisheries are available locally and some local fishermen move to the Dee estuary to gather cockles and mussels.

- 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 the 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 in shellfisheries designated under the EC 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.
- Water Quantity** - The Authority will develop and implement a Regional Licensing Policy which will enable the effective management of Water Resources within the Clwyd catchment. This will achieve the right balance between the needs of the environment, and those of abstractors and of other river users, including protection from derogation.

MAP 17.

BASIC AMENITY



3.16 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 amenity value of the river corridor as a whole is generally low. Public access and activity is generally concentrated in the environs of Ruthin, Rhewl, St. Asaph and the Foryd at Rhyl.

Public access is largely absent from the Elwy and the middle reaches of the Clwyd. Several access problems remain unresolved and a local requirement for short and medium length river walks has been identified, particularly in the Ruthin to St. Asaph reach.

There are few facilities for bird watching, and picnic sites and interpretation facilities are generally lacking.

- Objectives**
- To maintain the water course so that 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 - The 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 18.

ANGLING



3.17 ANGLING

General

This section deals with the recreational activity of fishing with rod and line, rather than the protection of fish stocks. The latter is 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

In terms of angling, the two rivers of greatest interest are the Clwyd and Elwy.

The Clwyd drains from the Clocaenog Forest and is a slow flowing and meandering system. The Elwy, which has its source to the west of the Denbigh Moors above Gwytherin, is an extremely flashy river having high run-off during times of heavy rain and suffers extreme low flows during dry periods. The River Aled, which drains to the Elwy, has two water supply reservoirs, Llyn Aled and Llyn Aled Isaf, in the headwaters.

The fisheries potential of the Clwyd and Elwy is markedly different but both are well known for their sea trout and brown trout fisheries. Seasonally smaller runs of salmon also take place.

There are 3 main local clubs in the Clwyd catchment, namely Denbigh and Clwyd AC, St. Asaph AA and Rhyl and District AA, which collectively form the Federation of Clwyd Angling Clubs to improve communication and management strategies for the Clwyd system. Other clubs which also control angling waters in the areas include Capenhurst AC, Wirral Game AC and Bodelwyddan AC.

Historically catches of salmon and sea trout show considerable variation, but in recent years a marked decline in numbers has been evident. However, since 1992 catches and the numbers of juveniles in-river have been increasing and it is hoped that a recovery of stocks is underway. Rod catches per season are around the 100 for salmon and around 250 for sea trout. Distribution of migratory fish, and therefore catches, are very much dependent upon the flow conditions prevailing, particularly on the Elwy. Brown trout fishing can be enjoyed throughout the system, but most angling clubs introduce reared fish to boost angling returns because natural recruitment and production is insufficient to keep up with the angling demand. A number of impassable barriers are located in the area which restrict the full distribution of migratory species, the most notable being found on the River Clywedog (tributary of the Clwyd).

Put and take trout fishing is available on a number of lakes in the catchment, notably Dolwen and Plas Uchaf reservoirs at Llanefydd, Tan-y-Mynydd at Abergele and Felin-y-Gors at Bodelwyddan.

Coarse fishing for perch, pike and roach is to be found in Llyn Aled and Llyn Aled Isaf, which are controlled by Hamdden Ltd (a subsidiary of Welsh Water PLC). The Brickworks Pool at Rhyl and Llyn Helyg near Holywell provide good mixed coarse fisheries for local anglers.

The Colwyn Bay Victoria Sea Angling Club (CBVSAC) has approximately 90 members with access to a pool at Clobryn Road, Llysfaen. The Club also has sea shore/boat anglers with a combined membership from all the sections of about 250.

Angling seasons for migratory fish extend from 20th March until the 17th October, and brown trout from 3rd March until the 30th September. Tighter restrictions (31st May to 30th September) apply to brown trout fishing below Rhuddlan Road Bridge to protect migrating smolts. The statutory close season (14th March until the 16th June) is in force in respect of the coarse fishing waters. Details on where to fish in the area are produced by the NRA in the "Angling Guide for the Rivers Dee and Clwyd".

Objective

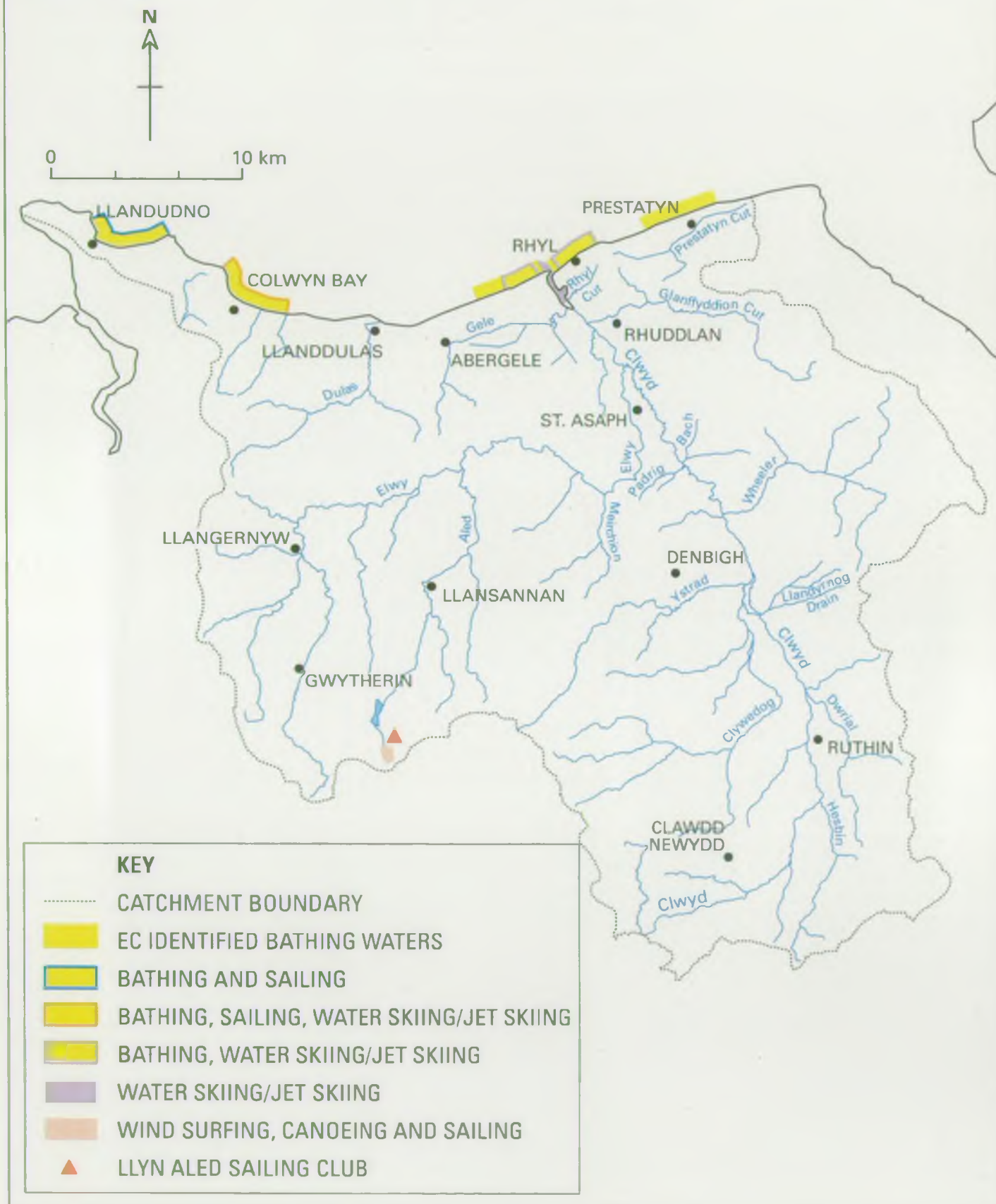
- To ensure that the water environment can sustain angling at least at its current distribution and quality.

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 19.

WATER SPORTS ACTIVITY



A £15 million DCWW scheme, due for completion in the Spring of 1994 is designed to ensure compliance with the mandatory bacteriological standards required by the Bathing Waters Directive. The scheme incorporates primary settlement and screening of sewage before discharge to sea through a 3.8km outfall. The existing crude sewage outfalls at Pensarn, Kinnel Bay and Rhyl will become combined storm sewage overflows, whilst the existing outfall at Prestatyn is due to be replaced. A scheme at Colwyn Bay is due for completion in 1998.

Other immersion sports such as water and jet skiing have become increasingly popular over recent years, with these activities mainly taking place at Colwyn Bay and Rhyl.

There are several clubs involved in all year sailing, water skiing, canoeing, jet skiing and wind surfing. The level of activity is significantly enhanced during the tourist season.

In the Clwyd estuary and along the coastline, most of the water and jet skiing is organised by the Rhyl Power Boat and Water Ski Club. It operates 12-14 craft and has approximately 50 members. The more recently formed Ocean Beach Water Ski Club has a similar membership and level of activity. On Llyn Aled, a 44.5ha reservoir at the head of the Elwy catchment, the local sailing club permits windsurfing and canoeing.

