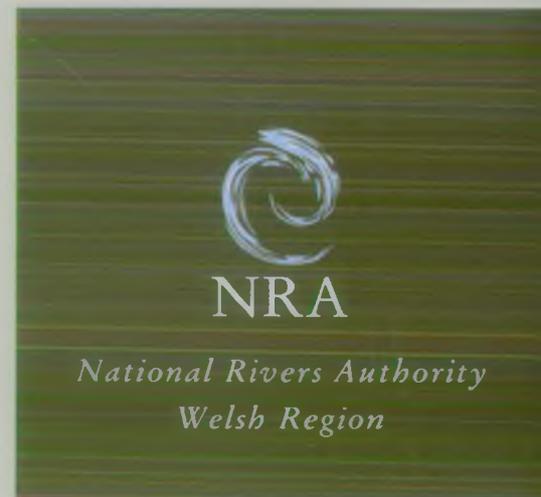


THE RIVER DEE
CATCHMENT MANAGEMENT PLAN
CONSULTATION REPORT: JUNE 1994



DEE CATCHMENT MANAGEMENT PLAN
CONSULTATION REPORT
JULY 1994

National Rivers Authority
Welsh Region

National Rivers Authority
Information Centre
Head Office
Class No
Accession No ARSA

THE NRA'S VISION FOR THE DEE CATCHMENT

The River Dee is a complex catchment which has become the most regulated river in terms of quality and quantity in Europe. This stems from the need to protect people and property from flooding and to safeguard major potable water abstractions. In particular, the requirement to minimise the risk of pollution incidents interrupting potable supplies, has necessitated an application from the NRA to the Secretary of State, for a statutory Water Protection Zone within the freshwater catchment of the Dee. Whilst directly supporting a population of nearly half a million people, this catchment is also a major attraction for a much wider area, the main river rising in the Snowdonia National Park and flowing through a landscape of considerable diversity before entering the Irish Sea.

The importance of the Dee for conservation is highlighted by both the source (Llyn Tegid) and estuary being RAMSAR sites. In between lies a nationally important salmon and sea trout fishery and, in the wilder reaches, some of the most popular whitewater canoeing opportunities in the UK. The management of this complex river system presents a major challenge, particularly arising from the potentially conflicting demands of users, to which the NRA responds with vigour. We recognise that we must harmonise these interests in moving towards the 21st century with a catchment which can be exploited to the full in a sustainable manner.

The NRA's vision for the Dee during the lifetime of this plan is to secure the integrity of drinking water supplies through reductions in both actual incidents and the risks of pollution. The Dee Regulation Scheme will be maintained and developed, particularly to take advantage of technological advances, to further secure the water supply and to provide effective flood control. Byelaws will be developed to both protect the vulnerable life-cycle stages of fish and shell-fish and to control presently unrestricted or illegal exploitation. The NRA's own operational activities will be undertaken in a manner sympathetic to the important conservation features of the catchment, whilst every effort will be made to facilitate and promote access and the provision of recreational facilities. However, we recognise that the NRA's direct influence will not enable us to achieve these goals alone. The importance of co-operative working arrangements with other representative organisations and agencies is essential if we are to achieve an integrated approach to management. We particularly hope through this catchment plan to influence the development plans of Local Authorities.

The delivery of this vision will therefore only be realised through the active collaboration of all users in developing a balanced approach to managing the Catchment. We will succeed if we can retain and develop the broad-ranging qualities of the Dee Catchment whilst also meeting the aspirations of all those with legitimate interest in exploiting this famed river.

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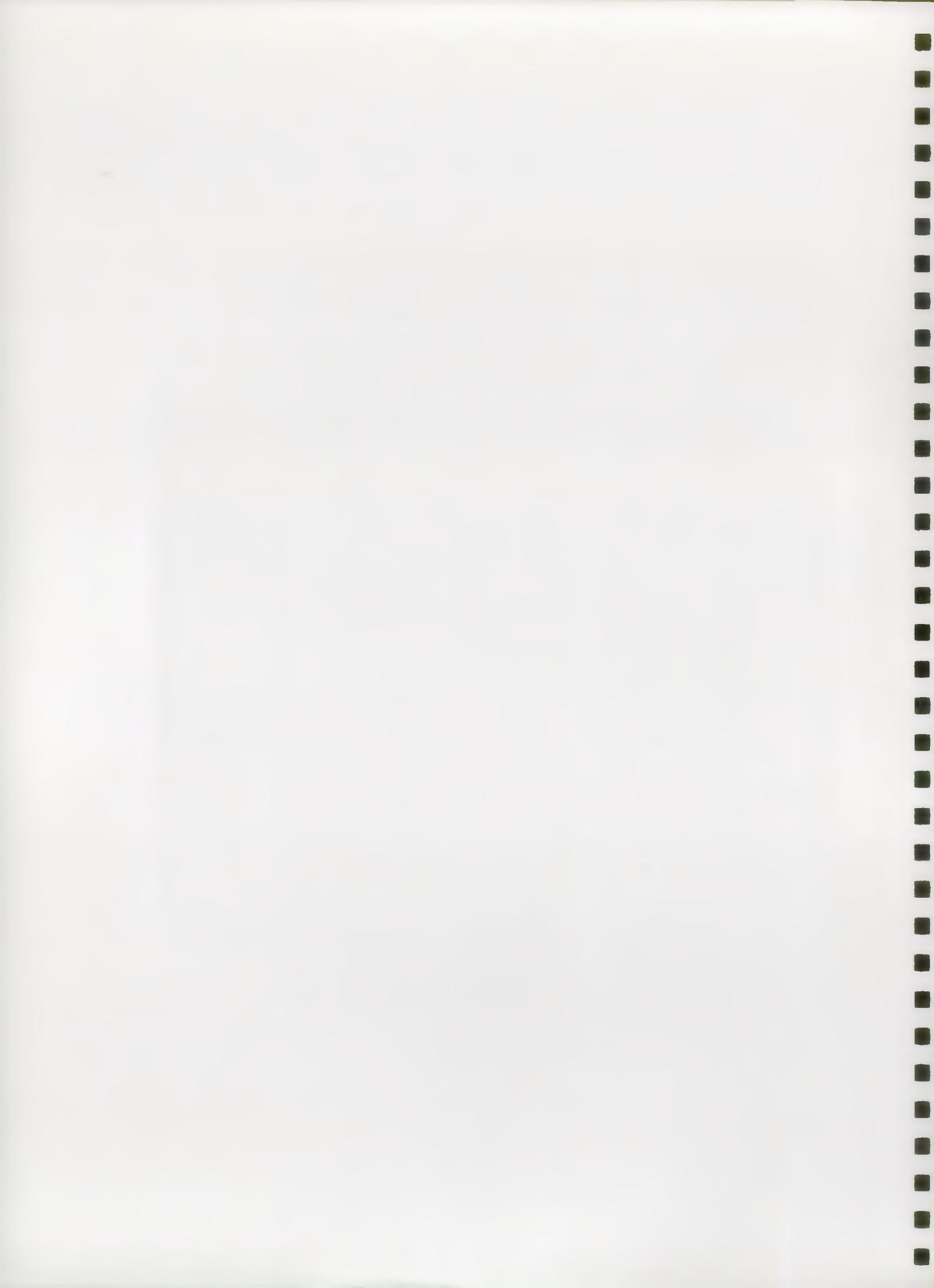
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**1.0 THE PURPOSE OF CATCHMENT
MANAGEMENT PLANS**



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.

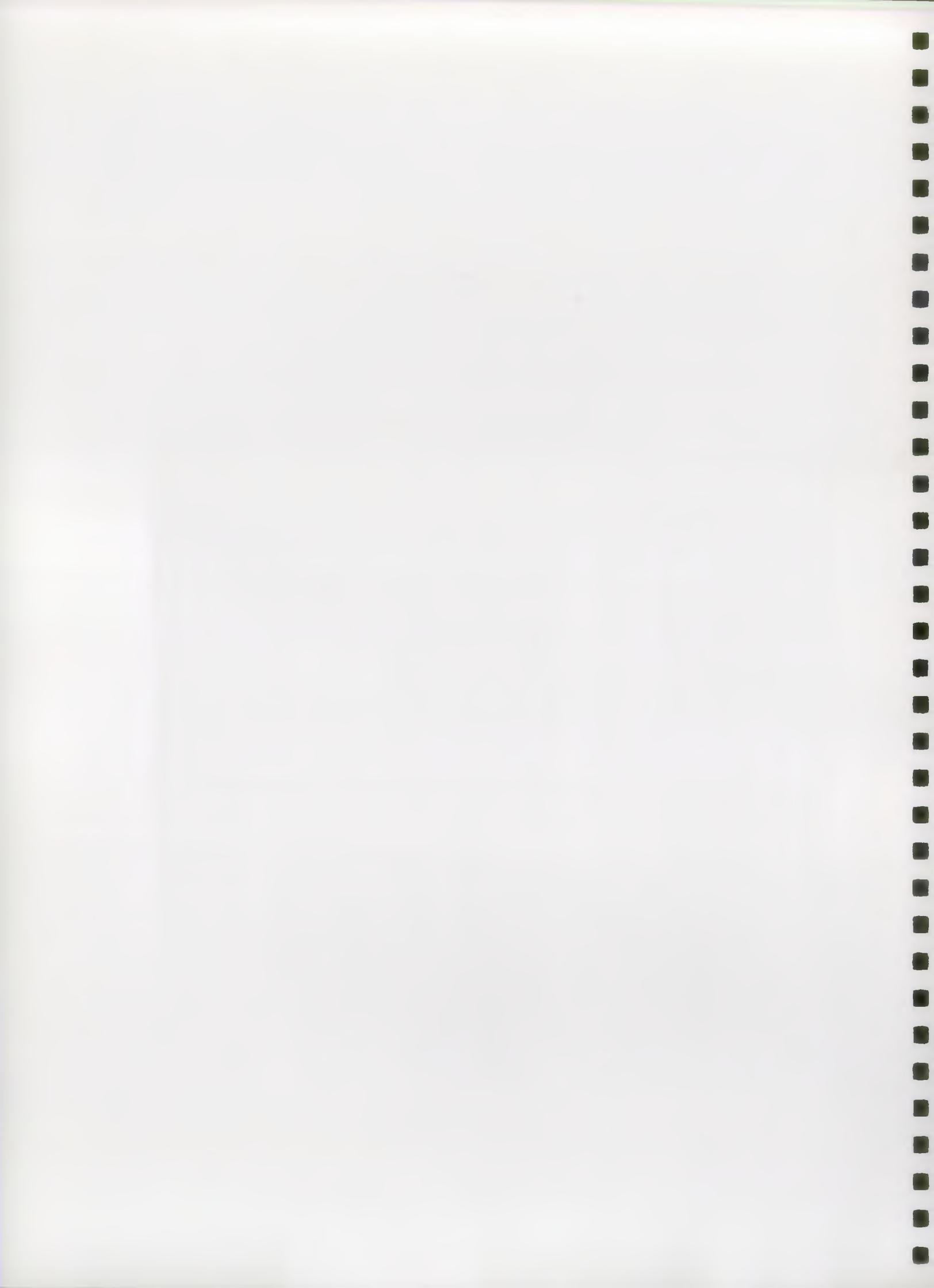
4. Issues and Options:

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 DEE CATCHMENT



2.0 AN OVERVIEW OF THE DEE CATCHMENT

2.1 Introduction

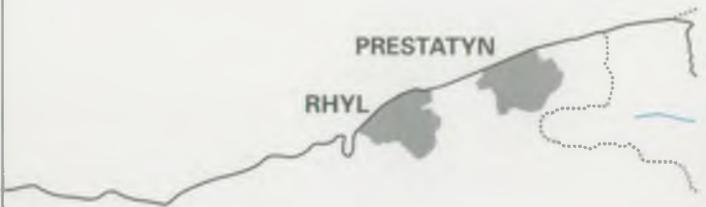
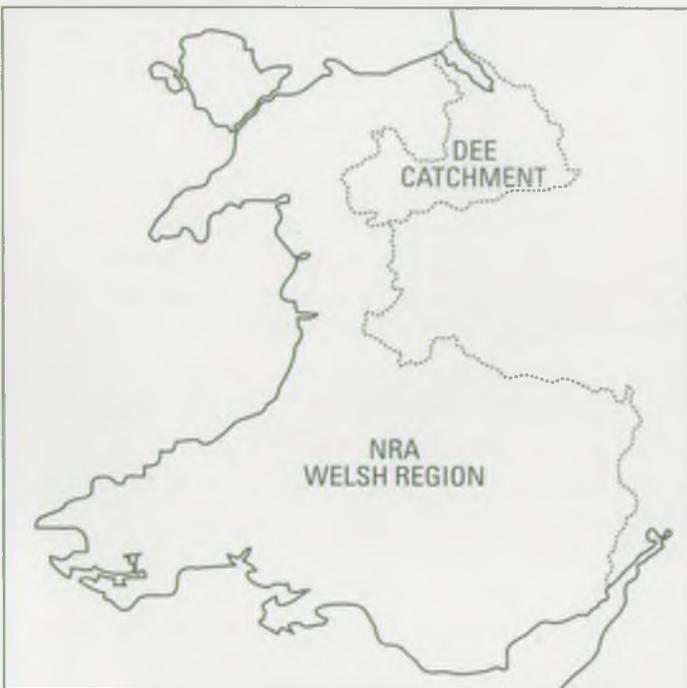
The Dee is one of the most important rivers in the United Kingdom. The source of the Dee lies within the Snowdonia National Park and its catchment contains a wide spectrum of landscape from high mountains around Bala, rugged peaks near Llangollen, steep sided wooded valleys, the plains of Cheshire and North Shropshire through to the vast mudflats of the estuary. It is steeped in history (these were the homelands of Owain Glyndwr) and has a wealth of conservation interests. The influence of man from pre-Roman times is very evident throughout the catchment.

The course and topography of the river valley and tributaries were strongly influenced and modified by the glaciations which ended some 13,000 years ago.

The Lower Dee floodplain is a former lake with a narrow restricted outlet, which explains the difficulty of preventing flooding completely in these parts. The need to control flooding, to maximise on the water resources of the catchment for supplying drinking water, and the protection of important fisheries and conservation interests explains why the Dee is the most regulated river in Europe.

The framework for present day management of the River Dee is defined within the Dee and Clwyd River Authority Act 1973. Under this Act the Dee Consultative Committee is charged with assisting the Authority with the drawing up and refinement of rules for the management of the Dee Regulation System.

The three water bodies used for regulation are Brenig, Celyn and Tegid. Llyn Tegid is the only natural lake, the other two being reservoirs. Celyn dam was constructed in 1964 and Brenig during the late 1970's. Since privatisation of the water industry in 1989 Celyn and Brenig reservoirs have remained in the ownership of Dŵr Cymru Welsh Water. In order to secure the proper operation and management of these reservoirs the Authority has entered into an "operating agreement" with Dŵr Cymru Welsh Water under Section 20 of the Water Resources Act 1991.