Apart from an embarkation point at Rhuddlan car park to tidal waters, access for canoeing on all rivers within the Plan is very restricted and permission must be sought from the riparian owners or fishing clubs.

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 Directive.

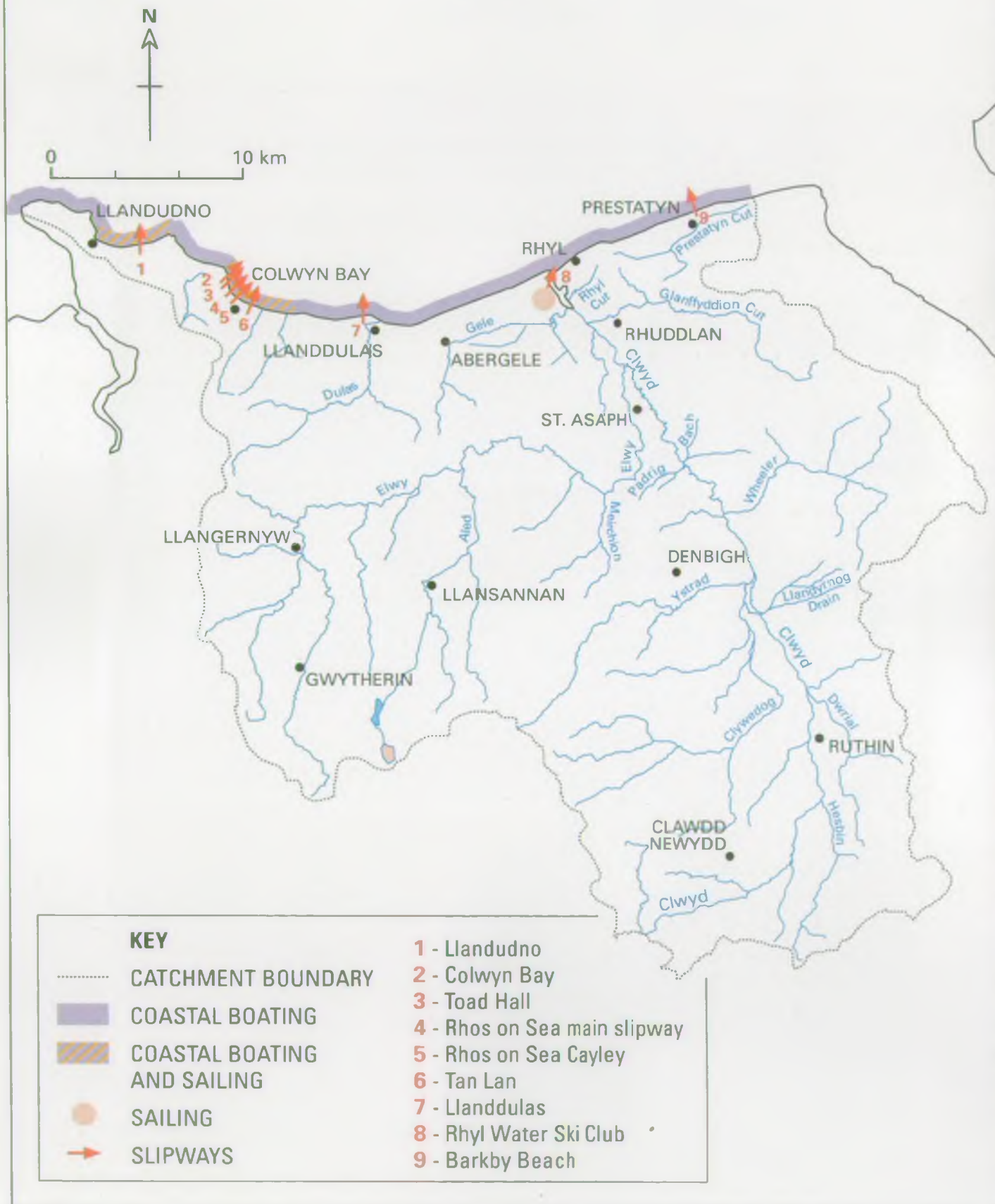
- Physical Features** - Promotion of safe and easy access to and from Identified Bathing Waters.

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** - 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** - To protect and, when possible, improve access to contact/recreation waters.

MAP 20.

BOATING



3.19 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 personal 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 NRA's concern is principally for the participants' enjoyment of the activity.

Local Perspective

The two sailing clubs in close proximity to Rhyl which use the coastal waters are Rhyl Yacht Club, with around 80 members, and Prestatyn Sailing Club with 30 members. The former club is situated at the Foryd Harbour and uses the mooring facilities within the dock, whilst the latter uses mooring facilities at Barkby Beach. Private slipways are to be found within Foryd Harbour and are operated by Rhyl Yacht Club. Just upstream of the Foryd road bridge the Water Ski Club also has a slipway. A public slipway is available at Barkby Beach, Prestatyn.

The Bay of Colwyn Sailing Club at Rhos-on-Sea has a small mooring facility, slipway access and an onshore compound. Rhos-on-Sea is also the base for local charter boats and a number of commercial fishing boats.

Rhuddlan Borough Council owns and controls the Marine Lake at Rhyl which is a salt water facility connected to the Clwyd. The level of the lake is maintained by periodically filling it with water from the estuary. The lake is operated as a general water based recreational facility for tourists and local residents. Rowing and paddle boats can be hired, and water skiing and windsurfing are permitted at certain times under the control of the Marine Lake Water-Ski Club.

The facility of Rhyl Harbour attracts and caters for coastal cruisers but more particularly boats with fishing parties. As Rhyl is an important tourist resort, special facilities for safety on the water are available on the promenade. These include the RNLI offshore lifeboat and the inshore inflatable rescue craft. The local council also operates beach patrols with inshore rescue boats. At Llandudno the safety of water users is catered for by the RNLI Lifeboat which is operated from the promenade.

In recent years consultants for Rhuddlan Borough Council have been assessing the feasibility of creating a marina within the Rhyl Harbour area which would be less affected by tides. However, no firm proposals have been advanced as yet. The project would entail the construction of a tidal sluice and full consideration of the implications of this to the river would be required. Colwyn Borough Council is also considering a proposal for a marina at Llanddulas. This proposal is in the very early stages, but again detailed consideration would be given to the environmental implications of any proposed scheme.

On the Denbigh Moors Llyn Aled reservoir owned by Hamdden Ltd., is used for both sailing and windsurfing by Llyn Aled Sailing Club, which has a membership of 40.

Objectives

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

Environmental Requirements

Water Quality

- The provisions for Aesthetic Criteria should be complied with.

Water Quantity

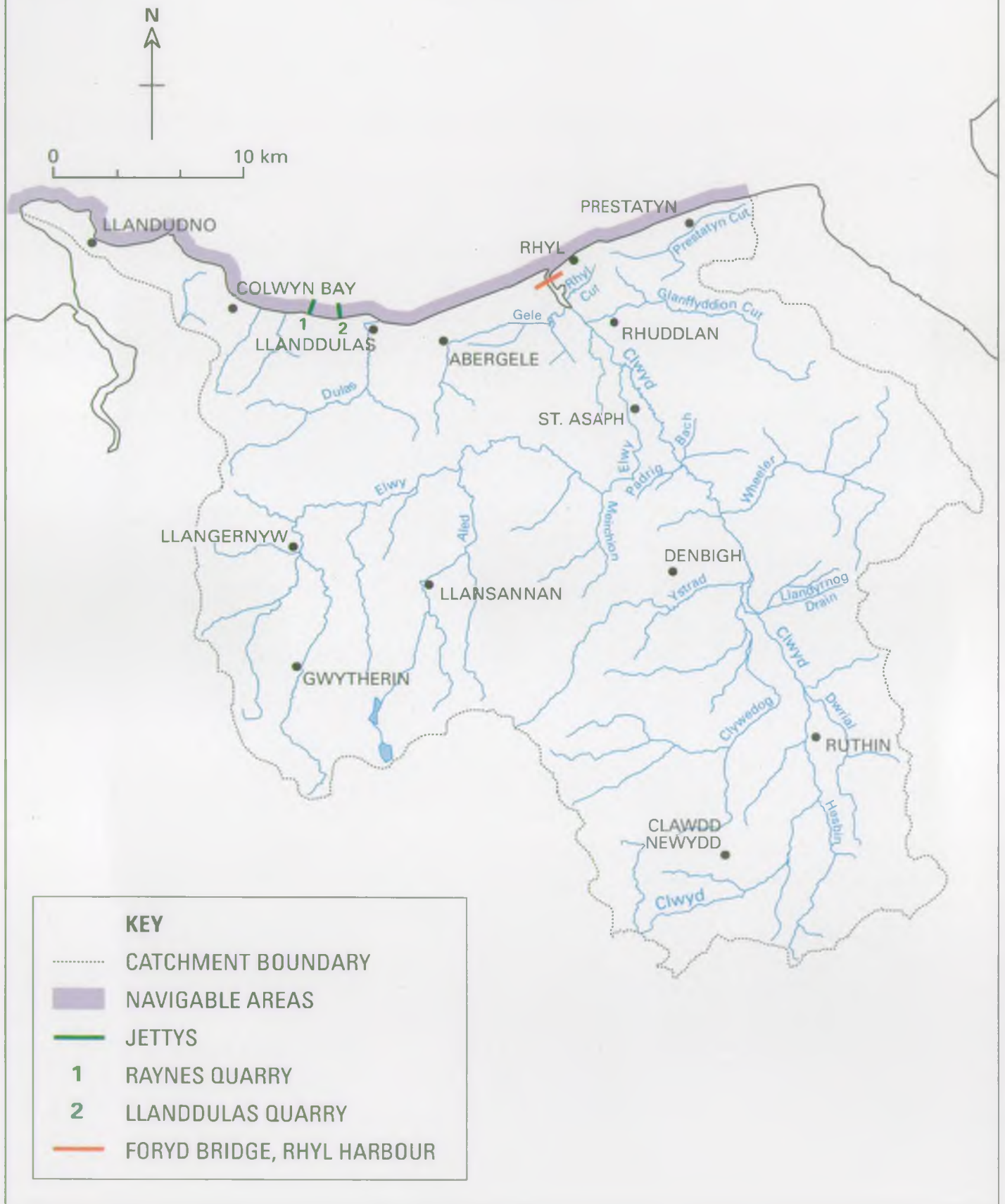
- The Authority will develop and implement a Regional abstraction licensing policy that will enable the effective management of water resources within the catchment. This will achieve the right balance between the needs of the environment, abstractors and other river users.

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.

MAP 21.

NAVIGATION



3.20 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

The physical features of the entrance to Rhyl Harbour presently restrict access to small recreational and fishing boats, which can only enter from about half tide upwards.

The NRA does not have any responsibility for the provision of navigation aids in the Clwyd estuary.

Trinity House is responsible for the maintenance of buoys and channel markers approaching the harbour entrance. Rhuddlan Borough Council is the Harbour Authority and has responsibility for perches and other navigational marks associated with the entrance to Rhyl Harbour. This harbour is utilised as a mooring facility for small craft.

Objectives

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

Environmental Requirements

Water Quality

- Compliance with the standards for Aesthetic Criteria should be achieved.

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**
- 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 22.

FLOOD DEFENCES



3.21 FLOOD WATER STORAGE AND FLOOD DEFENCES

General

This use relates to the protection of people and property against flooding from rivers and the sea and the 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, or combinations of both. The severity of an individual flood event is generally described in terms of its frequency of occurrence. This frequency is 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 of 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 those 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, e.g. urban areas are often provided with 1 in 100 year protection while, for agricultural areas, 1 in 5 year protection may often be considered sufficient.

Under the Water Resources Act 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. rivers 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 District or Borough council 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 the NRA so that the requirements of other uses are considered 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

Within the area covered by the plan, the necessary powers to maintain or improve defences is shared by a mixture of District Councils (maritime defences) and the NRA. The existence of extensive development within the coastal plain has generated a commitment to the provision of adequate sea defences by the District Councils. There are also significant lengths of defence in private ownership, predominantly that of British Rail. The type of sea defence varies between natural dune systems and the traditional concrete sea wall/promenade of a seaside town.

Prompted by the February 1990 Towyn flood disaster, extensive programmes of improvement work have been developed along the majority of the coastal frontage. Invariably the improvement works undertaken have consisted of "soft" solutions of rock revetment and beach nourishment to combat the loss of natural beach material from the front of the existing defences. In this way the risk of breaches is minimised by the reduction in wave energy.

In contrast the tidal defences within the Clwyd estuary and the remaining fluvial defences maintained by the NRA are earth embankments. The majority of the fluvial defences are concentrated in the flood plain of the Clwyd between Bodfari and Ruthin, where the major tributaries Ystrad and Clywedog join from the west.

The existence of such extensive areas of flood and coastal plains and low-lying land present drainage difficulties. Pumping stations are utilised in many urban and rural situations to introduce artificial gradients and hence facilitate drainage. Such pumped systems require regular maintenance to the watercourses feeding them.

Elsewhere in the area flood defence work consists mainly of shoal removal and river management schemes carried out as necessary.

One Flood Warning Scheme is operated in the area in recognition of the risks associated with the flood banked section of the Elwy where it passes through the developed area of St. Asaph. In addition the NEPTUNE TIDAL ALERT SYSTEM which is administered by the North West Region of the NRA, gives warnings of surge conditions along the North Wales Coast.

There are no major flooding problems within the area covered by the Plan, although large areas of agricultural land within the flood plains are inundated from time to time. However, limited incidents associated with ordinary river systems have been recorded.

The area contains part of the Afon Ganol Internal Drainage District (IDD), which extends from Rhos-on-Sea inland to the bifurcation structure at Mochdre. This IDD together with the Dulas catchment to the east is administered by the Gwynedd Local Flood Defence Committee (LFDC), the remainder of the Plan being within the Dee and Clwyd LFDC area.

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.
- 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

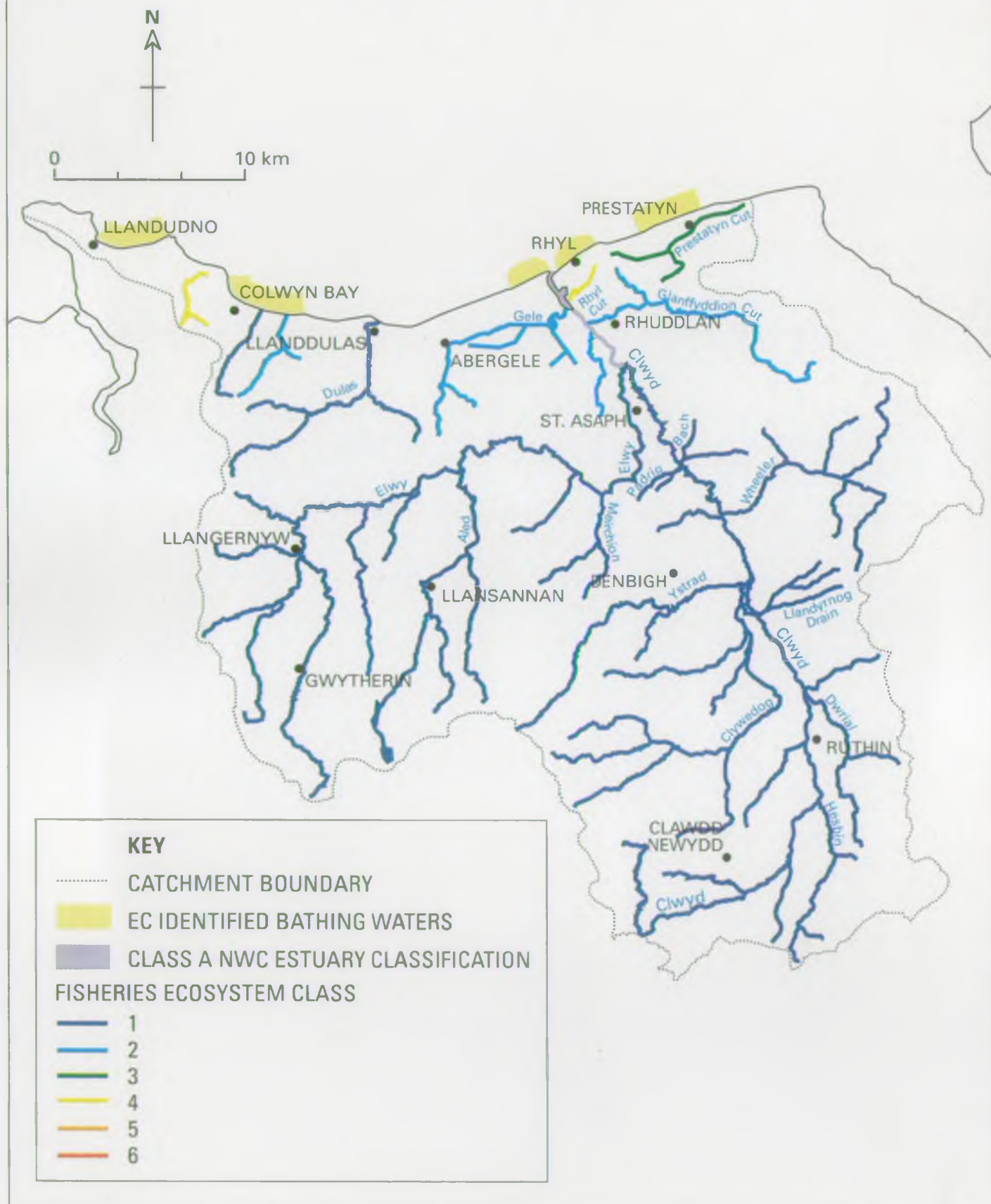
- Physical features**
- In protected areas, the flood defences/river bank should not be overtopped by a flood flow within a specified return period.
 - In areas where land use is primarily agricultural, the water course should provide effective drainage.
 - The river banks should contain flows up to 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.
 - To provide adequate arrangements for flood warning.

4.0 CATCHMENT TARGETS

In this section targets which are designed to protect the most sensitive Use for each part of the catchment are set for Water Quality, Water Quantity and Physical Features. In this manner any other Uses that have less stringent needs are also protected.