DEE CATCHMENT

MAP 1.



KEY

- CATCHMENT BOUNDARY
- MAIN CENTRES OF POPULATION

CATCHMENT OVERVIEW

The regulated Dee provides drinking water to over 2 million people distributed by four water companies, as well as water for agriculture and industry. In addition, provisions are made within the system to store up to 10,281 million litres per annum for special release purposes. These purposes include fishery, recreation and water quality management.

The need to protect water quality in the Dee has prompted the NRA to draft management proposals under S.93 (Water Resources Act 1991). These proposals, if ratified by the Secretary of State for Wales, will control those industrial activities within the catchment identified as being potential sources of pollution.

The quality of the varied environment of this catchment demands protection and, where appropriate, enhancement for current and future generations to enjoy.

2.2 Hydrology and Hydrogeology

The course and topography of the Dee valley and its tributaries were modified by the glaciations as mentioned above. The upper part of the catchment is dominated by relatively impermeable Cambrian and Ordovician Shales in the west; these give way to Silurian Shales and then Carboniferous Limestone which outcrops at Llangollen. Further down the valley the coal measures of the Carboniferous period dip beneath the Triassic Sandstones of the Lower Dee. Overlying the solid geology are superficial deposits consisting mainly of glacial drift material which can vary considerably in thickness.

The Triassic Sandstones underlying the Lower Dee catchment represent a major aquifer whose catchment area extends beyond the topographical boundaries of the surface water catchment. Artesian discharges occur through spring lines and enhance base flows in tributaries on the eastern side of the Lower Dee catchment. In contrast, to the west the tributaries flow over Carboniferous strata which in places results in a diminution or total loss of low flows through naturally occurring swallow holes.

Annual average rainfall varies from 2500mm in the mountains above Bala to 600mm in the Chester area. Typical annual evaporation is around 450mm. The natural annual average run-off to Chester weir (normal tidal limit) is 639mm/year which is equivalent to an average of 36.8 cubic metres per second.

CATCHMENT OVERVIEW

The broad glaciated valley between Bala and Corwen is prone to flooding. A study of flood peaks at Corwen has shown that since 1964, when Llyn Celyn came on line, the severity of flooding has significantly reduced.

Over the 43km between Corwen and Manley Hall the river flows through a steep incised valley with negligible flood plain. Flood peaks take approximately 5.5 hours to move through this reach with very little attenuation.

The final 60km between Manley Hall and Chester weir is characterised by two broad flood plains joined by a narrow post glacial channel at Farndon. All floods experience major attenuation in this reach from river channel and flood plain storage.

The lower reach between Farndon and Chester weir experiences flow reversals of up to 60 cubic metres per second as a result of high tides which regularly exceed the Chester weir crest level. Accompanying these flow reversals there are temporary variations in river levels of a metre or more over 12 hours.

These unsteady hydraulic conditions cause problems for hydrometric measurement, real time control of regulation releases and prediction of times of travel within the reach.

2.3 Flood Defence

The NRA's 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.

Some flood control is exercised at Bala through the regulation of the upper catchment and the NRA maintains a flood storage system on the Finchetts Gutter at Chester. The principal flood plain of the river is in the middle reach between Bangor on Dee and Chester, where specific meadow areas have been protected against flooding. Part of this between Holt/Farndon and Bangor on Dee is being considered for designation as a SSSI on geomorphological grounds.

Elsewhere, flood defence work consists mainly of shoal removal and river management schemes. There are a few isolated cases of flooding to properties associated with non-main rivers within the catchment.

During 1994/96 the NRA will be preparing maps that show the areas liable to flooding, which will be available as reference documents particularly for planning purposes by the Local Authorities.

2.4 Fisheries

The fisheries of the Dee are of national importance; in the estuary there is a commercial salmon fishery and sea fisheries of economic significance. Elsewhere the catchment is notable for the wide range of species present.

Salmonids (salmon, sea trout and brown trout) are widespread and cyprinids (coarse fish) are abundant in the lower river. The Dee is noted for the good numbers and large size of its grayling.

Llyn Tegid, the largest natural lake in Wales, contains 14 fish species. The gwyniad (Coregonus clupeoides pannantii), a relic from the last ice age, is unique to the UK.

Since 1991 the NRA has operated a purpose built salmon trap at Chester weir, providing the most intensive monitoring station in Wales and England. The trap and associated studies (the Dee Stock Assessment Programme) aim to provide scientific measures of both the numbers of fish entering the river and the factors influencing them.

Not surprisingly, angling is a major interest in the catchment. In economic terms the salmon fishery is of great importance but coarse fishing is popular, and the headwater lakes and reservoirs provide good quality trout angling.

2.5 Conservation

The catchment has 46 sites of conservation importance and diversity of habitat is a feature. Rising in uplands within the Snowdonia National Park and designated Areas of Outstanding Natural Beauty, the Dee travels through wooded river valleys and lowland river meander systems of geomorphological importance. Llyn Tegid and the estuary are both Ramsar sites (wetlands of international importance).

In the estuary the large inter-tidal areas provide rich feeding grounds for up to 120,000 birds. In the period 1985/86 to 1989/90 the average peak was 117,070 birds. The outer estuary is important for grey seals with about 15% of the Welsh population.

CATCHMENT OVERVIEW

2.6 Recreation

Near the headwaters, the larger lakes and reservoirs are popular for sailing and wind surfing whilst the Alwen Reservoir is one of the few inland sites in Wales used for water skiing.

At Bala, the regulated Afon Tryweryn is the base of National White Water Canoe and Rafting Centre and the river is internationally renowned for wild water and slalom canoeing. In 1994 the World Cup will be staged on this river and it will host the 1995 World Championships.

The Dee at Chester is popular for a variety of boating activities including large showboats, rowing boats and low powered vessels.

Tidal constraints limit activity in the canalised section of the estuary but further down river the estuary is well used by sailing dinghies and small fishing boats. Parts of the estuary salt marsh are used for wildfowling.

2.7 Navigation

The Dee Conservancy Board was established under the Dee Conservancy Act 1889 and the NRA, as the successor to the Board is responsible for navigation on the estuary. The NRA is also the Harbour Authority for the greater part of the estuary.

Due to the shallow channel, commercial shipping is restricted to entering the upper estuary on a limited number of tides per year. The only port of any size is that at Mostyn Docks near the mouth of the estuary, which can accommodate commercial shipping throughout the year.

From Chester weir upstream to Farndon bridge, navigation is the responsibility of Chester City Council. Upstream of Farndon bridge there are no public rights of navigation. The navigation authority for the Shropshire Union Canal is British Waterways.

2.8 Water Quality

The Dee is generally of very good quality throughout its length although a number of tributaries are adversely affected by sewage or agricultural pollution. Very low summer flows in some tributaries have an adverse effect on quality. Pollution incidents in the main river or the tributaries can have severe impacts on some uses, especially potable water abstraction where there has been an unacceptable record of interruptions to supplies.

CATCHMENT OVERVIEW

Most sewage and some industrial discharges are made directly to the freshwater river, generally on the fringes of urbanised areas. The regulated nature of the river ensures high dilution for main river discharges except in severe droughts.

The river is intensively monitored, including automated bank-side monitoring and twice daily sampling at nine key locations. This programme is designed to give warning of pollution incidents to water undertakers who draw water from the river. To minimise the impact that such incidents have, the NRA is seeking further controls on the way industry stores and uses potentially polluting substances in the river catchment area by means of an Order made under S.93 of the Water Resources Act 1991.

Agriculture has a major impact on quality in the lowland areas especially in Cheshire, whilst forestry and sheep rearing can exert a minor quality impact in upland areas. Some upland sub-catchments suffer from the effects of acidification.

Historical industrial activities throughout the catchment have left large areas of contaminated land with polluting discharges. Such contamination results from former textile mills, areas of mining, old waste tips and many sites of chemical related industries.

A phased programme of improvements has been agreed with many active industries to ensure that effluent quality improves to acceptable standards. Of the many discharges of sewage to the estuary, some cause localised pollution or more widespread water quality problems.

Active waste disposal sites are to be found in the estuary and the Wrexham, Ruabon, Chirk and Mold conurbations. These include a colliery tip on the foreshore at Point of Ayr.

2.9 Land Use

The majority of the catchment is rural, supporting mixed sheep and beef farming on high ground, and intensive dairy farming in the lowlands particularly in the Cheshire Plain and North Shropshire. Commercial and industrial developments are mainly centred around the urban areas of the estuary and Ruabon/Wrexham.

CATCHMENT OVERVIEW

Two major electricity generating stations are to be built on the estuary, at Connah's Quay and Shotton.

Within the catchment, there is an active coal mine and Point of Ayr, a few open cast coal mining sites, and numerous mineral extraction sites which are primarily for sand and gravel, limestone and clay. There is also small scale granite quarrying and intermittent exploration for gold in areas above Bala. Much of the development in recent years has been leisure and tourism orientated.

Current and planned housing developments are chiefly within the main towns and cities, notably Chester, Wrexham, Buckley and Mold.

2.10 Infrastructure

The area is served by a network of trunk and main A roads for the main population centres, with B roads linking smaller settlements. A number of road improvements and by-pass schemes are proposed or under construction within the catchment. Perhaps the most significant road development from the NRA's viewpoint is the proposed third River Dee crossing.

Rail transport consists of the main line from Chester to Holyhead and branch lines to the north, south and east of the catchment.

A small airport at Hawarden is mainly used by British Aerospace for testing purposes, and also by light business and commercial aircraft.

2.11 Monitoring Network

Monitoring of the hydrological cycle takes place throughout the Dee catchment and is essential to all functions of the Authority. The main areas of hydrometric data collection are river flows and levels (29 sites), groundwater levels (36 sites) and rainfall (26 sites).

Flows and levels are recorded at the regulating reservoirs, Celyn, Brenig and Llyn Tegid, and also at the Alwen direct supply reservoir. Flows and levels are monitored and recorded along the main river from New Inn to Chester weir. Tributary flows and levels are measured on the Alwen, Aldford Brook, Carden Brook, Ceidiog, Ceiriog, Ceirw, Clywedog, Celyn,

CATCHMENT OVERVIEW

Golbourne Brook, Hesgin and Worthenbury Brook catchments. A tidal levels recorder is maintained at Summers Jetty on the estuary near Connah's Quay. The Authority also undertakes many spot gaugings throughout each year and has a database containing hundreds of instantaneous flow measurements throughout the catchment.

Manley Hall is one of three River Protection Stations in the Welsh Region which monitors continuously and is probably the most sophisticated of its kind in the U.K. The station monitors for pH, Temperature, Dissolved Oxygen, Conductivity, Turbidity, Ammonia, Phenol and Formaldehyde, and has a fish monitor. In addition an autosampler facility provides samples for analysis by the Dee Joint Organics Laboratory for Phenol, Cresol, Formaldehyde and taste and odour on a daily basis. All water quality parameters have limits which when exceeded result in alarms being sent via a telemetry link to a 24 hour control centre whilst stand-by officers are paged automatically.

This sophisticated monitoring arrangement is designed to ensure that prompt action can be taken when a pollution incident occurs thereby protecting the consumers of potable water derived from the Dee.

As part of a national programme, biological samples are taken on the Dee in order to assess the river quality based on macroinvertebrate fauna. During 1993 extensive biological surveys were carried out in the lower Dee catchment to assess agricultural impacts and to identify any acidified parts of the catchment.

The Dee Stock Assessment Programme (DSAP) is a long term monitoring and investigative programme for salmon and sea trout in the Dee. It commenced in 1991 with the completion of an adult fish trap at Chester weir. Trapping and tagging at this site along with other components, including a three year radio tracking study, fishery censuses, microtagging and juvenile monitoring programmes, make the DSAP the most comprehensive study of its kind in England and Wales and one which is already contributing information of national importance.

A strategic survey of the habitat quality of the river corridor has been carried out on the main river between Bala and Connah's Quay. This will continue in future years to include all major tributaries.

2.12 KEY DETAILS

Catchment Details

Area	-	2088km ²	
			Existing 1991
Population		(Estimated)	>427,000
Holiday Influx	-	(Bed Spaces in Clwyd)	33,000
	-	(Visitors to Chester)	1,500,000

Topography

Ground Levels	Min Level	4 to 5M A.O.D.
	Max Level	900M A.O.D.
Tide Levels	Mean High Water Springs	- 5.07M A.O.D. (1)
		- 0.60M A.O.D. (2)
	Mean Low Water Springs	- 0.00M A.O.D. (1)
		- 2.00M A.O.D. (2)

(1) Hilbre Island

(2) Bed Level of R.Deer at Chester

Geology

The western half of the area comprises Lower Palaeozoic rocks dating back to Cambrian period. Further east the younger Triassic Sandstone is abundant in the Cheshire Plain. Thick deposits of unconsolidated clays, sands and gravels occur throughout the area.

Administrative Details

County Council - Gwynedd C.C., Clwyd C.C., Cheshire C.C. and Shropshire C.C.

Metropolitan Borough Councils - Wirral M.B.C.

District Councils - Meirionnydd D.C., Aberconwy B.C., Colwyn B.C., Glyndwr D.C., Wrexham Maelor B.C., Delyn B.C., Alyn & Deeside D.C., Chester City C., Ellesmere Port & Neston B.C., North Shropshire D.C., Oswestry B.C.

National Parks - Snowdonia National Park

NRA - Welsh Region - Northern Area

CATCHMENT OVERVIEW

Water Companies Dŵr Cymru Welsh Water, Wrexham & East Denbighshire Water Company, Chester Waterworks Company, North West Water Ltd, Severn Trent Water

Public Sewage - 110
Treatment Works

Main Towns and Populations (1991 Census)

Chester	-	77,800
Wrexham	-	41,281
Buckley	-	13,689
Connah's Quay	-	14,443
Flint	-	12,564
Mold	-	9,168

Water Quality

River Classification

Very Good	-	135.1km	Poor	-	21.7km
Good	-	145.5km	Bad	-	6.8km
Fair	-	32.5km			

Estuary Classification

Good	-	63.0km	Poor	-	None
Fair	-	2.5km	Bad	-	None

Water Resources

Surface Water : Upland rivers and lakes gravitate to the main river Dee supported by releases from Celyn and Brenig reservoirs.

Groundwater: Aquifers in the Triassic Sandstone and Carboniferous strata and superficial deposits.