MAP 23.

WATER QUALITY TARGETS



4.1 WATER QUALITY

General

There are two aspects to water quality assessment; the first relates to the classification of waters according to a graded system, the second to the measurement of achievement of targets associated with the protection of specific Uses. The first aspect has, for many years, involved using the National Water Council (NWC) system where water quality classes range from excellent to very poor on the basis of simple class standards. 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. However, this approach will not be appropriate for water quality assessment for individual catchments, such as is required for Catchment Management Plans.

For Catchment Management Plans it is more appropriate to assess the performance of waters against specific water quality targets. In this instance the targets are set to protect specific Uses of the catchment and call on suites of water quality standards that have been determined for each. These suites draw heavily on the existing sources of data, especially the EC Directives for Bathing Waters, Freshwater Fisheries, Shellfish Waters, Shellfish Hygiene and Urban Wastewater Treatment but are constructed to give a more complete coverage of water chemistry than any of the Directives or NWC classes individually. These suites are used as the basis for setting use-related water quality targets for all parts of the catchment. The targets set using these suites represent the most stringent available and reflect the visionary concept of Catchment Plans.

Water Quality

Targets for CMPs

Specific water quality targets are set for Catchment Plans by firstly identifying the appropriate targets for each Use at each site (or reach). Then the Use(s) with the most stringent water quality requirements is identified and used to set the overall targets for that site. All other Uses with lower water quality requirements will be protected by the chosen targets.

WQOs

For a number of Uses the Department of the Environment is developing schemes of Water Quality Objectives which can be made statutory following public consultation and agreement with the Secretaries of State. It is intended that the standards supporting these WQOs will, where appropriate, be the same as those used within the Catchment Plan for the relevant Uses. When the scheme has been finalised these WQOs will ultimately be introduced to all catchments via the Catchment Planning process.

Specific Catchment Targets

Twenty one Uses have been identified within the catchment, each with its own water quality requirements. The accompanying map No. 23 shows which Uses are the more demanding in terms of water quality for the different reaches. In the Clwyd estuary NWC class A is the target and for the identified bathing waters at Llandudno, Colwyn Bay, Kinnel Bay/Sandy Cove, Rhyl and Prestatyn there is a need to comply with the standards contained in the Bathing Waters Classification Regulations (DoE interpretation of EC Bathing Waters Directive requirements). Throughout the freshwater reaches of the catchment Fisheries Ecosystem standards are the targets, albeit augmented by the need to comply with the standards of the EC 'Surface Waters' Directive, EC Freshwater Fish Directive etc. The fisheries in the catchment are predominantly salmonid and require a target of Fisheries Ecosystem classes 1 or 2. Some tributaries are targeted to support high class cyprinids.

The different classifications (A1, A2, A3) for potable abstractions reflect the different types of treatment required for the current quality of water abstracted, and these remain as the targets for this Use.

To protect other Uses in the catchment, it is important that all discharges have, and comply with, environmentally protective consent conditions. This remains a target of high priority. All Public sewage discharges should comply with the requirements of the EC Urban Waste Water Treatment Directive by the year 2006. Priority schemes which need to be completed by the year 2000 have been incorporated into Dŵr Cymru Welsh Water's Asset Management Plan (AMP 2) in agreement with the NRA.

The prevention of groundwater contamination is a major objective for the NRA. In the Plan area there are substantial reserves of groundwater which are an important source for potable abstraction. The NRA requires all those whose activities may compromise groundwater quality to have regard to its Groundwater Protection Policy. Activities of particular significance in this context are:-

1. Waste disposal to land.
2. Disposal of slurries and sludge to land
3. Physical disturbance of aquifers affecting both quality and quantity of groundwater reserves.
4. Contaminated land.
5. Diffuse pollution.

It is important to note that the definition of "controlled water" provided by the Water Resources Act, 1991, includes groundwater.

4.2 WATER QUANTITY

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.

Specific Catchment Targets

Both the Clwyd and Aled (a tributary of the Elwy) are subject to regulation of flow, the former from groundwater in the Vale of Clwyd and the latter from surface water reservoirs on the Denbigh Moors.

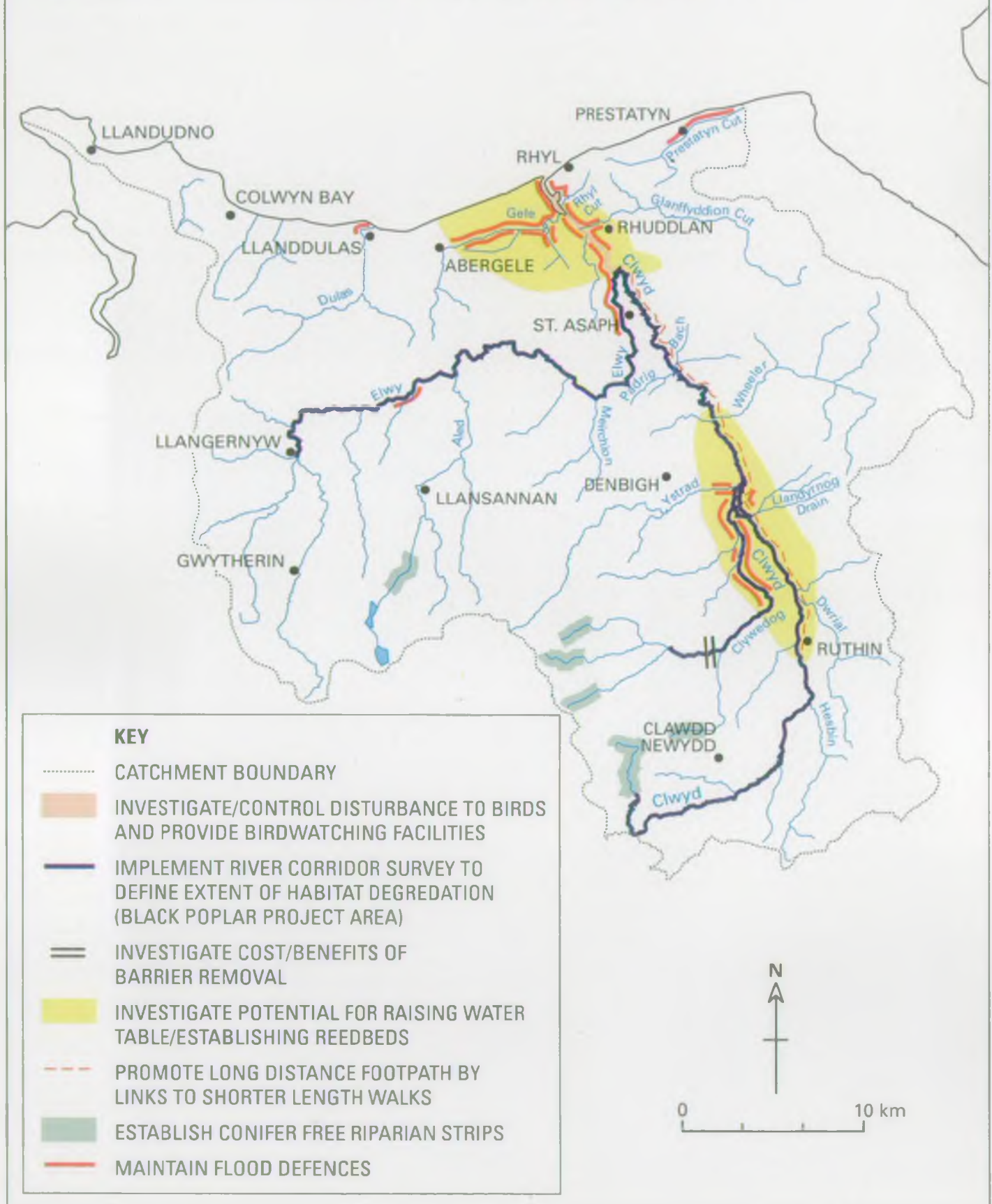
The Clwyd and Aled schemes are both the subject of Agreements under Section 20 of the Water Resources Act 1991 between the NRA and Dŵr Cymru Welsh Water. Each Agreement stipulates and governs the rules under which the scheme is managed, to safeguard the environment.

Boreholes into the Triassic sandstone are used as the principal source of water for augmentation of the Clwyd during times of low flow, to allow abstractions into supply at Llannerch Park. In addition, augmentation is effected by indirect discharges of water from the Alwen aqueduct which crosses the southern part of the catchment. The scheme operates on a 'hands off' flow principle, which means that natural low flows downstream of the abstraction point are not affected.

Groundwater from the Clwyd aquifers is used conjunctively with the Llyn Aled/Aled Isaf system. Storage in these lakes is augmented by catchwaters. Compensation flow and releases are made in dry conditions to protect natural flows downstream of abstractions for the benefit of other uses.

MAP 24.

PHYSICAL FEATURES TARGETS



4.3 PHYSICAL FEATURES

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.

Specific Catchment Targets

There are many uses in the catchment which have their own physical features requirements. Map No.24 shows the areas where, for a particular use, a specific requirement exists.