Flood Protection

Length of Main River in Catchment	-	746km
Length of Main River Within Internal Drainage District	-	N/A
Length of Adopted Ditch Within Internal Drainage District	-	N/A
Length of Flood Banks Maintained by NRA	-	213km
Area at Risk of Flood (Tidal or River)	-	10,500Ha

CATCHMENT OVERVIEW

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

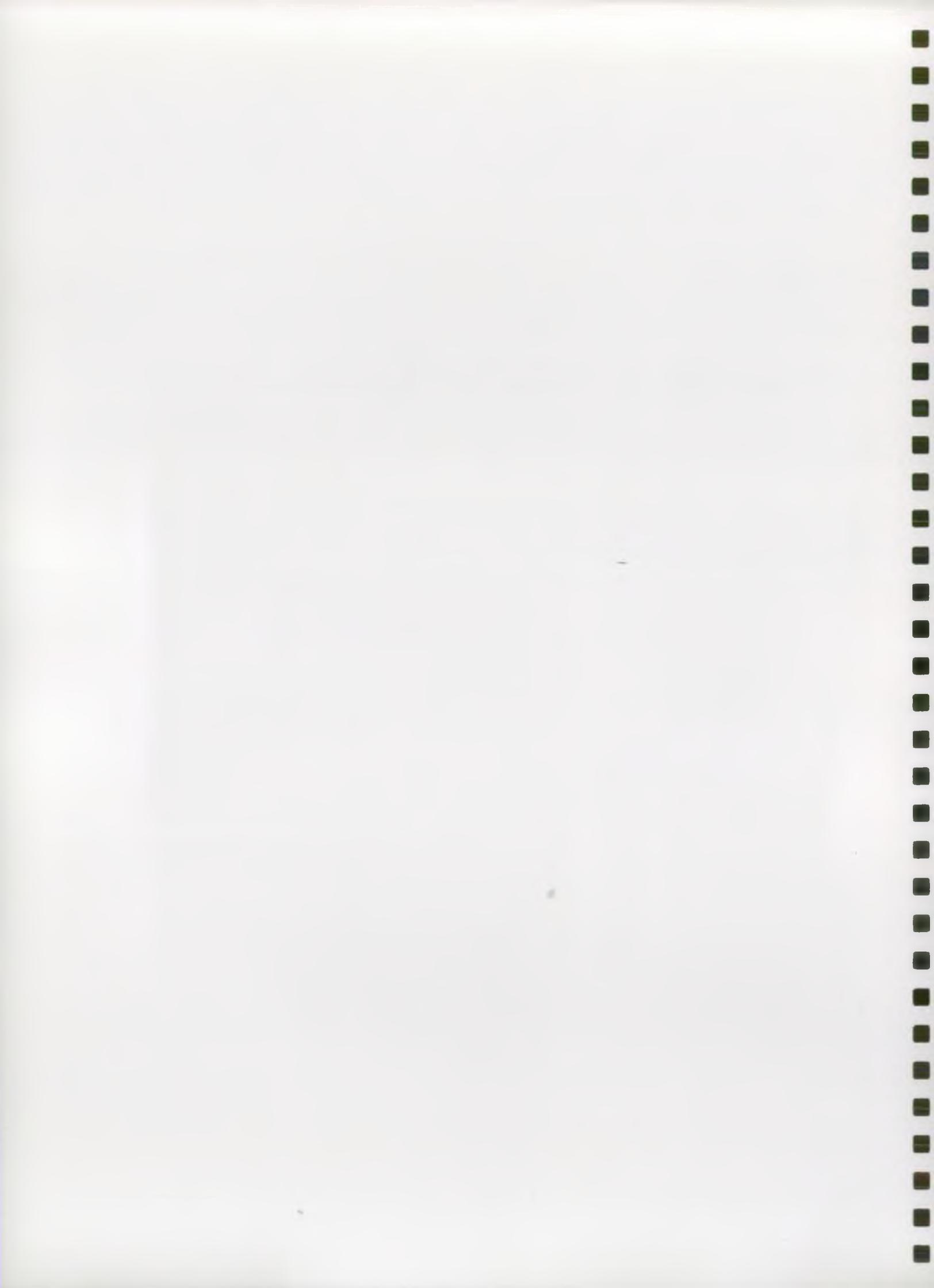
Salmonid - 291km
Cyprinid - 28.5km (Shropshire Union Canal)

Conservation

Sites of importance - 46
Ramsar sites - Llyn Tegid, Estuary
Special Protection Area - Estuary

3.0 THE USES OF THE DEE CATCHMENT

The following sections catalogue the legitimate uses of the Dee 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.



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 the 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 Dee Catchment lies within the County of Clwyd, although the headwaters of the river system are in Gwynedd, and tributaries arise in Shropshire, Cheshire and Wirral. Where the catchment falls within Gwynedd County Council (i.e. Meirionnydd District Council and Aberconwy Borough Council) the Snowdonia National Park Committee is responsible for local planning activities. A summary is provided of the current situation with respect to development plan (Table A).

USES OF THE DEE CATCHMENT

Table A - Current Status of Development Plans within the Dee Catchment

<u>ADMINISTRATIVE COUNCIL</u>	<u>DEVELOPMENT PLANS WITHIN THE DEE CATCHMENT</u>
GWYNEDD COUNTY COUNCIL	CC STRUCTURE PLAN - Adopted November 1993
- Meirionnydd D.C.) - Aberconwy B.C.)	- SNOWDONIA NATIONAL PARK - Park wide Local Plan - Draft expected 1994
CLWYD COUNTY COUNCIL	CCC STRUCTURE PLAN 2nd alteration prepared Public consultation due Feb/March 1994
- Colwyn B.C. - Glyndwr D.C. - Wrexham Maelor B.C. - Delyn B.C. - Alyn & Deeside D.C.	Draft District Wide Plan Deposit plan expected spring 1994 Local Plan formal adoption expected spring 1994 Local Plan formal adoption anticipated late 1994 Borough Wide Plan adopted October 1993 Draft District Wide Local Plan deposit expected early 1994
CHESHIRE COUNTY COUNCIL	CHESHIRE 2001 - approved January 1992, final document produced May 1993
- Chester City - Ellesmere Port & Neston B.C	Currently working to 3 adopted Local Plans. Draft District Wide Plan expected early 1994 Local Plan adopted June 1993
SHROPSHIRE COUNTY COUNCIL	1989 - 2006 Structure Plan currently in use became operative 1.1.93
- North Shropshire D.C. - Oswestry B.C.	Local Plan currently in use although Council is in process of updating Rural Area Plan in use. Working on Urban area which will eventually combine with Rural Plan for District Wide Plan
WIRRAL METROPOLITAN B.C.	Wirral Unitary Development Plan - Draft in preparation. Deposit expected early 1994

USES OF THE DEE CATCHMENT

DEE CATCHMENT - POPULATION FIGURES (1991 CENSUS)

COUNTY COUNCIL

GWYNEDD	4408
CLWYD	272658
CHESHIRE	118000
SHROPSHIRE	12000
WIRRAL	20338

MAIN TOWNS

CHESTER	77800
WREXHAM	41281
BUCKLEY	13689
CONNAH'S QUAY	14443
FLINT	12564
MOLD	9168

TOTAL 427404

The total population within the catchment is illustrated above. Current and planned housing developments are chiefly within the main towns and cities, notably Chester, Wrexham, Buckley and Mold. Development within the catchment is becoming increasingly leisure and tourism orientated, with a considerable number of proposed hotel complexes and golf courses.

Tourism is an important industry within the catchment, with over 33,000 bedspaces available for visitor accommodation in Clwyd alone. Chester attracts 1.5 million visitors per year, and is a tourist centre for visitors to North Wales. Hoylake and West Kirby, situated at the mouth of the Dee estuary, are popular seaside resorts. Llangollen and smaller towns and villages of the upper valley, such as Bala, Corwen, Glyn Ceiriog and Llanuwchllyn offer picturesque surroundings and are popular tourist attractions. The recent rediscovery of important industrial heritage sites within Wrexham Maelor has attracted many new visitors into the area. Llangollen hosts the annual International Eisteddfod which attracts visitors from all over the world.

There are proposals for new industrial and business parks and existing sites within the catchment are expanding. There is an existing Simplified Planning Zone (SPZ) at Greenfield Business Park, and another is planned at Flint, both sites being within the Delyn Borough Council area (SPZ's aim is to encourage business/industry to locate within designated areas).

USES OF THE DEE CATCHMENT

Further major developments within the catchment include the construction of a gas and oil terminal at Talacre, Point of Ayr, where reserves discovered in the Irish Sea will be brought ashore and processed. Gas will be conveyed through a 26km pipeline to a 1350 megawatt Combined Cycle Gas Turbine (CCGT) power station at Connah's Quay, which is currently being built. It is anticipated that sufficient reserves exist for operation of the power station for 25 years. A further CCGT power station being built at Shotton will use existing gas supplies.

The area is served by a network of trunk and main A roads for the principal population centres, with B roads linking smaller settlements. A number of road improvements and by-pass schemes are proposed or under construction within the catchment. Perhaps the most significant proposed road development from the NRA viewpoint is the third River Dee crossing. Another major proposal involves the A494 crossing of the Dee. The existing crossing, the busiest section of road in North Wales carries an average 60,000 vehicles per day, and already exceeds the design capacity. The proposal involves a dual four lane carriageway across the Dee estuary. The northbound carriageway would follow the line of the existing crossing, with a completely new bridge to the east forming the southbound crossing.

Rail transport consists of the main line from Chester to Holyhead, which is within easy reach of most of the industrial and employment centres in the north east of the catchment. No main line facilities exist in the catchment upstream of Llangollen. Lines to the south pass through Wrexham and Chirk, to the north along the Wirral and to the east to Crewe.

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.

USES OF THE DEE CATCHMENT

- 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.

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. A statutory water protection zone (WPZ) for the freshwater catchment of the River Dee is being promoted in response to the unacceptable record of significant pollution incidents affecting potable water supplies from the river. This is the first occasion that the NRA has sought to use the relevant legislation (S.93 Water Resources Act 1991). The NRA also has a Groundwater Protection Policy (Appendix 1) which seeks to protect groundwater.

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 Surface Water

Four water companies (Dŵr Cymru Welsh Water, North West Water, Wrexham and East Denbighshire Water Company and Chester Waterworks Company) abstract surface water for drinking water supply, at 32 locations within the catchment (9 are from the regulated Dee and the remaining 23 from other reservoir, stream or spring sources, namely, Llyn Arenig, Cynwyd, Alwen Reservoir, Llyn Bran, Cilcain Reservoirs, Brithdir Mawr,

Moel Fammau, Nant-y-Fflint, Springs at Llandderfel, Oerog Springs, Ceiriog Springs, Newhall Spring, Trefnant Brook, Pen-y-Cae Reservoir, Vivod, Ty Mawr and Cae Llwyd Reservoirs, Nant-y-Ffrith Reservoir, Afon Teirw, Pendinas Reservoir and Llyn Cyfynwy). All of these at the point of abstraction have been identified for designation under the EC Surface Water Directive.

The total volume licensed for abstraction from the regulated Dee for potable supply is over 295,000 million litres per annum (Ml/a), whilst the other sources are licensed in total for just under 29 Ml/a.

This water is used to supply potable demands in the Dee catchment itself and also parts of the Vale of Clwyd (via the Alwen Water Treatment Works). However, 88% of the total water abstracted from the River Dee is licensed for North West Water Ltd, to supply Merseyside and Cheshire.

There are also 28 licences for private domestic supplies from surface or spring sources within the catchment, amounting in total to 83.5 Ml/a.

Groundwater

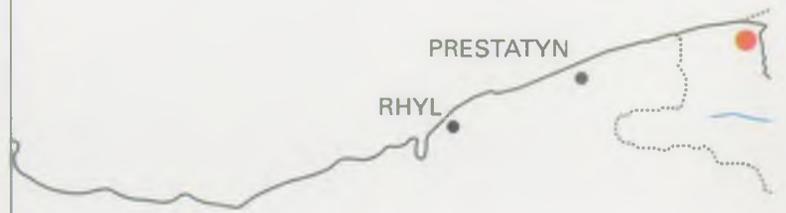
As shown on the accompanying map (Map 3) there is a large area of Triassic Sandstone underlying part of the Lower Dee catchment. This sandstone is a water bearing rock which receives water where the rock outcrops, or where the thickness and nature of overlying material allows rainwater percolation. Over much of its area this sandstone acts as an underground reservoir or aquifer through which groundwater is able to flow.

Groundwater is abstracted for public water supply within the Dee catchment by Dŵr Cymru Welsh Water, Wrexham and East Denbighshire Water Company, North West Water Ltd and Severn Trent Water.

Abstractions from the Triassic Sandstone are made by Severn Trent Water at Tower Wood and Overton, and by North West Water at Gorstons. Dŵr Cymru Welsh Water have three boreholes at Pulford, Bretton and Gorstella that are used as emergency sources.

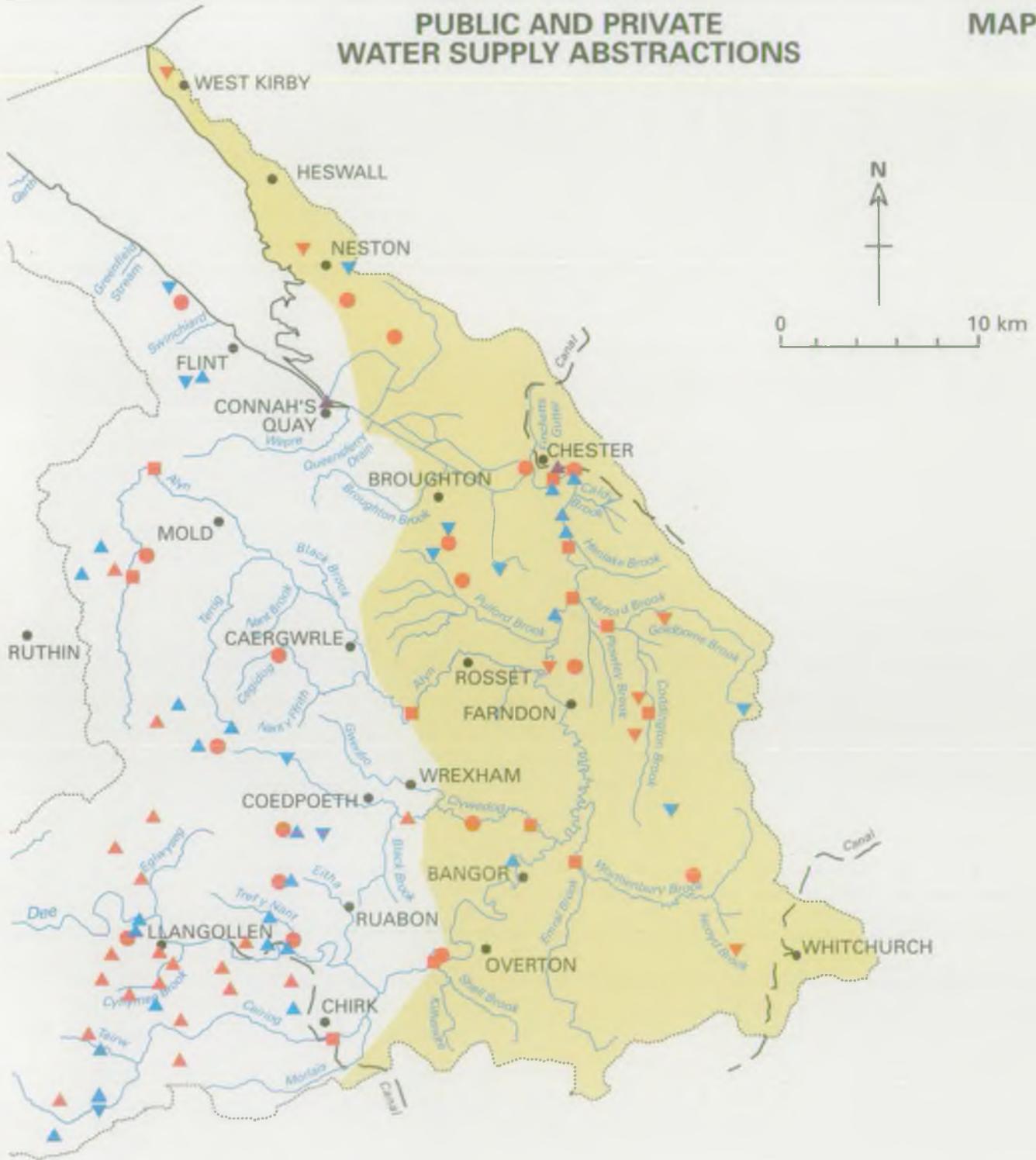
KEY

- CATCHMENT BOUNDARY
- TRIASSIC SANDSTONE AQUIFER
- ▲ PRIVATE DOMESTIC - SURFACE
- ▼ PRIVATE DOMESTIC - GROUND
- ▲ PUBLIC SUPPLY - SURFACE
- ▼ PUBLIC SUPPLY - GROUND
- DAILY RAINGAUGE
- ◆ MONTHLY RAINGAUGE
- RIVER GAUGING STATION
- ▲ LEVEL RECORDING STATION



PUBLIC AND PRIVATE WATER SUPPLY ABSTRACTIONS

MAP 3.