In addition to the requirements identified on the map the following general requirements are also considered targets for the catchment:

Flood Storage/ Defence**Operational Activity**

The NRA aims to deliver the following drainage service, subject to the work being cost-effective:

- (i) Protection of people and property from inundation by floodwaters:

For domestic, commercial and industrial property against flood events up to 100 year frequency, and

For land, against flood events up to 10 years frequency, depending upon land use.

- (ii) Provision of adequate outfalls to existing land drainage systems to facilitate efficient operation.

- (iii) Provision of suitable access for maintenance of the river/channel and sea/tidal/flood defences and for the construction of new defences as required.
- (iv) Maintenance of unobstructed river flow by the removal of excessive silt and other major obstructions, especially in urban areas where aesthetic standards must also be maintained.
- (v) Continued operation of flood defence structures to ensure adequate flood protection of all identified uses.

Regulatory Activity

The NRA, in its role as statutory consultee under the planning legislation, will advise the local planning authorities on all drainage matters. In particular, planning authorities will be encouraged to use their planning powers to guide development away from flood plains.

For particular developments, the NRA aims to avoid development taking place on land where flood protection standards are sub-standard and when an increase in flood risk would result.

The NRA also aims to deliver:-

- (i) Control over its main river network through the granting of consent for the construction of works which could adversely affect the hydraulic capacity of that main river section.
- (ii) Extension of these powers to ordinary watercourses under certain circumstances.
- (iii) General supervision over all matters relating to flood defence and the development of byelaws necessary to secure the efficient working of its assets.

Archaeology and Heritage

Preservation of sites and areas of historical interest through development control and NRA authorization.

Special Ecosystems

Maintenance and where possible, enhancement of the special interest of the site through development control, NRA authorisation and collaborative projects.

CATCHMENT TARGETS

Fisheries Ecosystems	<p>Maintenance of suitable habitat for salmonid breeding, i.e. redd sites and nursery areas.</p> <p>Unimpeded access for migratory salmonids through the Clwyd estuary and up river to all available spawning reaches, the latter target to be restricted to those areas where there is no risk of adverse impact on the genetic integrity of pristine native brown trout populations.</p> <p>Maintenance of fish holding pools throughout the catchment.</p> <p>Protection of wild fish stocks and prevention of escapement from fish farms by effective fish screens on all abstractions and discharges.</p>
Basic Amenity	<p>Maintenance and, where possible, promotion of the development of footpaths, birdwatching points, picnic sites and access points along the river. In particular the resolution of access problems and, by co-operative action, promotion of river walks between Ruthin and St. Asaph and along the Elwy.</p>
Boating	<p>Maintenance and, as required, improvement of access and associated facilities.</p>
Water Sports Activity	<p>Protection and, when possible, improvement of access to contact/recreation waters. Promotion of the establishment of at least one canoe access agreement within the catchment.</p>
Navigation	<p>Any maintenance of navigation channels or aids to navigation to take into account other uses of the water.</p>
Fisheries/ Shellfisheries	<p>Maintenance and, where required, improvement of access and associated facilities.</p>
Angling	<p>Safe access to and from the waterside to be promoted, particularly for the disabled. The waterside features required for successful angling should be maintained and developed.</p>
General Conservation and Landscape	<p>Maintenance and enhancement of aquatic habitats and related landscapes through development control, NRA authorisations and NRA operations. Collaborative projects to focus on degraded wetland habitats, particularly fossil channels, marshy grassland, fen and bog. Establishment of minimum 25ha reedbed and 25ha damp grasslands for waders by 1998.</p> <p>Investigation of alleged disturbance of waterfowl in upper Clwyd estuary by power boats and jet-skis.</p>

Definition of the extent of degraded riparian habitats by Strategic River Corridor Survey (RCS) and implementation of remedial measures.

Maintenance and, where possible, enhancement of key rare or protected species e.g. otter, black poplar.

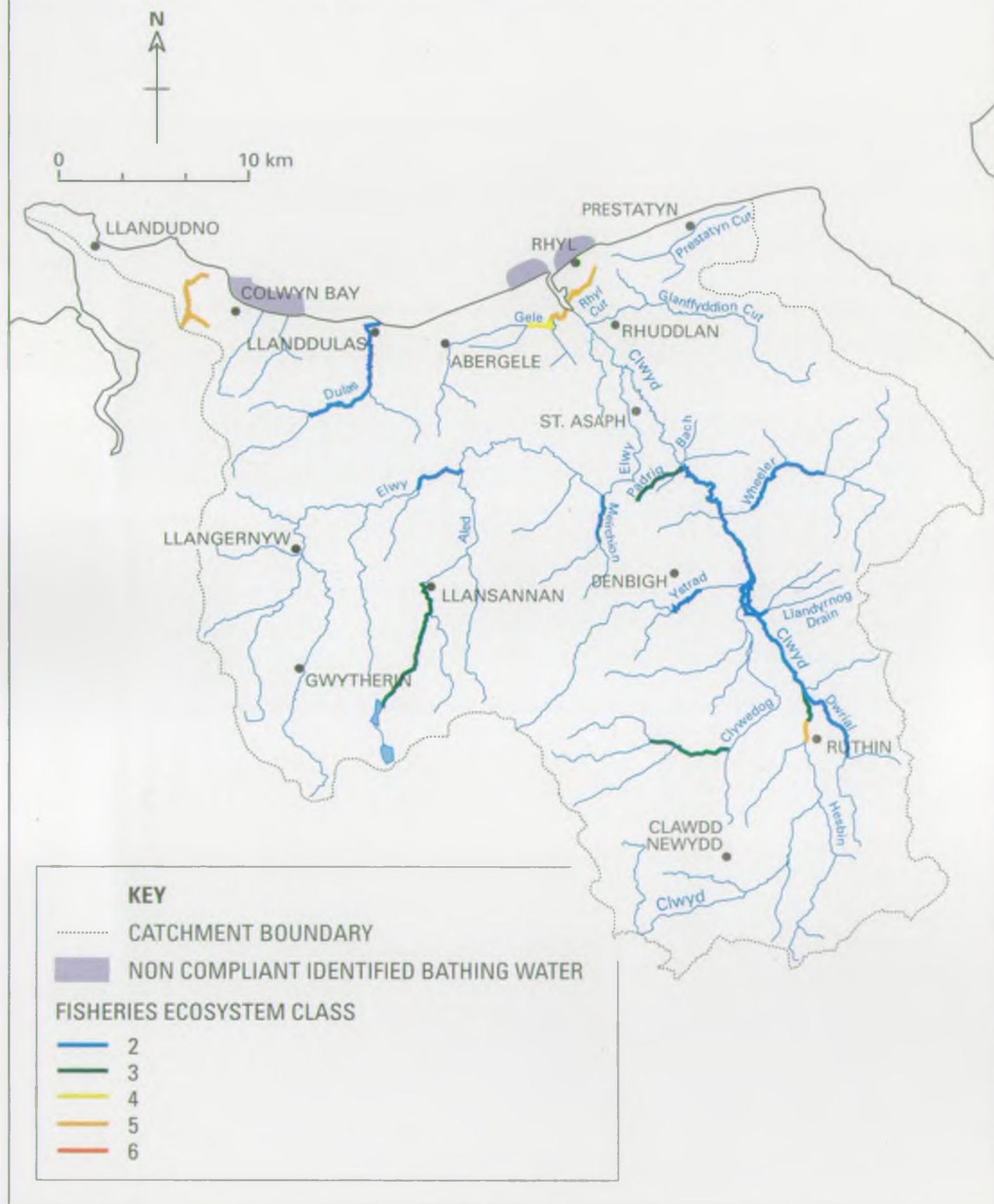
Production of site management plans for all NRA land holdings by 1998.

5.0 THE STATE OF THE CATCHMENT.

The following section examines the catchment's ability to meet the targets set in section 4, and thus support the Uses identified in section 3. In this way the Key Issues in the catchment can be identified and cost-effective solutions sought. The Issues are outlined in Section 7 of the Consultation Report.

MAP 25.

STATE OF THE CATCHMENT – WATER QUALITY



5.1 WATER QUALITY

General

The current state of the water quality of the Clwyd catchment has been assessed against the Use-related targets set in Section 4. 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 rivers which have irregular but significant pollution incidents, and 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 4 are not met.

The following section and map No.25 illustrate the results of this analysis: unless it is specifically stated otherwise, the catchment achieves its identified targets.