USES OF THE DEE CATCHMENT

Additional sources of groundwater exploited within the Dee catchment include the Halkyn Mine drainage system (Dŵr Cymru Welsh Water) and Esclusham Mountain mine drainage system near Minera (Wrexham and East Denbighshire Water Company).

Wrexham and East Denbighshire Water Company also abstract from the Cefn-y-Fedw sandstone near Talwrn and from superficial deposits near Tregeiriog.

The total volume licensed for abstraction from groundwater for potable supply is 14,350 Ml/a.

There are also currently 7 licences for private domestic supplies from groundwater sources within the catchment, amounting in total to 119.4 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

- The quality of water at licensed potable 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.

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

Surface Water

There are 28 licences allowing abstractions from surface water for industrial and commercial purposes with a total annual licensed volume of 43,115.9 MI/a. 80% of this, licensed for abstraction from the estuary by British Steel at Shotton, is not used at the present time.

Other uses include the manufacture of chemical, dairy, and paper products. A proportion of any cooling water will be returned within the catchment but in other cases the water abstracted may form a constituent part of the finished product.

At Llangollen water is abstracted for replenishing the boilers of the steam locomotives of Llangollen Railway and for maintaining the flows within the Shropshire Union Canal.

95% of the 8839.1 MI/a licensed for abstraction from the Dee surface catchment upstream of Chester weir is made under the general industrial or commercial classification. The balance is made up of sand and gravel washing (426.8MI/a) and bottling of spring waters (16.46MI/a).

KEY

- CATCHMENT BOUNDARY
- TRIASSIC SANDSTONE AQUIFER
- ▲ INDUSTRIAL - SURFACE
- ▼ INDUSTRIAL - GROUND



INDUSTRIAL ABSTRACTIONS

MAP 4.



USES OF THE DEE CATCHMENT

Groundwater

There are 25 licences for abstraction from groundwater for industrial and commercial purposes with an associated volume of 6135.8MI/a. These are indicated separately on the accompanying map (Map 4).

Of these, there are 13 from the Triassic Sandstone aquifer representing a volume of 4373.33MI/a.

Ten licences permit abstraction of up to 1541.56MI/a (25% of total volume) from aquifers in the superficial deposits. The remaining 220.94MI/a is abstracted from the carboniferous strata.

The largest abstractor is British Steel at the Shotton works with a licensed abstraction of 3327.7MI/a.

The other main industries and businesses benefiting from groundwater abstraction include - chemical industry, dairy products, construction industry, brewery trade, soft drinks manufacture.

Chester Zoo also has a licensed groundwater abstraction for use, in part, as a top up for the sea lions pool.

The total of 199.1MI/a is licensed for use in sand and gravel washing.

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.

USES OF THE DEE CATCHMENT

- 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.

3.4 ABSTRACTION FOR AGRICULTURAL SUPPLY

General

All abstractions for agricultural purposes, apart from some small (less than 20 cubic metres per day (M³.D⁻¹) 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 a total of 371 licensed abstractions within the Dee catchment for agricultural purposes. These purposes include spray irrigation and fish farming.

There are 10 licensed fish farms within the catchment which return all abstracted water to the river (17,674.5 Ml/a).

USES OF THE DEE CATCHMENT

Eight rear brown or rainbow trout for stocking of other fisheries or to supply fish for the table market. One salmon rearing station is operated by the NRA at Maerdy, near Corwen, to enhance river stocks of juvenile fish to boost adult salmon returns in Welsh rivers, which includes the River Dee. At Farndon a carp rearing farm has been constructed to supply fish to the large number of carp waters that have been developed in recent years.

All fish farms have abstraction licences and discharge consents, the volumes and effluent criteria of which are set to take account of the environmental requirements of the streams affected.

At two fish rearing units in the catchment young salmon and sea trout can enter the intakes. Since 1991 the NRA has undertaken a rescue at these sites and approximately 1,000 smolts have been returned to the river annually. With the consent of the Minister the NRA has the power to install gratings. However, as the Authority would be responsible for their maintenance and possibly liable for compensation, this power has not been utilised.

Conditions requiring fish farmers to screen intakes and outlets can be applied via abstraction licences issued under the Water Resources Act 1963. Such conditions cannot be added to existing licences.

There are a total of 42 spray irrigation licences concentrated in the middle and lower reaches of the catchment, with no spray irrigation taking place upstream of Llangollen. Of these, 36 abstract from surface waters (862.3 Ml/a) and 6 abstract from groundwater resources (137Ml/a). The volume of water returned to river is negligible from this category of use. Moreover, the need to abstract arises during times of low river flow (periods of low rainfall). For this reason the Authority has powers to curtail or reduce this use when resources are under stress.

The accompanying map (Map 5) indicates the locations of fish farms, spray irrigators and the larger abstractions for general agricultural use, that is, those abstractions that on average exceed $20 \text{ M}^3\text{D}^{-1}$. There are 33 licences (total 548.3Ml/a) for general agricultural use which exceed this $20 \text{ M}^3\text{D}^{-1}$ threshold, all of which rely on groundwater as the source.

This leaves 286 licensed abstractions (266 groundwater) which account for up to 796.7Ml/a of the water abstracted from the catchment.

Of the 371 licensed agricultural abstractions detailed in this section 305 are reliant on groundwater. As with the water abstracted for potable supply, a large proportion is extracted from the Triassic Sandstone aquifer underlying the Lower Dee catchment (54%), with a smaller proportion from the Carboniferous strata to the south and west of the Wrexham area (16%).

KEY

- CATCHMENT BOUNDARY
- TRIASSIC SANDSTONE AQUIFER
- ▼ AGRICULTURAL - GROUND
- ▲ SPRAY IRRIGATION - SURFACE
- ▼ SPRAY IRRIGATION - GROUND
- FISH FARMS
- OBSERVATION BOREHOLES



USES OF THE DEE CATCHMENT

There are also an appreciable number of abstractions from superficial deposits in the middle and lower reaches of the catchment. These account for the remaining 30% of the groundwater abstracted for agricultural use.

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 in or alteration to the physical habitats required by other uses.

3.5. ABSTRACTION FOR WATER TRANSFER

General

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

Local Perspective

Water Transfer

There are 13 licences associated with the transfer of water within the Dee catchment. The total volume licensed for transfer is 642,255Ml/a. Of this 99% is associated with regulation of the River Dee between Llyn Tegid and Chester weir. Regulation is the term used to describe the management of flows in the river during periods of low flow.

The management rules for regulating the River Dee have been developed over thirty years and are continually refined and adjusted through a Statutory Consultative Committee, which is chaired by the NRA. One such management rule is that the residual flow over Chester weir should not drop below 4.2 cubic metres per second (cumecs) under normal operating conditions.

The River Dee was first regulated in the early 1800's to sustain flow into the Shropshire Union Canal at Llangollen (Horseshoe Falls). This abstraction which is protected by statute, still takes place today and represents a transfer of water out of the Dee catchment. This transfer is further enhanced by an additional abstraction into the canal which is subsequently abstracted by North West Water at Thurleston near Nantwich.

The present Dee system is regulated to support abstractions for potable water supply as well as the canal abstraction.

During low flow periods water is released from Llyn Celyn (via Llyn Tegid) and Llyn Brenig into the river so that there is sufficient flow to meet the requirements of the above abstractions whilst maintaining a residual flow of 4.2 cumecs over Chester weir.

USES OF THE DEE CATCHMENT

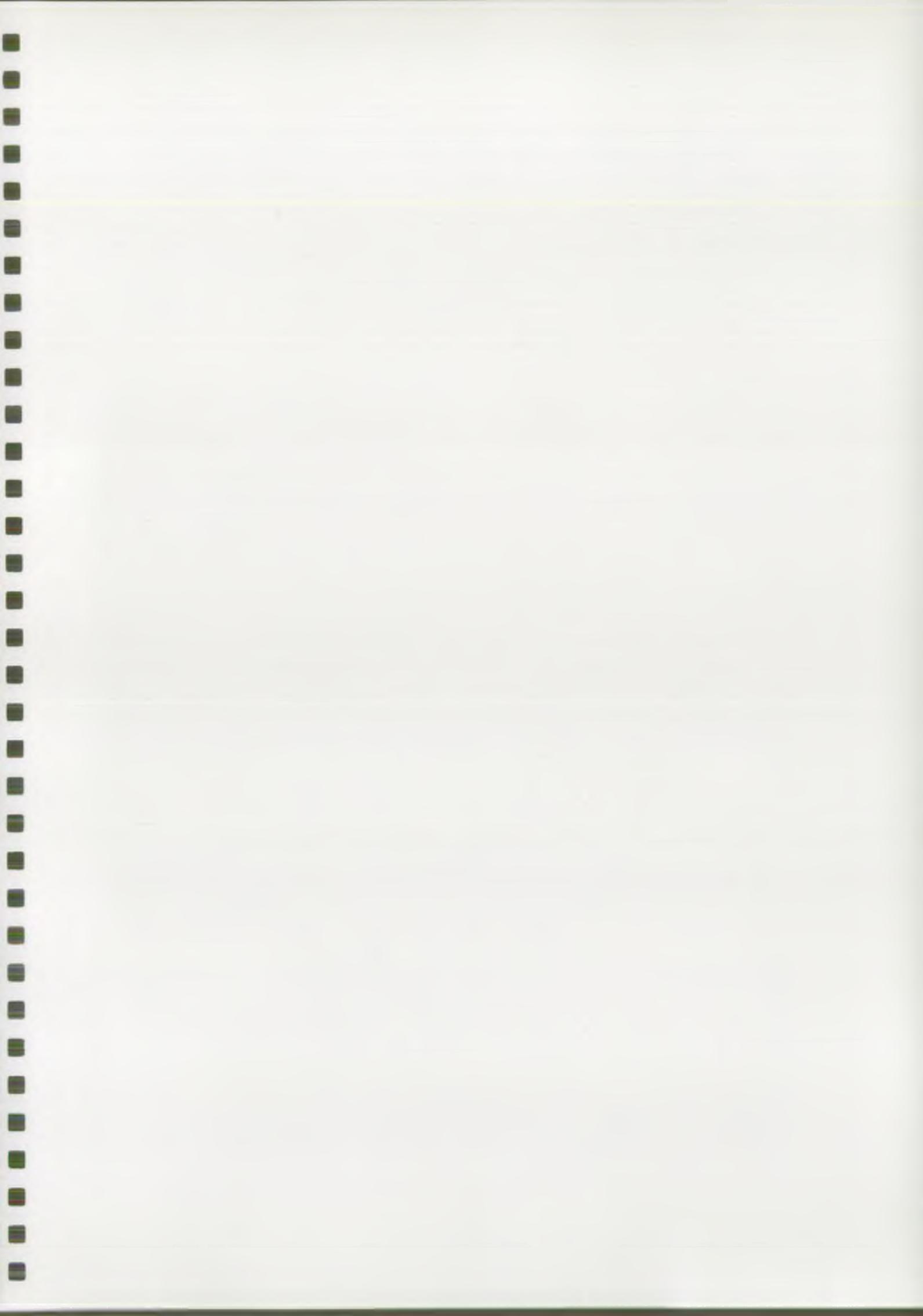
The remaining transfers of surface water are associated with assisting the refill of surface water reservoirs. There are two catchwaters operated by Dŵr Cymru Welsh Water which assist with the replenishment of Alwen Reservoir and Brithdir Mawr. There are also two transfers operated by Wrexham and East Denbighshire Water Company associated with the refill of Pendinas and Ty Mawr reservoirs.

There are two groundwater licences for water transfer from ground to surface sources. One is operated by Tilcon on the Dolfechlas Brook although this has not been used in recent years. The second is operated by Delyn Borough Council and transfers water into the reservoir at Greenfield Mills from a nearby mine drainage adit.

- 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

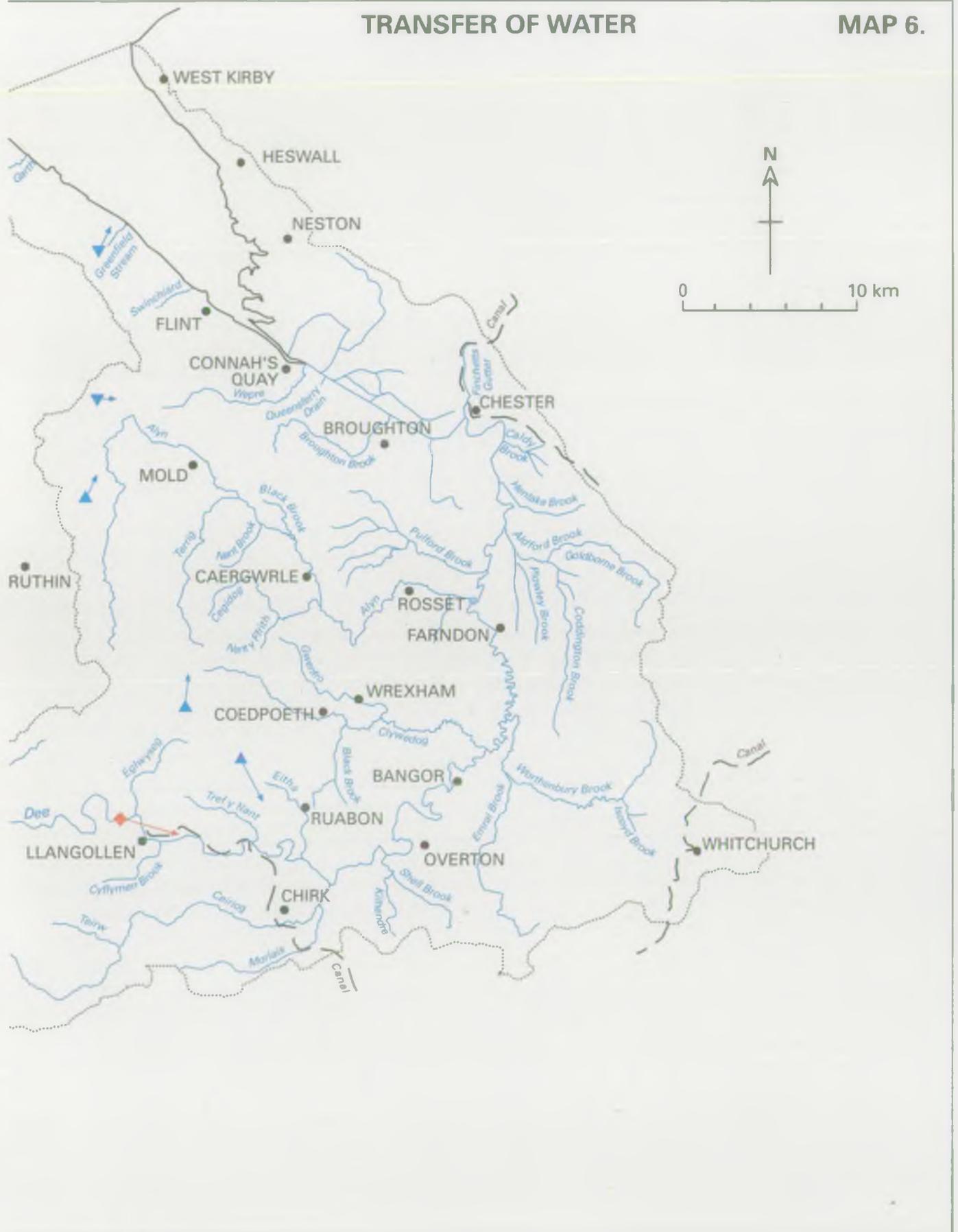
Environmental Requirements

- Water Quality**
- Water transfer should not adversely affect water quality in either the donor or receiving catchment.
- 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 must not be altered in a way that might preclude water transfer at suitable locations.
 - Water transfer should not lead to alterations of the physical habitat to a degree that might affect other uses, in either the donor or receiving catchment.



TRANSFER OF WATER

MAP 6.



3.6. ABSTRACTION FOR WATER POWER

General

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

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

All hydropower abstractions require an abstraction licence.

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

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

Local Perspective

Hydro-electric Power

There are three licences associated with hydro-electric power generation within the Dee catchment. These licences allow up to 141,872.16Ml/a to be used for this purpose and all the water is returned to the catchment.

The largest of these licences is held by Dŵr Cymru Welsh Water (136,380.00 Ml/a) and is associated with the release of water from Llyn Celyn for regulation of flows in the River Dee below Llyn Tegid. This licence allows Dŵr Cymru Welsh Water to take advantage of releases specified by the Authority by putting the water through a turbine generator set at the foot of the dam prior to discharge into the Afon Tryweryn.

USES OF THE DEE CATCHMENT

The other two licensed abstractors are for small turbines generating power for domestic use, one on the Afon Twrch and the other on the Nant-y-Derwydd.

Mills

There are 14 mills indicated on Map 7 including - Melyn Mynoch, Kings Mill (Afon Clywedog), Nant Mill, Bersham Mill, Nant-y-Garth, Aberkan (Llanerch-y-Mor), Ffrwyd Mill, Rossett Mill, Greenfield Park, Loggerheads.

Several of these mills have been fully restored and are now operational, mainly as tourist attractions. Others are undergoing restoration programmes. The remainder have been converted for other commercial or domestic purposes.

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

Environmental Requirements

Water Quality

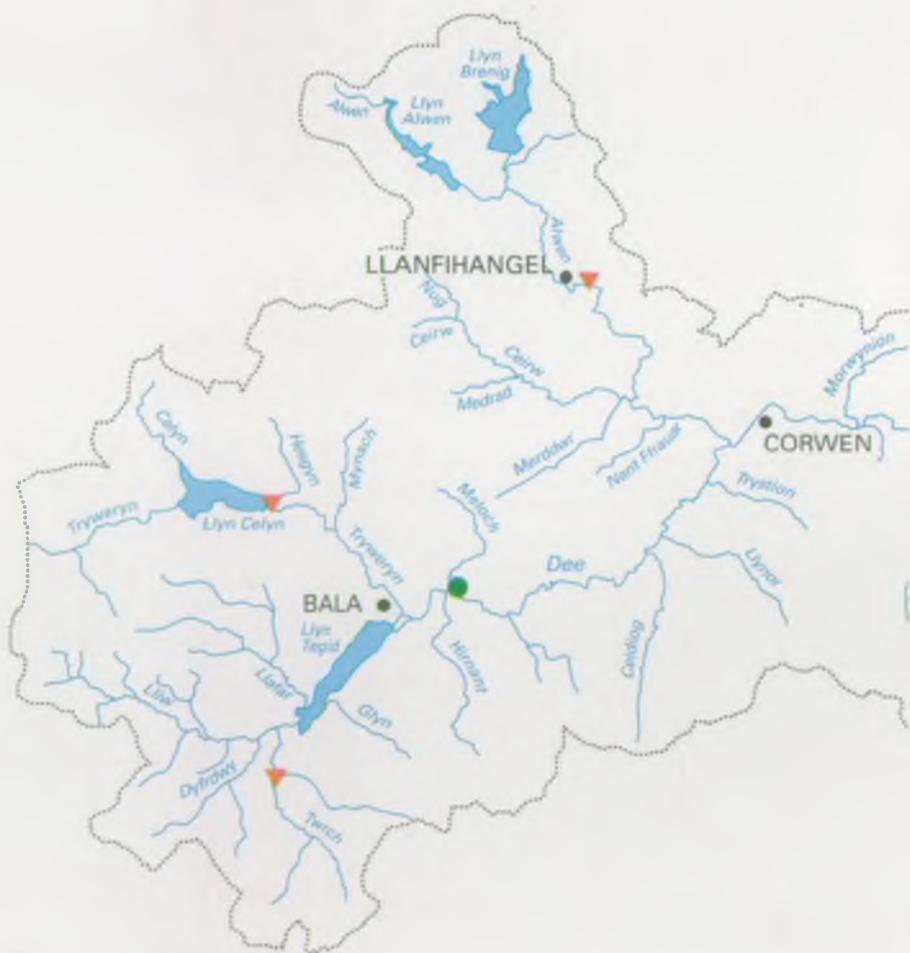
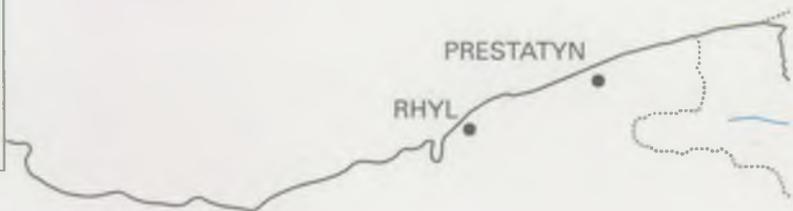
- Water quality should not be affected by power generation and associated activities to a degree which compromises other uses.
- For industrial abstractions the standards for Aesthetic Criteria will be met and there should be no deterioration in water quality compared to when the abstraction licence was granted.
- Waters will be required to comply with the standards for Aesthetic Criteria, Dangerous Substances, where appropriate, and Agricultural Abstraction.

Water Quantity

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

KEY

- CATCHMENT BOUNDARY
- ▼ HYDRO-ELECTRIC GENERATION
- MILLS



HYDRO-ELECTRIC GENERATION AND MILLS

MAP 7.



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

3.7. 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 Dŵr Cymru Welsh Water, handles the bulk of sewage effluent discharged to freshwaters, although the greater number of STWs are privately owned.

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

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

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

KEY

----- CATCHMENT BOUNDARY

DWR CYMRU
WELSH WATER

PRIVATE



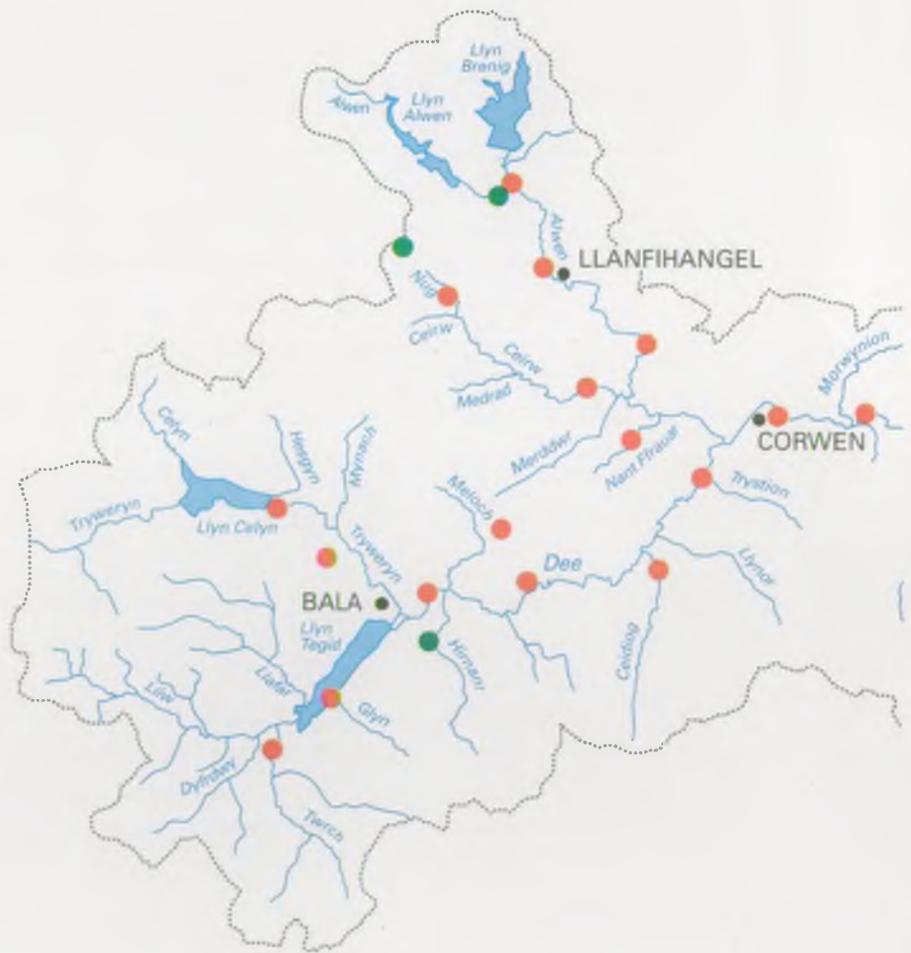
PRIMARY TREATED
(INCLUDING PRELIMINARY)



SECONDARY TREATED



TERTIARY TREATED



SEWAGE EFFLUENT DISPOSAL

MAP 8.



Local Perspective

There are 110 sewage disposal works operated by Dŵr Cymru Welsh Water (DCWW) in the Dee catchment, all of which are monitored by the NRA at a frequency determined in accordance with the volume and potential impact of the discharge on receiving waters. There are also a large number of discharges of effluent to subsurface soakaways. In addition to the 110 DCWW discharges, there are 31 other significant sewage effluent discharges to surface waters. The majority of discharges are made to tributaries rather than the Dee itself.

Where discharges of treated effluent have an adverse impact upon water quality to a degree that affects legitimate uses of the water, then the NRA will review the consent and impose stricter standards. Where works fail to meet consent standards then the NRA may start formal legal proceedings if the discharger fails to implement a plan of improvements to enable the works to comply fully.

The NRA seeks to ensure that environmentally protective discharge standards are imposed on all works discharging to surface waters. Where a discharge to a soakaway is within an aquifer protection zone, these are also consented.

Many of the treated effluent discharges within the catchment are from small works serving communities in the rural areas. The major discharges of treated effluent are made from works draining the urban areas principally around Mold, Buckley, Wrexham, Chester and Queensferry.

The largest input of sewage is from Chester STW. A revised consent for this works based on extensive computer modelling of the inner Dee estuary, is currently being negotiated. This work, together with revised standards for Queensferry STW, will greatly improve the water quality of this area of the estuary, especially with respect to ammonia concentrations.

A significant impact of sewage within the estuary is found at Heswall where inadequate sewerage facilities cause this area of the estuary to be the only one in Class B (NWC classification).

Recent capital expenditure by DCWW at Mold and Rhydymwyn STWs, involving the provision of additional treatment capacity, has resulted in substantial water quality improvements within the middle reaches of the River Alyn. Similar work at Gresford STW, recently completed, should result in further water quality improvements in the lower reaches of the River Alyn.

USES OF THE DEE CATCHMENT

A major capital scheme has recently been completed at Five Fords STW, Wrexham, during which the outfall into the Clywedog was diverted to the Dee via a 5 kilometre pipeline. This has resulted in a significant improvement in water quality of the Clywedog. The discharge to the Dee is the subject of an environmentally protective consent.

In developing rural communities not served by main drainage facilities, proliferating septic tank and package treatment plant installations give rise to localised pollution in watercourses. Development in some areas is now opposed where ground conditions preclude efficient disposal of effluent via subsurface irrigation systems.

In urban areas, unsatisfactory performances of sewerage systems, particularly the premature and/or prolonged operation of combined storm sewage overflows, can result in a deterioration of water quality. This is a particular problem in parts of the Wrexham area draining to the River Gwenfro, and forms the basis for the NRA's objection to further developments that would increase the sewage input into this part of the public sewerage system.

- 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.

3.8. INDUSTRIAL EFFLUENT DISPOSAL

General

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

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

Where the NRA has wider concerns over industrial activity than simply those resulting from direct consented discharges, there are powers under S.93 Water Resources Act 1991, to promote the designation of water protection zones (WPZ). WPZs are specific to areas at unacceptable risk from pollution, and the first application for such status has been made with respect to protection for the potable water supplies from the River Dee.