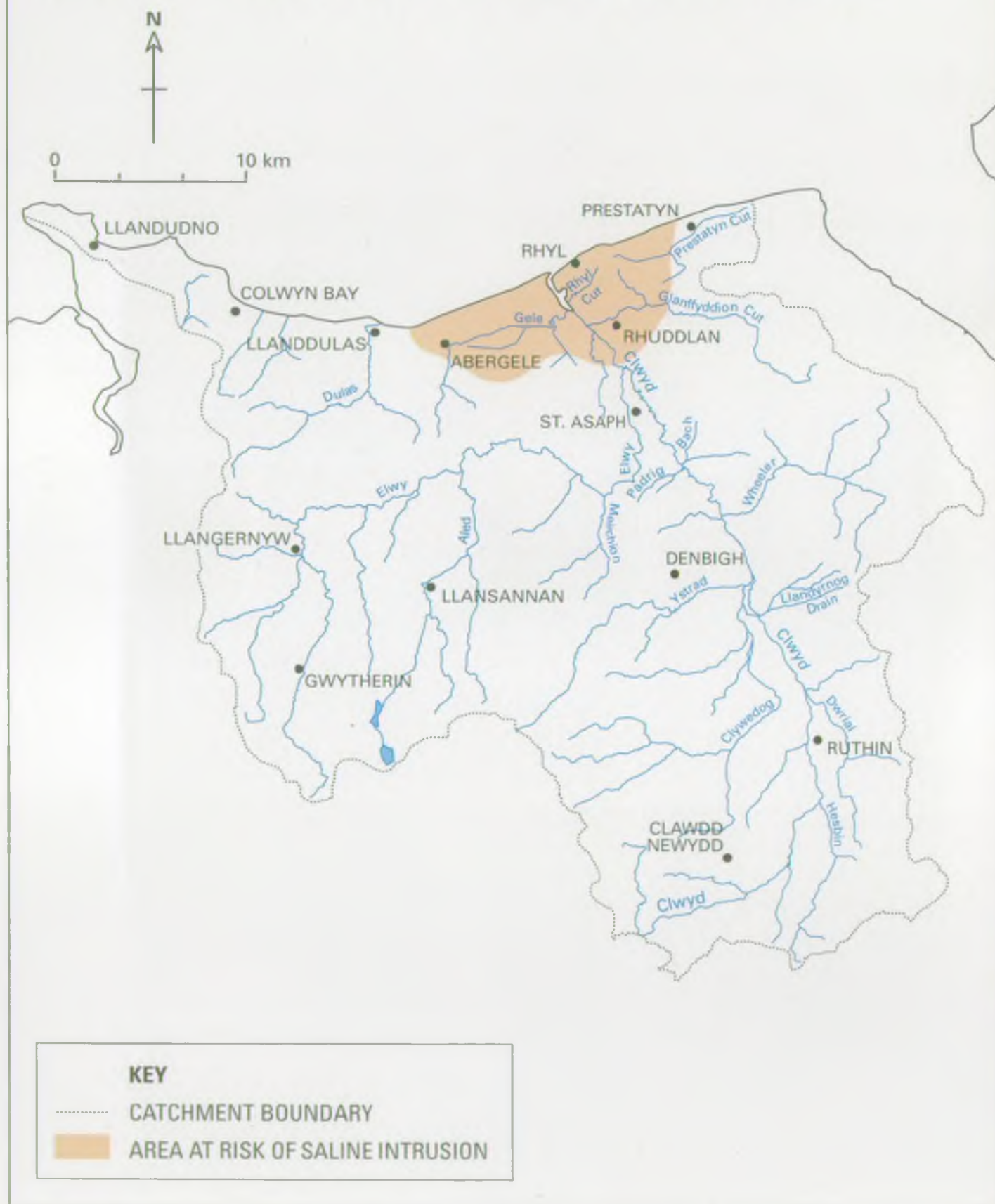
Issues Identified

- Elevated ammonia levels in the Clwyd below Ruthin sewage treatment works cause a deterioration from Fisheries Ecosystem Class 1 upstream of the discharge point to Class 5 for some 2 km downstream of the works.
(Issue 1 Section 7).
- Crude sewage discharges along the coast are associated with the failure of the identified Bathing Waters at Sandy Cove/Kinmel Bay, Rhyl and Colwyn Bay to comply with the EC Bathing Waters Directive mandatory standards.
(Issue 2 Section 7).

- Failure to achieve Fisheries Ecosystem class 1 for 5.8 km in the River Wheeler due to elevated ammonia levels derived from sewage works and fish farms. (Issue 3 - Section 7).
- Failure to achieve the target of Fisheries Ecosystem Class 1 in the lower Clywedog, Ystrad and Dulas catchments, due to agricultural pollution. (Issue 4 Section 7).
- Premature operation of some storm sewage overflows particularly at Ruthin, Rhyl, Dyserth and Prestatyn results in identifiable sewage debris in the receiving watercourses and is aesthetically unacceptable. (Issue 5 Section 7).
- Containment at Lon Parcwr and Ddol Uchaf waste disposal sites is considered inadequate resulting in a risk of leachate contamination of ground and surface waters. (Issues 6 & 7 Section 7).
- Failure to achieve the target of Fisheries Ecosystem Class 4 in the Ganol East due to diffuse agricultural and industrial pollution. (Issue 8 Section 7).
- Forest planting and harvesting operations result in solids contamination of watercourses within the upper reaches of the Plan area. This affects water quality and causes blanketing of the river bed with solids in important fishery nursery areas e.g. Nant Melin Dwr, a tributary of the River Clywedog. (Issue 9 Section 7).
- Zinc concentrations in the upper reaches of the rivers Aled and Clywedog put the stretches in Fisheries Ecosystem Class 3. The naturally acidic upland soils encourage the leaching of metals such as zinc and aluminium into the aquatic environment. Land use changes such as land drainage and forestry are known to increase acidification effects and require careful management and control. (Issue 10 Section 7).
- Agricultural abstraction in lowland tributaries of the Clwyd Estuary, particularly the River Gele, appear to be affected by saline intrusion. The suitability of the water for crop irrigation should be confirmed prior to use. (Issue 11 Section 7).

MAP 26.

STATE OF THE CATCHMENT - WATER QUANTITY



5.2 WATER QUANTITY

General

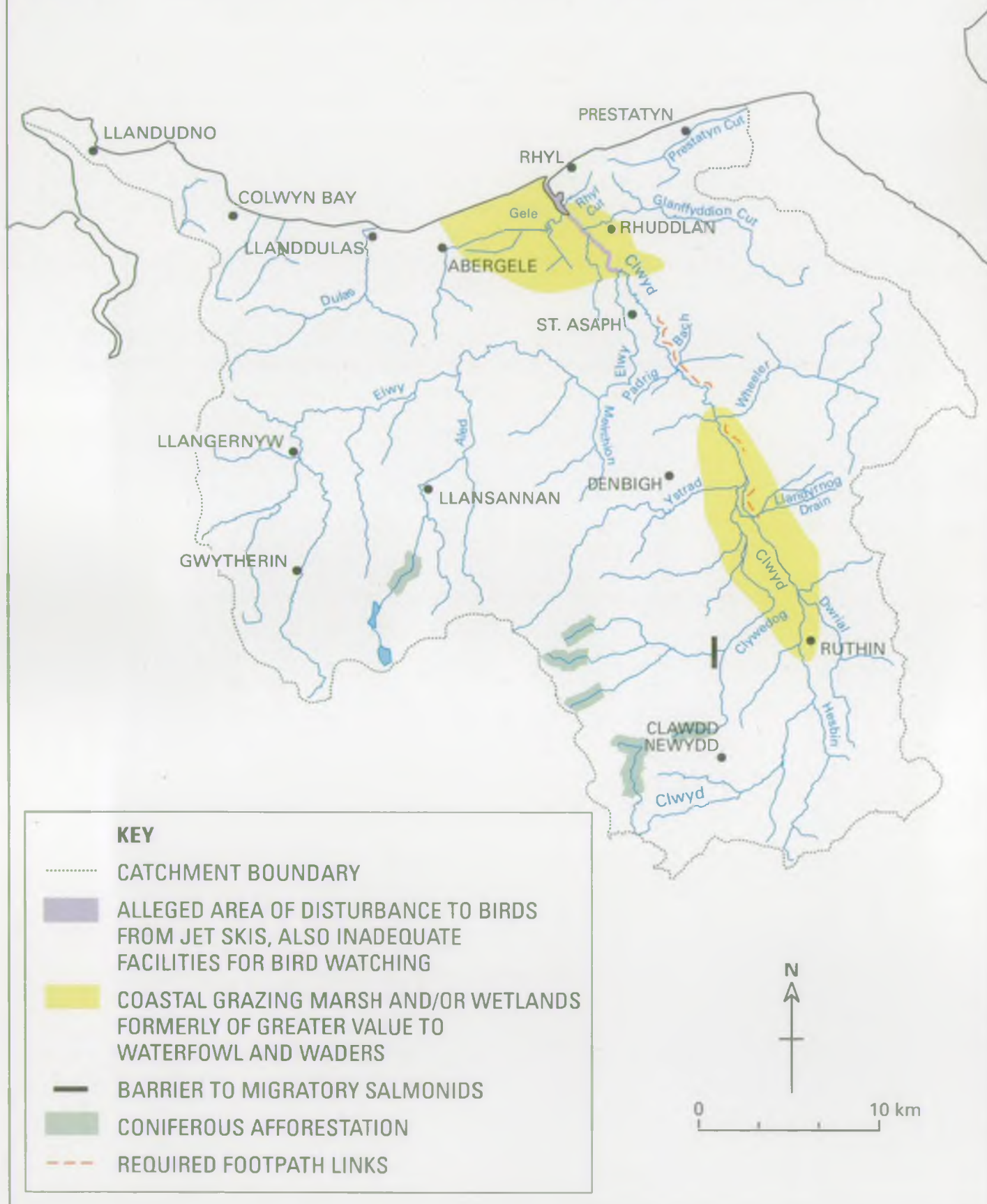
A catchment would fail its targets for water resources if abstraction was causing rivers and streams to dry up or flows to become unacceptably low, or if groundwater levels were declining or groundwater quality deteriorating.