Trade effluent is discharged to sewers with the permission of the sewerage undertaker (Dŵr Cymru Welsh Water in Welsh Region) and is then subject to the sewage effluent treatment and disposal controls outlined in Section 3.7.

Local Perspective

Industrial activity is widespread in the catchment though particularly evident in the estuary and the Wrexham area. Concentrations of major industries and industrial parks are located at Neston, Chester, Sandycroft, Queensferry, Deeside, Flint, Bagillt, Greenfield, Mostyn, Point of Ayr, Wrexham, Llay, Ruabon, Chirk, Corwen and Bala.

These industries include aircraft construction at British Aerospace, chemical manufacture at NIPA Laboratories and Warwick International, paper production at Shotton Paper, Kimberley Clark and Henry Cooke Makins, and steel coating at British Steel on Deeside. An active mine is in operation at Point of Ayr and new facilities for electricity generation are currently under construction by Powergen and National Power at Connah's Quay and Deeside. A gas terminal is being built at Point of Ayr by Hamilton Brothers to serve the Powergen site.

USES OF THE DEE CATCHMENT

A number of major industries are also found elsewhere in the catchment. Monsanto PLC of Ruabon produces a wide variety of chemicals for the rubber and pharmaceutical industries, whilst Kronospan Limited at Chirk produces chipboard and medium density fibre board. Express Foods near Malpas operate a large creamery producing over 6000 tonnes of cheese annually, and the Mold based Synthite Limited, a major formaldehyde manufacturer, operates on the banks of the River Alyn. On the upper reaches of the Worthenbury Brook, Wardles Metals, a large aluminium reclaimers, produces 11,000 tonnes of metal per annum.

An increasing number of problems originate from the development and expansion of industrial estates. Accidental or deliberate cross connections of foul effluents to surface water drainage result in water quality problems which are difficult to identify and resolve.

At the Wrexham Industrial Estate a wide variety of products ranging from heavy industrial products, chemical and pharmaceutical synthesis, food manufacture and processing, to small scale electrical and hi-tech industrial components are manufactured, stored or transported, which present a significant threat to the water quality of the adjacent tributaries and the River Dee.

Historic industrial activities have left large areas of contaminated land notably around Sandycroft, Queensferry, Flint, Deeside, Saltney, Connah's Quay, Greenfield, Wrexham, Brymbo, Johnstown, Llangollen and Chirk. The NRA seeks satisfactory reclamation of such areas prior to redevelopment. The Authority is also particularly anxious to ensure that industrial activities within the catchment do not contaminate groundwater.

The total volume of industrial effluent consented for discharge within the catchment is $21.73\text{M}^3.\text{A}^{-1}$ to surface waters with no discharges consented for disposal to groundwaters.

The NRA's wider concerns over the unacceptable record of pollution incidents interrupting potable water supplies in the River Dee has resulted in the promotion of management proposals under S.93 of the Water Resources Act 1991, which if ratified will provide for greater control over activities which have accompanying pollution risks. In the absence of WPZ status the NRA and others will have to continue with reacting to incidents, whereas the approach of pollution prevention is far more effective and acceptable to society.

Objectives

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

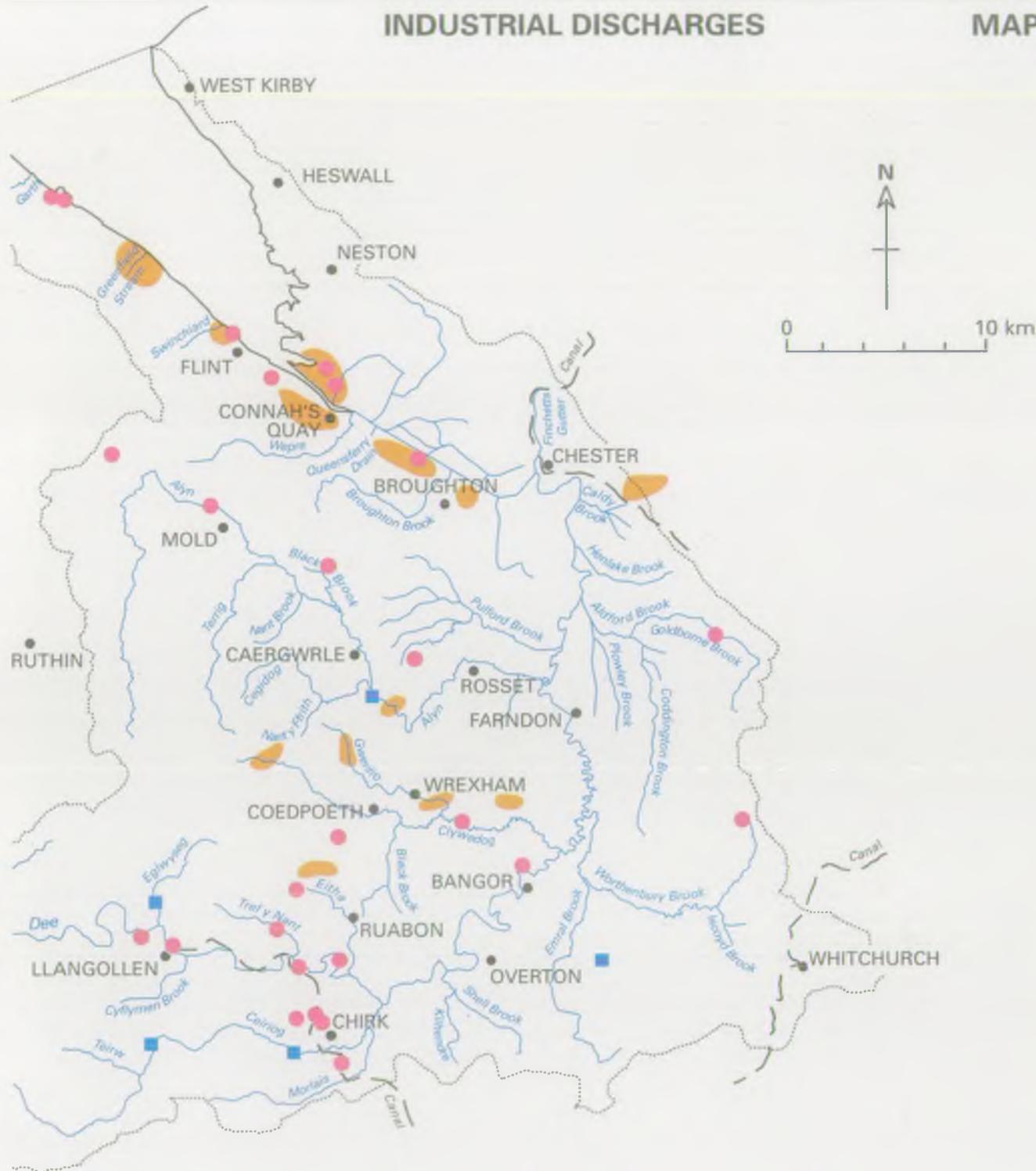
KEY

- CATCHMENT BOUNDARY
- INDUSTRIAL DISCHARGE
- FISH FARM
- AREAS CONTAMINATED BY HISTORICAL INDUSTRIAL ACTIVITY



INDUSTRIAL DISCHARGES

MAP 9.



USES OF THE DEE CATCHMENT

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.

3.9. 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 licenses.

Local Perspective

There are many existing landfill sites within the Dee catchment and the NRA seeks to ensure that none of these or any new sites adversely affect the quality of surface and groundwaters.

Redundant and active mineral extraction sites situated in the Wrexham area, within the Ruabon marl belt and within the sand and gravel deposits adjacent to the River Dee, have been used or are planned to be used for waste disposal.

The NRA has presented evidence at three public inquiries into proposals for new or enlarged waste disposal sites at Pen y Bont at Newbridge, Hafod Clay Pit at Ruabon and Cae Dyah, near Wrexham. Comments have been made on proposals for extending waste disposal operations at Gardden Lodge Ruabon, and on many applications for inert waste disposal sites, waste transfer stations and commercial waste handling facilities.

Waste is currently being deposited at the Gardden Lodge site, which receives commercial and domestic waste from a number of local and regional sources. Further clay extraction will create extra available void space for the disposal of 1.8 million cubic metres of waste over the next 11 years.

The proposed site at Pen y Bont will make a further 1.9 million cubic metres of void space available over the next 6 years for the disposal of domestic and commercial waste.

USES OF THE DEE CATCHMENT

The Secretary of State for Wales, following a Public Inquiry, has indicated that he will grant permission to develop the former Hafod Clay Pit for restoration by landfilling with domestic and commercial wastes. With a capacity in excess of 4 million cubic metres it will have an operational life of 30-40 years at planned rates of infill.

The tipping of waste at former landfill sites at Chirk, Corwen, Llangollen and Wrexham has ceased and restoration, in accordance with the operational site licence conditions, has been carried out.

However, this restoration does not always comply with today's required minimum standards and, where pollution is occurring or has a potential to occur, then further remedial work is being carried out to meet current requirements.

At the former Llwyneinion Clay Pit, extensive deposits of acid tar waste in excess of 40,000 tonnes were dumped during the 1960s. There is some concern over the effectiveness of containment at this and an adjacent chemical waste tip which warrants further ground and surface water investigations.

The Dark Lane landfill site is within the Pulford Brook catchment, near Chester, and is licensed to receive 1200 tonnes of household and commercial waste per day. The site was acquired by its present operator in 1988. The site was previously operated as a 'dilute and disperse' site where the natural clays and sands beneath the site attenuated the polluting matter in any leachate. However, poor site management resulted in the deposition of highly contaminated wastes which produced leachates with a high organic content. The groundwaters beneath the site are in hydraulic continuity with the Pulford Brook and so the leachates eventually contaminated the brook. Since the site has been operated by its present owner, it has been run as a containment site with careful leachate management and stricter control of the types of waste being deposited.

Wrexham Maelor Borough Council operates a site in Llay where tipping operations have just been completed. The site is presently being capped with impermeable clay to prevent ingress of water into the tipped waste and possible problems with excessive leachate generation.

In the estuary there are many active and disused landfill sites as well as several waste transfer stations. Many industries also have private waste disposal licenses and activities operating within their premises.

USES OF THE DEE CATCHMENT

Many old landfill sites are now leading to local pollution problems for streams and the estuary. Notable examples exist at the Countess of Chester Hospital, Dock Road and Princess Pit in Connah's Quay, Flint landfill, Greenfield, Deeside, Saltney and Northop. All of these sites are the subject of reclamation schemes or negotiations to obtain full environmental impact data. Existing landfill operations at Buckley, Bagillt, Alltami, Flint, British Steel and Point of Ayr Colliery have led to environmental concerns which are now being addressed via reviewed site licenses and increased monitoring.

There are a number of smaller sites within the catchment which are licensed to accept only inert waste. This type of waste includes soils, bricks, glass and other non-leachate forming materials.

- 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.

SOLID WASTE DISPOSAL

MAP 10.



3.10. 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

The Dee catchment supports a variety of mineral extraction activities, some of which can exert a significant impact on water quality. Historically operated sites, especially those associated with lead mining, have given rise to localised problems with diffuse run-off from such areas resulting in elevated metal levels in the receiving streams.

At Minera near Wrexham a major scheme funded by Government Agencies and the Local Authority has been carried out to restore large areas contaminated with tailings from the historic lead mining activities.

USES OF THE DEE CATCHMENT

The legacy of centuries of mining activity is areas of spoil, contaminated land, and hundreds of abandoned shafts and adits which discharge mine water to surface rivers. Such discharges may contain high levels of metals and are known to affect many local streams, principally the Afon Garth, Broughton Brook and Greenfield stream. Such inputs of metals to the estuary are contributory factors in causing the Dee estuary to periodically fail Environmental Quality Standards for copper and zinc.

Land reclamation schemes currently underway at the Gowdal in Greenfield will aid in reducing the input of metals from spoil run-off in this area. The use of the Afon Garth as a source of process water by Warwick International, which is currently installing improved treatment facilities, further serves to reduce the input of metals to the estuary, especially copper and zinc.

Small scale granite quarrying and intermittent exploration for gold takes place in areas above Bala.

On the upper reaches of the River Alyn a number of quarries extract limestone from the Carboniferous Limestone outcrop. The production of road surfacing materials, which involves the coating of limestone chippings with bitumen takes place at many of these quarries. To reduce the risk of contamination of groundwaters, companies are now ensuring that plants are located on impermeable bases.

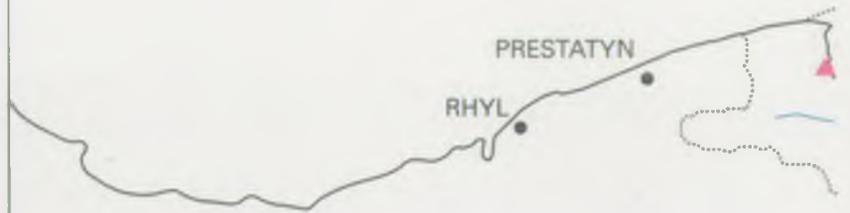
At Minera near Wrexham high quality reserves of limestone were quarried to produce more than 0.5 million tons of crushed stone and tarmacadam products each year, up until December 1993. The future of this quarry is unclear. Pant Quarry in the estuary at Halkyn is an active limestone quarry.

The middle reaches of the River Dee flow through areas of glacial drift and extensive deposits of Ruabon marl, a high quality clay in demand in the brick and tile industry. The largest operational sites are Gardden Lodge and Hafod clays at Ruabon.

In the Wrexham area and within the catchment of the River Alyn, there are large scale extractions for sand and gravel. There are also active sites in the estuary such as Springhill Quarry, Bagillt. This activity can have localised impacts, mainly in the form of discolouration and transported sediment contamination of receiving watercourses.