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.

Issues Identified

- The NRA is considering carefully the available groundwater resources of the Triassic sandstone, particularly in the Vale of Clwyd and also along the coast. There is a fine balance between resource yield and replenishment, and its over-utilisation. In order to adequately monitor long term trends in this important aquifer, additional observation boreholes and a river gauging station have been identified as being necessary in the valley to protect the resources.
(Issue 12 Section 7).

MAP 27. STATE OF THE CATCHMENT - PHYSICAL FEATURES



5.3 PHYSICAL FEATURES

General

Since targets relating to Physical Features are the most subjective (Section 4.3) 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 50 years and the known distribution of flooding.

The following section and accompanying map No.26 illustrate the current state of the catchment and identify areas where there are perceived deficiencies.

The NRA's approach to conservation management reflects both the environmental status of sites and the range of impacts largely partitioned between the maritime and freshwater environments.

The Clwyd estuary, which has a long history of land reclamation and canalization, is not exposed to the range of impacts found on the Dee. NRA operations, development and recreational disturbance are the primary impacts. Upstream, the state of the physical resource is poorly documented and key data (strategic RCS, phase 1 vegetation maps) are lacking. However, there is evidence that wetland and riparian habitats are generally degraded and would benefit from a restoration programme.

Issues Identified

- Lack of riparian habitat diversity within the Clwyd catchment. (Issue 13 Section 7).
- Lack of wetland habitats, particularly reedbed and damp grassland throughout the Plan area. (Issue 14 Section 7).
- Bird disturbance from powerboats and jet skiers in the tidal section of the Clwyd. (Issue 15 Section 7).
- Lack of bird watching facilities in the Clwyd estuary. (Issue 16 Section 7).

THE STATE OF THE CATCHMENT

- Requirement for improved riverside access along the Clwyd.
(Issue 17 Section 7).
- Lack of canoe access agreements within the Plan area.
(Issue 18 Section 7).
- Barriers to fish migration on the Clywedog (at Bontuchel), Ystrad
(Nr. Denbigh), Nant Melin Dŵr (damaged Cefn weir).
(Issues 19 & 20 Section 7).
- Net Limitation Order 1995 review. (Issue 21 Section 7).
- Environmental impact of proposed marinas at Rhyl and Llanddulas.
(Issue 22 Section 7).

6.0 CONFLICTS BETWEEN USES

6.0 CONFLICTS BETWEEN USES

General

In considering the many Uses and the demands which those uses place upon the water environment, conflicts are bound to arise. An example would be an increased demand for water abstraction, which could reduce water quality because of lower dilution for effluents and affect fisheries. Areas of conflict have been addressed during the formulation of this Plan, resulting in the options for actions that are proposed for wider consideration. Some conflicts still remain and the public consultation will no doubt identify others. A strategy for action to address these issues will be developed following this process of consultation.

Summary of General Conflicts

In considering the issues and options three main areas of conflict recur:

Priorities of water use The water resources duties vested in the NRA through the Water Resources Act 1991, require that special regard is given to the needs of water undertakers. However, any new or varied licences to abstract water which are issued must not (except by consent) derogate existing protected rights. The NRA needs also to take into account the impact of proposed abstraction upon the water environment. Licences will be considered and determined in accordance with the Authority's statutory duties.

It should be understood that there is no priority ranking of Uses of the water environment. All users must consider each other and an element of compromise may be required.

Cost In many of the options cost is identified. Whilst not a constraint in the identification of options it is a major factor in determining the preferred course of action.

Environmental impact Again in considering any options to resolve issues, consideration is given to what, if any, environmental impacts would occur. In any discussion regarding future works the overall effect on the environment must be considered along with all other factors. This aspect, as with the previous two, is the responsibility of all users of the water environment who must work together to seek the improvements that all would wish to see.

This consultation process is a vital stage in determining how these conflicts can be addressed for the overall benefit of the catchment.

Specific Conflicts

- The possible liming of the upper reaches of the Clywedog and Aled systems to alleviate the effects of acidification could lead to damage of naturally acidic habitats. (Issue 10 Section 7).
- Improvements in riparian habitat diversity, particularly tree planting, could lead to an internal conflict with the flood defence need for access to both main river and non-main river. (Issue 13 Section 7).
- Creation of new wetland habitats could lead to conflict with landowners. (Issue 14 Section 7).
- A conflict exists between a need to protect the bird habitats in the upper Clwyd estuary and the recreational use of power boats and jet skiers in the same stretch. (Issue 15 Section 7).

7.0 ISSUES AND OPTIONS

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 Northern Area, Welsh Region of the NRA and do not constitute policy statements. Comments on the issues and options are requested 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.

You should note that no priority should be inferred from the order in which the following issues and options appear.

ISSUE No : 1		WATER QUALITY DEGRADATION OF THE CLWYD CAUSED BY THE DISCHARGE FROM RUTHIN STW.	
OPTIONS	Responsibility	Advantages	Disadvantages
Determine environmentally protective discharge consent conditions and impose consent.	NRA	Standards set for achieving Fisheries Ecosystem Class 1.	NRA Cost (unknown).
Improve sewage treatment to ensure compliance with revised consent.	DCWW	Achievement of Fisheries Ecosystem Class 1. Compliance with EC Freshwater Fish Directive.	Cost (> £1m).

ISSUE No : 2		FAILURE OF IDENTIFIED BATHING WATERS AT RHYL, KINMEL BAY/SANDY COVE AND COLWYN BAY BEACHES TO MEET EC DIRECTIVE (76/160/EEC) MANDATORY STANDARDS.	
OPTIONS	Responsibility	Advantages	Disadvantages
Connection of crude sewage outfalls at Pensarn, Kinmel Bay and Rhyl to new treatment/ disposal facilities by March 1994.	DCWW	Improved water quality in coastal waters. Compliance with EC Bathing Waters Directive, in identified waters.	Cost (approx. £17m for Rhyl scheme, unknown for Colwyn Bay scheme). NRA will continue to object to further development in the Colwyn Bay area until improvements are confirmed.
Improve sewage disposal facilities at Colwyn Bay.	DCWW		

ISSUE No : 3	THE RIVER WHEELER FAILS ITS TARGET OF FISHERIES ECOSYSTEM CLASS 1 DUE TO ELEVATED AMMONIA LEVELS.		
OPTIONS	Responsibility	Advantages	Disadvantages
Review of Discharge Consents to determine environmentally protective conditions.	NRA	Environmentally protective standards.	NRA Cost (unknown).
Programme of site inspections within the catchment.	NRA	Maintenance of water quality and pre-empt pollution incidents. Targeting of sites for improvements.	Cost (£5K).
Improve treatment facilities and their management.	DCWW/Fish farm owners	Reduction in ammonia levels.	Cost (£25K).

ISSUE No : 4		WATER QUALITY OF THE LOWER CLYWEDOG, YSTRAD AND DULAS IS AFFECTED BY AGRICULTURAL POLLUTION.	
OPTIONS	Responsibility	Advantages	Disadvantages
Programme of farm inspections/ liaison with agricultural community, NFU/ FUW.	NRA	Establish targeting of sites for improvements.	Cost (£2.5K).
Improve farm effluent management and handling/ storage facilities.	Farmers	Water quality improvements and reduced risk of prosecution.	Cost (unknown), but 25% grant may be available.

ISSUE No : 5		PREMATURE OPERATION OF COMBINED STORM OVERFLOWS (CSOs) CAUSES AESTHETIC PROBLEMS.	
OPTIONS	Responsibility	Advantages	Disadvantages
Investigate CSOs in plan area to identify degree of environmental impact and remedial measures required. (completed 1993).	NRA	Problematic CSOs and improvements required identified.	NRA Cost (unknown).
Improve screening and re-set weirs. Improve storm flow capacity at treatment works.	DCWW	Improved water quality and amenity value.	Cost (£50K).

ISSUE No : 6		LEACHATE CONTAINMENT FACILITIES REQUIRED AT LON PARCWR LANDFILL, RUTHIN.	
OPTIONS	Responsibility	Advantages	Disadvantages
Improve the operation and regulation of the site in terms of restoration, leachate collection and disposal.	Waste Regulatory Authority (Glyndwr D.C.)	Reduced risk of pollution to the Clwyd and groundwater abstractions.	Cost (£40K).
Installation of facilities.	Site operators		

ISSUE No : 7		MIGRATING LEACHATE AT DDOL UCHAF LANDFILL SITE AFONWEN, PERCEIVED AS A POLLUTION THREAT TO THE WHEELER.	
OPTIONS	Responsibility	Advantages	Disadvantages
Site investigation by Waste Regulatory Authority in consultation with NRA to determine extent of leachate migration and any mitigating measures that are required.	Delyn B.C.	Management information to determine action for protecting ground and surface waters and compliance with EC Freshwater Fish Directive.	Cost (£40K).