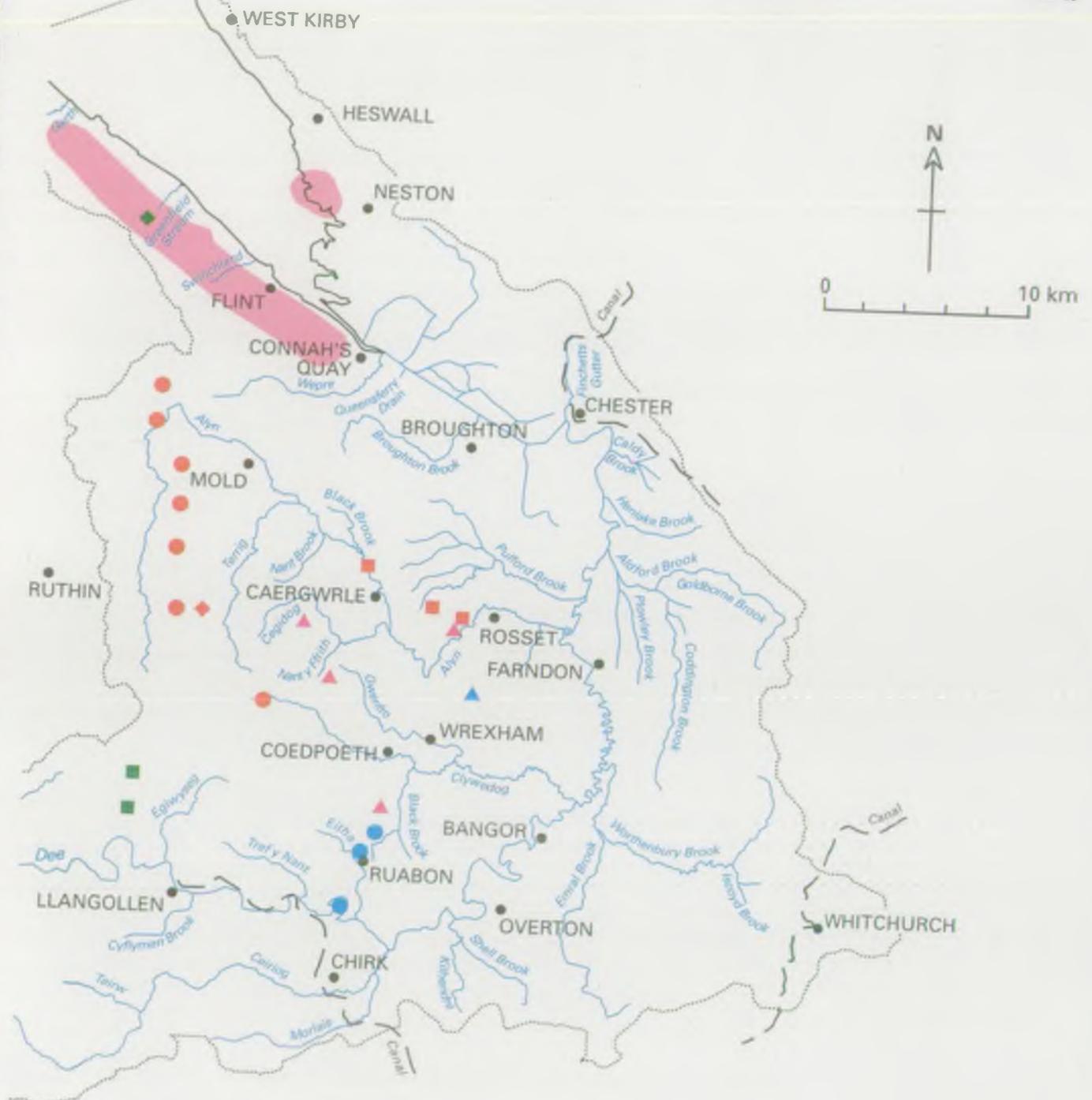
KEY

- CATCHMENT BOUNDARY
- LIMESTONE
- SAND
- ▲ SAND AND GRAVEL
- ▲ COAL
- ◆ SILICA
- CLAY
- SLATE
- ◆ RECLAMATION SITE
- DISUSED MINING AREAS



SITES OF MINERAL WORKING

MAP 11.



USES OF THE DEE CATCHMENT

Today there is only one active colliery in the catchment, the deep coal mine at Point of Ayr. Some small scale drift and open cast mining operations are carried out with some risks to water quality. The tipping of colliery spoil onto the estuary causes localised pollution. This matter is now being addressed by British Coal, and site defences and restoration plans are now underway.

A number of planning applications have recently been received for open cast sites on the coal measures of the middle and lower River Alyn. One open cast mine, at the site of the former brickworks at Caello, has recently been restored following a two year operational life. It is of some concern nationally that rising groundwater levels in former coal mining areas can cause very significant deterioration in water quality. The effect of cessation of de-watering operations at the larger colliery sites at Bersham and Hafod has not yet impacted on surface waters.

The NRA pays particular attention to applications for planning permission to extract materials given the potential for the after use of the site as a landfill. A number of small sites have recently been acquired by waste disposal operators primarily because of their potential as landfill sites.

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.

3.11. 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.

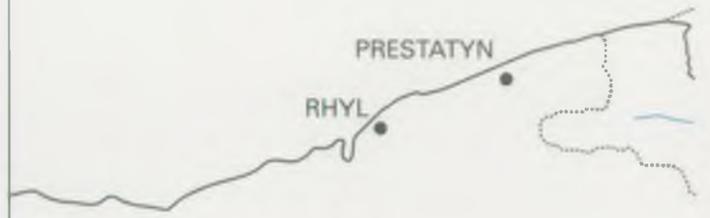
Where there is a specific discharge of effluent from a farm site this will be dealt with via the general discharge consenting process described in the discharge uses sections. However, the highly polluting nature of agricultural waste normally precludes this option and the NRA's approach is aimed at 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.

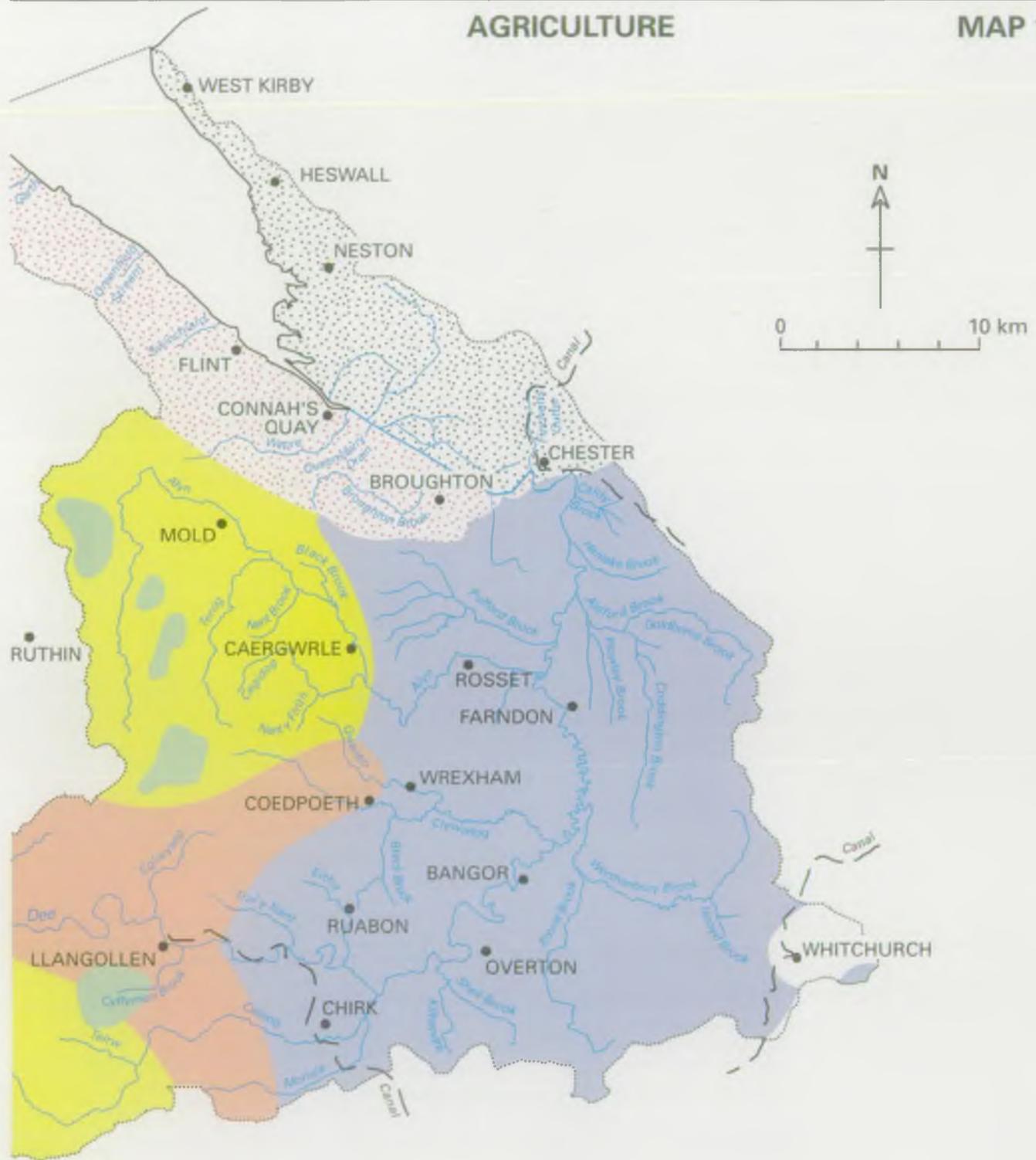
KEY

- CATCHMENT BOUNDARY
- FORESTRY
- PREDOMINANTLY DAIRY
- MIXED BEEF & SHEEP
- PREDOMINANTLY SHEEP
- ▨ MIXED DAIRY/BEEF/ SHEEP/ARABLE
- ▨ LIMITED ARABLE



AGRICULTURE

MAP 12.



Local Perspective

The Dee catchment supports a wide range of agricultural activities. Sheep farming is found predominantly on the poorer grassland on the moorland areas above Llangollen, and on the upper reaches of the River Alyn. This turns to mixed sheep and beef in the lower lying land adjacent to the Dee in this upper part of the catchment. Although pollution risks associated with upland sheep rearing are minimal due to the dispersed husbandry, there remains a very real risk when dipping takes place. Guidance is given to farmers on how to avoid contaminating surface water or groundwater during the use and disposal of dipping liquids.

The major and most intensive agricultural activity in the Dee catchment is dairy farming, which extends from the fertile grazing lands surrounding Wrexham, the Cheshire Plain, and North Shropshire in the south, to the estuary in the north. Units holding over 300 milking cows are not uncommon, and the Dee and its tributaries are subject to intermittent and significant pollution. The main tributaries affected are the Shell Brook, Dungrey Brook, Worthenbury Brook, Aldford Brook and Pulford Brook. This problem is often due to insufficient upgrading of effluent containment and treatment systems when herd sizes are increased, and to changes in agricultural practices during the past 20 years. These factors coupled with high rainfall also lead to diffuse pollution of watercourses. This is particularly evident in the Balderton Brook which discharges to the estuary.

Silage making remains the source of numerous and significant pollution incidents, although the frequency has reduced considerably as the result of extensive campaigns by the NRA and considerable investment by farmers.

On the Wirral side of the estuary, farming is predominantly arable and is especially intensive around Deeside and Sealand. The NRA is aware of the potential impact of pesticide and fertiliser run-off on streams in the area.

Substantial fish farms are found on tributaries such as the Afon Ceirw, Afon Ceiriog and Afon Eglwyseg. All fish farms in the catchment have abstraction licences and discharge consents.

The acidification of upland afforested catchments has been studied by the NRA for several years. Streams draining areas around Penllyn forest have been included within its regional monitoring programme.

The forests in the upper and middle reaches of the River Alyn are underlain by well buffered soils of neutral to alkaline pH, which reduces the effect of acidification. Forestry harvesting can cause disturbance of silt and other problems. Close liaison with the Forestry Industry is maintained to try and minimise such impacts.

USES OF THE DEE CATCHMENT

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

3.12 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 Dee 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 Dee supports a varied fish fauna including both migratory and resident species, which is not surprising given that 280km of the catchment's rivers have very good or good quality water. The migratory salmonids (salmon and sea trout) are the best studied species along with other long term or permanent residents. In particular, juvenile populations of the former have been sampled since 1985, and more recently (1991) these and the adult fish have become the subject of a regionally important monitoring and research initiative (the Dee Stock Assessment Programme or DSAP). DSAP is a long term monitoring and research programme concerned with the salmon and sea trout of the Dee. Its purpose is to provide improved measures of stock and fishery performance required for more effective management of migratory salmonids. The catches for the first two years of operation of the Chester weir trap were:

CHESTER WEIR TRAP CATCHES : 1991 AND 1992

a. Salmon

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1991	-	-	-	-	4	17	71	289	336	218	16	11	962
1992	1	14	21	83	96	68	303	278	275	162	56	8	1365

b. Sea Trout

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1991	-	-	-	-	11	154	195	94	25	98	16	1	594
1992	0	1	4	25	76	465	220	28	34	29	26	3	911

In contrast, little is known about the status of those migratory species which enter freshwater only briefly to spawn and are of little commercial importance, which include the marine and river lampreys and the locally rare smelt (*Osmerus eperlanus*).

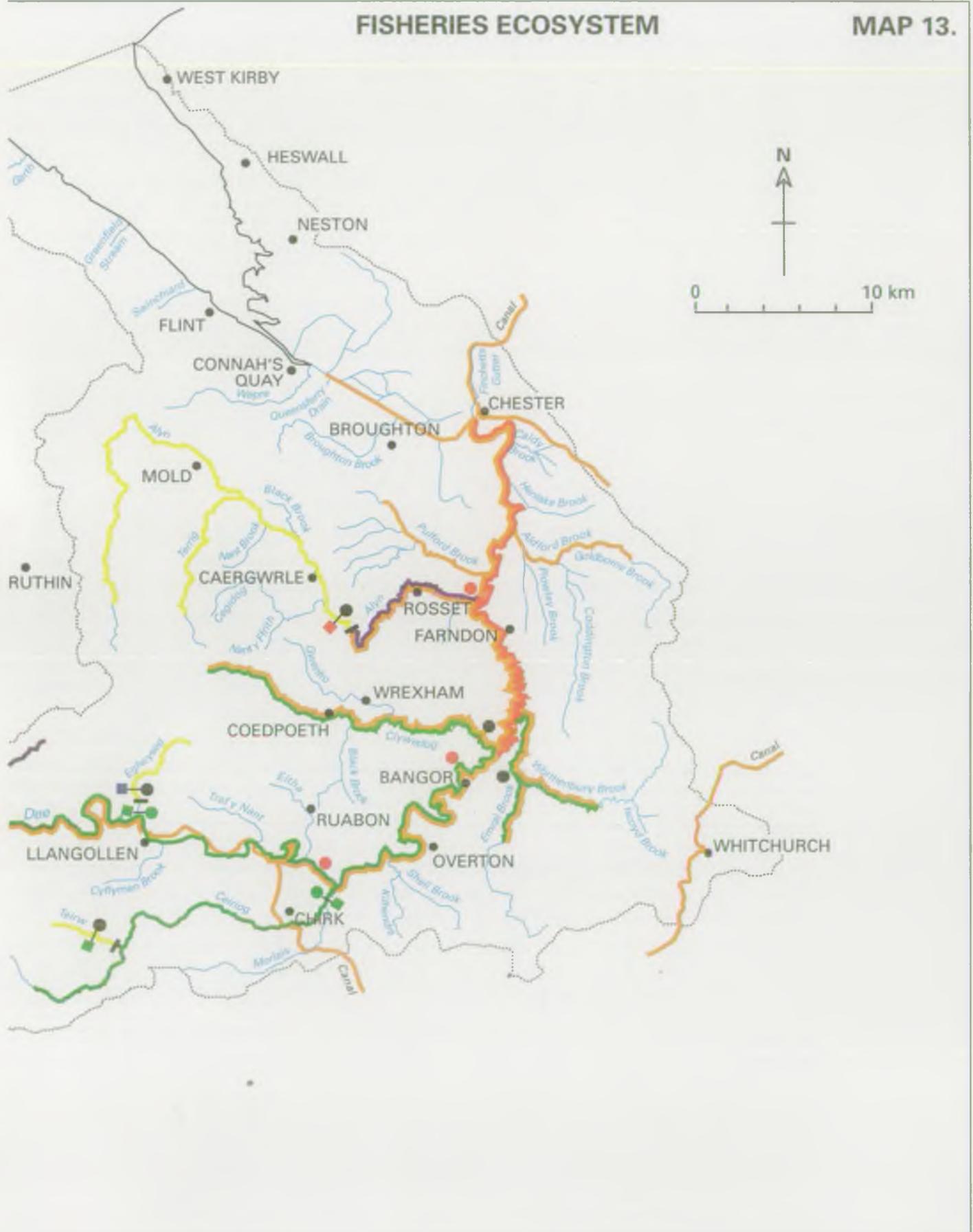
a) Salmonids

The Dee is accessible to salmon and sea trout along its entire length with the large weirs at Chester, Erbistock, Manley Hall and Llangollen appearing not to adversely restrict adult movements under the present regulation regime. Likewise, most of the tributaries are open to migrants except where physical barriers prevent this, although even some of these (e.g. Abbey Brook, Teirw) may be passable under high flows. The permanent loss of spawning/rearing habitat resulting from the Llyn Celyn impoundment is compensated by the annual stocking of several thousand juvenile salmon reared at the Authority's Maerdy hatchery near Corwen.