ISSUE No : 8	THE GANOL EAST FAILS ITS TARGET OF FISHERIES ECOSYSTEM CLASS 4 DUE TO DIFFUSE AGRICULTURAL AND INDUSTRIAL POLLUTION.		
OPTIONS	Responsibility	Advantages	Disadvantages
Undertake catchment inspection programme to identify sources of pollution.	NRA	Establish targeting of sites for improvements.	Cost (£2.5K).
Improve farm effluent management and handling/ storage facilities.	Farmers	Improved water quality.	Cost (unknown), but 25% grant may be available.
Improve treatment of industrial discharges.	Discharger	Improved water quality.	Cost (unknown).

ISSUE No : 9	SOLIDS CONTAMINATION OF WATER DURING FORESTRY PLANTING AND HARVESTING.		
OPTIONS	Responsibility	Advantages	Disadvantages
Implementation of Forestry and Water Guidelines, including riparian buffer zones.	Landowner	Reduction of environmental impact from forestry activity.	Cost implications including loss of planting area (unknown).
Establishment of Forest Design Plans.	Forest Enterprise	Improved crop management.	Cost (unknown).
Establishment of Indicative Forestry Strategy.	Clwyd County Council	Planned afforestation.	Cost (unknown).
Research and development to identify improved methods of forestry management.	NRA/NERC/ Forest Authority	Implementation of best methods would reduce environmental impact from forestry activity.	Cost (£135K).

ISSUE No : 10	ELEVATED ZINC LEVELS DUE TO ACIDIFICATION ON THE UPPER REACHES OF THE CLYWEDOG AND ALED.		
OPTIONS	Responsibility	Advantages	Disadvantages
Identify local causes of acidification (e.g. acid rain/ land drainage/ afforestation) and investigate cost benefit of remedial measures e.g. liming.	NRA	Gain information to determine future action.	NRA Cost (unknown). Potential damage to naturally acidic habitat if liming option pursued.
Research and development to identify and evaluate options for amelioration of impact.	NRA/NERC	Identification of options and costs.	Cost (£25K).

ISSUE No : 11	SALINE INTRUSION IN LOWLAND TRIBUTARIES MAY LEAD TO LOSS OF THE RESOURCE FOR CROP IRRIGATION.		
OPTIONS	Responsibility	Advantages	Disadvantages
Alert existing and potential abstractors to problem.	NRA	Abstractors will be more aware of water quality.	None.
Determine suitability for irrigation purposes.	Abstractor	Pre-empt adverse impact on crops.	Cost (£1K).
Use of bankside storage (if necessary).	Abstractor	Freshwater supply secured.	Cost (£10K).

ISSUE No : 12	PERCEIVED OVER UTILISATION OF THE WATER RESOURCES PARTICULARLY IN THE VALE OF CLWYD.		
OPTIONS	Responsibility	Advantages	Disadvantages
Investigate rate of usage/ replenishment (increased monitoring).	NRA	Establish severity of problem as a basis for determining future action.	Cost (£200K).
Construct groundwater model.	NRA	Information to determine optimum use of resource.	Cost (£50K).

ISSUE No : 13		LACK OF RIPARIAN HABITAT DIVERSITY WITHIN THE CLWYD CATCHMENT.	
OPTION	Responsibility	Advantages	Disadvantages
Results of River Corridor Survey required before options can be proposed, if any.			

ISSUE No : 14		LACK OF WETLAND HABITATS, PARTICULARLY REEDBEDS AND DAMP GRASSLAND.	
OPTIONS	Responsibility	Advantages	Disadvantages
Create new habitats.	NRA/CCW	Increased habitat diversity.	Cost (up to £20K per ha). No compensatory mechanisms for land loss. Landowner resistance. Requirement for ongoing management.
Manage existing habitats.	NRA		Cost (£2K per 100m). Conflicts with Geological Conservation Review. Landowner resistance.

ISSUE No : 15		BIRD DISTURBANCE FROM POWER BOATS AND JET SKIERS IN THE TIDAL SECTIONS OF THE CLWYD.	
OPTIONS	Responsibility	Advantages	Disadvantages
Establish degree of impact.	RSPB/NRA	Nature of problem defined.	Cost (£3K).
Voluntary agreement and code of conduct.	Recreational bodies	Bird disturbance minimised through voluntary action.	Some reduction in area/time for these water sports.
Consider development of byelaws.	NRA	Adherence to byelaws would minimise disturbance.	Cost (unknown). Difficult to regulate.

ISSUE No : 16		LACK OF BIRDWATCHING FACILITIES WITHIN THE CLWYD ESTUARY.	
OPTIONS	Responsibility	Advantages	Disadvantages
Erect hide(s).	NRA/RSPB/ District Council	NRA as facilitator reduces single authority cost.	Cost (£3K per hide).

ISSUE No : 17	REQUIREMENT FOR IMPROVED RIVERSIDE ACCESS ALONG THE CLWYD.		
OPTIONS	Responsibility	Advantages	Disadvantages
Review existing footpath network and produce strategy.	NRA, District and County Councils	Targeting of areas for improved access.	NRA Cost (unknown).

ISSUE No : 18	LACK OF CANOE ACCESS AGREEMENTS WITHIN THE CATCHMENT.		
OPTIONS	Responsibility	Advantages	Disadvantages
In conjunction with riparian owners, angling interests and Welsh Canoe Association promote at least one access agreement by 1997.	NRA/ Riparian Owners/ WCA	Provides for controlled river use by canoeists.	NRA Cost (unknown). Anglers against access agreements. In absence of registration system for canoeists, control not complete.

ISSUE No : 19	BARRIERS TO FISH MIGRATION ON THE CLYWEDOG, YSTRAD AND NANT MELIN DŴR.		
OPTIONS	Responsibility	Advantages	Disadvantages
Investigate cost/benefits of removal of barrier, or by-passing with fish pass.	NRA	Information to determine future actions. Providing access should improve spawning capability within the catchment.	NRA cost (unknown). Genetic implications to native species if access provided.

ISSUE No : 20	REPAIRS TO CEFN WEIR FISH PASS TO ALLOW EFFECTIVE UPSTREAM MIGRATION OF SALMONIDS.		
OPTIONS	Responsibility	Advantages	Disadvantages
Carry out repairs if feasible or construct new fish pass.	NRA/ Riparian Owner	Unimpeded passage for migratory salmonids. Prevention of deterioration of structure.	Cost (<£50K).

ISSUE No : 21	REVIEW OF LICENSED NETTING WITHIN THE CATCHMENT (I.E. NET LIMITATION ORDER 1995 REVIEW).		
OPTIONS	Responsibility	Advantages	Disadvantages
Evaluate impact of licensed net fishery on the runs of salmonids into the Clwyd system.	NRA	Management Information.	NRA Cost (unknown).
Reduce number of licences if adverse impact evident.	NRA	Reduction of impact on salmonid numbers entering river.	Reduction of nets will adversely affect employment.

ISSUE No : 22	PROPOSED MARINAS AT RHYL AND LLANDDULAS.		
OPTIONS	Responsibility	Advantages	Disadvantages
Build environmental controls into any planning permission.	Local Authorities, NRA and other statutory consultees in the planning process	Minimised environmental impact whilst recreational activity promoted.	Cost of environmental safeguards (unknown).

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 Clwyd 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 Clwyd 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/WO 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
				EQI (BAPC)	Basic Amenity Score	- to be developed
	DO % sat 10%ile	BOD mg/l 90%ile	Ammonia mg N/l 90%ile	(indicative - to be finalised)	(indicative - to be finalised)	
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: THE STANDARDS OF NRA FLOOD PROTECTION

1. This refers to the maintenance and improvement of main rivers including floodbanks, pumping stations and outfall sluices. The standard of protection will be appropriate to the land use, in accordance with the NRA's Standard of Service. The target levels of protection for the Plan Area as follows:
 - where economically viable predominantly agricultural land will be protected against flood of return period up to 1 in 10 years.
 - residential and non-residential buildings will be protected against floods of return period up to 1 in 100 years.
2. In historical flood plain locations, main river channels and outfall sluices will be maintained to allow for the evacuation of floodwater within a reasonable time.
3. Flows will be monitored and the data analysed for any trends. The results will be evaluated against design standards and this will provide the basis for any recommendations.
4. The existing River Elwy flood warning system will continue to operate and will be improved as necessary to give landowners and the emergency services enough time to make an appropriate response to the warnings. Yellow, Amber and Red Alerts will be issued to the Police when appropriate trigger conditions are reached.
5. The Neptune Tidal Warning scheme will continue to operate and will be improved as necessary to ensure that the appropriate Local Authorities are aware of and updated upon extreme tidal conditions.

APPENDIX 4 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 Clwyd catchment is the area of land which drains to the rivers and estuaries bounded by the headlands of Point of Ayr in the east and the Orme's Head in the west.

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 costal 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 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 (m³.d⁻¹)

Short for cubic metres per day. There are 1000 litres in a cubic metre, and 1000 cubic metres in a megalitre (Ml). 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.

Ml/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.