Where habitat or water quality is sub-optimal in the catchment, juvenile salmon and trout populations are only poor or moderate. This is particularly true of the Llyn Tegid tributaries and the Rivers Alwen, Ceirw, Alyn and Tryweryn. This is also the situation in the Dee from Bala to the River Clywedog confluence, the River Clywedog itself and the Worthenbury Brook. On the remaining tributaries, the largest of which is the River Ceiriog, populations are generally good or even excellent in the case of trout on Abbey Brook.

FISHERIES ECOSYSTEM

MAP 13.



USES OF THE DEE CATCHMENT

Acidification problems on the Llyn Tegid tributaries and the River Alwen may account for their poor populations although, in the former, improved trout densities tend to occur above inaccessible falls where populations of non-migratory fish may be better adapted to acidic conditions than migrant forms. Radio-tracking studies on the Dee suggest that the now rare early running 'Spring' fish component of the adult salmon population has a strong tendency to spawn in the upper reaches, and so may be particularly vulnerable to the affects of acidification. The NRA has recently proposed fishery byelaw changes in an effort to conserve this particular component of the stock.

The absence or low abundance of salmonids in the three Lower Dee tributaries - River Clywedog, Worthenbury Brook and River Alyn reflects conditions of poor instream habitat/water quality stemming from these highly urbanised and/or intensively farmed catchments. No information is available on salmon abundance in the Dee below the River Clywedog confluence, although fry production is likely to be low as spawning activity and suitable habitat is known to be virtually absent in this section.

There is provision in the regulation scheme for freset releases (except when Drought Rules are in force) to encourage and protect fish movements upstream and, in summer, enhancement of the residual flow over Chester weir particularly during periods of high temperatures and low natural flows and during the annual grilse run.

Little is known about the status of trout populations in the Dee, principally because of the difficulties of sampling for this species in large rivers. Furthermore, even where trout populations have been surveyed, the relative contribution of migratory and non-migratory forms cannot be easily determined among the smaller fish, unless barriers to migration effectively exclude the former (e.g. upper River Alyn). It is highly likely that populations within the accessible catchment, at least as far as Llyn Tegid, include varying proportions of sea trout progeny. Resident trout populations exist in Llyn Tegid and the Celyn, Alwen and Brenig reservoirs. The latter three are put-and-take trout fisheries and are regularly stocked with brown and rainbow trout. Brown trout stocking also supplements the river fisheries of the Dee. The majority of these introductions are fish produced outside the catchment and the impact on the genetic integrity of Dee stocks is cause for concern.

USES OF THE DEE CATCHMENT

b) Non-Salmonids

The larger resident coarse fish species of the Dee support a valuable recreational fishery. Also within the catchment, the Shropshire Union Canal and numerous small still waters form important coarse fisheries. These contain most of the species found in the river as well as others, such as tench and various carp species, which may only have a token presence in the Dee.

A number of smaller coarse species, including the loach, bullhead, minnow, brook lamprey, 3-spined stickleback and gudgeon, are also present and widespread in the Dee.

Generally, the larger coarse fish species are most abundant at the extreme ends of the freshwater catchment - in Llyn Tegid itself and in the reach from Erbistock to Chester. At the top of the catchment Llyn Tegid remains a productive coarse fishery supporting several species of which pike, roach, perch, ruffe, grayling and eels are among the most abundant. The lake is renowned for its population of gwyniad - a national rarity of considerable conservation interest and a species which appears to be maintaining reasonable status.

Careful management of the draw-down regime of Llyn Tegid is important to the maintenance of this fishery.

Dispersion from the flood plain upstream of Erbistock is probably restricted by the steeper gradient of the middle Dee up as far as Llangollen - which creates less suitable conditions for many coarse fish species. However, the more common species such as the pike, eel and, in particular, the prolific grayling are found virtually along the entire length of the Dee downstream of Bala.

A combination of factors in the lower freshwater reach, including depressed water temperature effects caused by regulation releases, impact of pollution/abstraction on important tributary rearing and feeding habitats (e.g. Pulford and Aldford Brooks), and lack of flood refuge in the constrained main channel, may restrict the success of species such as roach, bream and chub. In contrast, the dace, with different habitat requirements to the above cyprinids, is one of the most abundant and widespread species on the river - occupying the main stream and tributaries between Llangollen and Queensferry. The Authority is taking steps to improve populations of some of the less abundant coarse fish species through stocking and habitat improvement.

USES OF THE DEE CATCHMENT

- 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.

3.13. 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

Within the Dee catchment there are 42 existing and 3 proposed Sites of Special Scientific Interest (SSSI and PSSSI respectively), 2 proposed and 2 existing Ramsar sites, 1 proposed and 1 existing Special Protection Area (SPA), 2 proposed Environmentally Sensitive Areas (ESA) and 1 Local Natural Reserve (LNR).

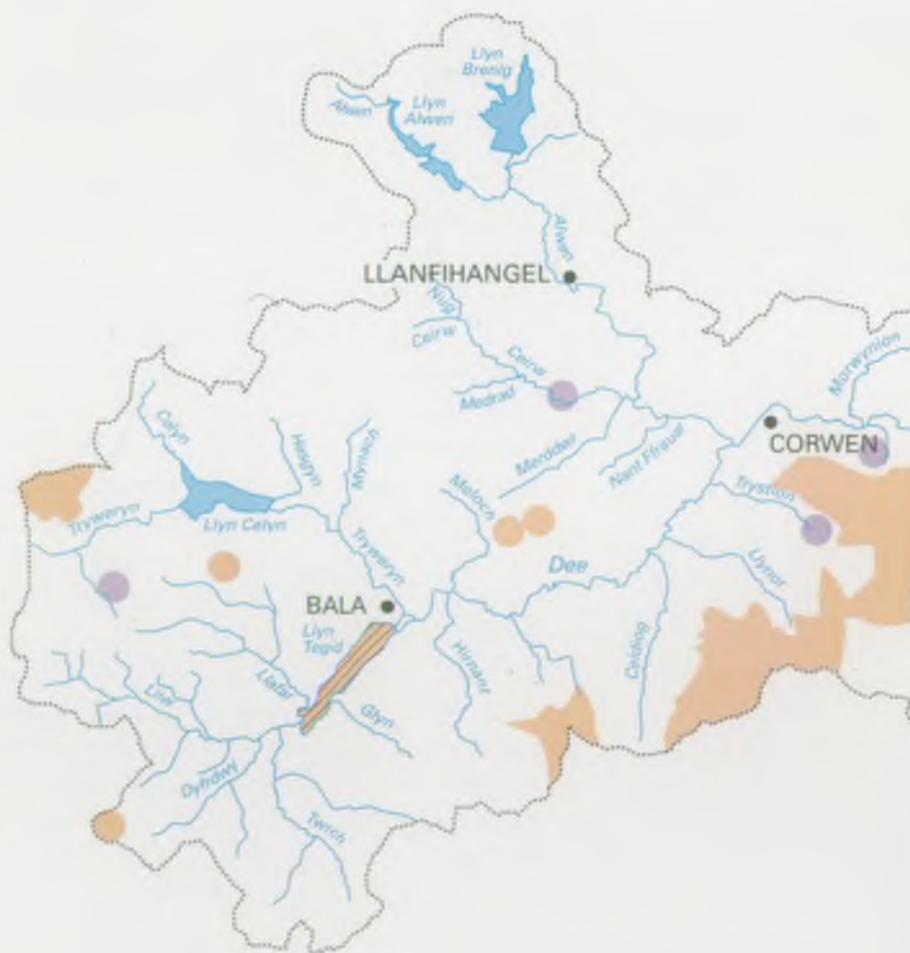
The nature of the sites is diverse and includes large expanses of upland, wooded river valleys, quarries, lowland river meander systems, coastal dunes and of course the Dee estuary.

The estuary is of international importance for its bird population, being amongst the five most important in Britain (over 10% of wintering waders) and ten most important in Europe (over 1% of NW European wildfowl). This importance is recognised in its designation as a Ramsar site and a SPA. The extensive saltmarshes at the head of the estuary and along the eastern coastline are of botanical interest. English Nature, the Countryside Council for Wales, and local authorities are currently preparing a Dee Estuary Strategy that will provide a policy framework for integrating the various uses within the estuary. Other initiatives include a Coastal Management Plan (Tidal Dee Users Group).

Current estuarine issues include industrial pollution, habitat loss, coast protection, cockling and recreational impacts. Many ornithological and conservation groups have been formed around the estuary and the central co-ordinating group to protect their interest is the Dee Estuary Conservation Group.

KEY

- CATCHMENT BOUNDARY
- SSSI
- WETLAND SSSI
- PSSSI
- //// RAMSAR SITE



SPECIAL ECOSYSTEMS

MAP 14.



USES OF THE DEE CATCHMENT

The river system includes Wales' largest natural lake, Llyn Tegid. The lake is a Ramsar site and SSSI containing amongst other fish the unique gwyniad (Coregonus cluroides pannantii) and the rare snail Myxas Glutinosa.

Upland sites include parts of the Migneint, a proposed Ramsar site and one of the largest areas of blanket bog in Wales, and Berwyn, a proposed ESA and SPA and nationally notable for its blanket mire vegetation and bird populations.

The published records from non-scheduled sites of biological interest are patchy, but records held by the Wildlife Trusts, Countryside Council for Wales, and English Nature indicate there are several hundred sites.

Of the scheduled sites some 36% are wetlands or include wetlands and 26% include water related features, such as river valleys, meanders, lakes and dune systems. All of these sites have the potential to be impacted by the NRA through its own activities or by authorising the activities of others.

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.

3.14. 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 predominant habitat type within the river corridor is improved or semi-improved grassland giving way to heather moorland and acidic grassland as altitude increases. The blanket bogs of the uplands represent the largest area of wetland habitat but have been partly degraded by coniferous afforestation. Elsewhere wetland habitats are poorly represented and inadequately described, although ponds (old marl pits, many with great crested newts) are abundant in the eastern sector. Wet and marshy grassland, particularly to the south of Aldford Brook, has been degraded by drainage schemes and groundwater abstraction.

Fossil channel features are common, particularly in the upper and lower catchment, but have undergone seral succession to varying degrees and require management. Further channel migration is constrained primarily as a result of excessive bankside armouring but also by river regulation, resulting in the loss of a range of marginal and riparian habitats. These habitats are further impacted by stock grazing and poaching resulting in a lack of woodland understorey and riparian vegetation structure.

Nevertheless, ecological indicator species demonstrate the conservation importance of the river corridor. Otters appear to be on the increase particularly on the Rivers Ceiriog and Alyn and are extending their range. Dippers occur on most upland tributaries and sandmartins, kingfishers, sawbills and wagtails are common. Beyond the immediate corridor, agricultural improvements have severely affected wader populations, particularly snipe, redshank and lapwing.

The RSPB survey of 1991 showed that the Dee supports breeding Oystercatcher which is a scarce river nesting bird in Wales.

KEY

- CATCHMENT BOUNDARY
- AONB
- SNP
- SLA
Special Landscape Area
- FORMER WASHLANDS
- ▨ FORMER WASHLANDS OF PARTICULAR BIRD INTEREST
- MACROPHYTE SECTION
- LAPWING, CURLEW, SANDPIPER, GOOSANDER
- I ISOGENUS NUBECULA
- SAND MARTIN/KINGFISHER
- ↔ DOWNSTREAM LIMIT OF OTTER SIGHTINGS
- == UPSTREAM LIMIT OF OTTER SIGHTINGS



GENERAL ECOLOGY AND LANDSCAPE

MAP 15.



USES OF THE DEE CATCHMENT

Positive works to enhance the environmental interests of the Lower Dee river corridor have been identified by the Chester Waterways Study which will be complemented by NRA's strategic river corridor surveys.

River plant communities are particularly significant and approach Site of Special Scientific Interest status. The middle reaches contain unusual microphyte assemblages with 21 nationally uncommon species recorded. Macroinvertebrate communities are particularly diverse with several rare species, e.g. a nationally notable dragonfly (Gomphus Vulgatissimus) and nationally rare stonefly (Isogenus Nubecula).

The quality of landscapes in the upper catchment is recognised by its national and regional designations of National Park, Area of Outstanding Natural Beauty and Special Landscape Area. Elsewhere, inconsistencies are recognised in the fragmented designations of the Dee estuary.

- 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 sites although water around such public places should at least conform with the informal standards for Aesthetic Standards criteria.

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

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

- Physical Features**
- Physical features that give rise to natural beauty should be protected.
 - Sites 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.

3.15. 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 historical heritage.

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

Local Perspective There are 218 Scheduled Ancient Monuments (SAM) which lie within the catchment, but these represent less than 10% of all currently known sites. Furthermore, these sites are merely component parts of a history which has formed the landscape we see today and should not be considered in isolation.

The Authorities which hold the definitive records for sites are as follows:-

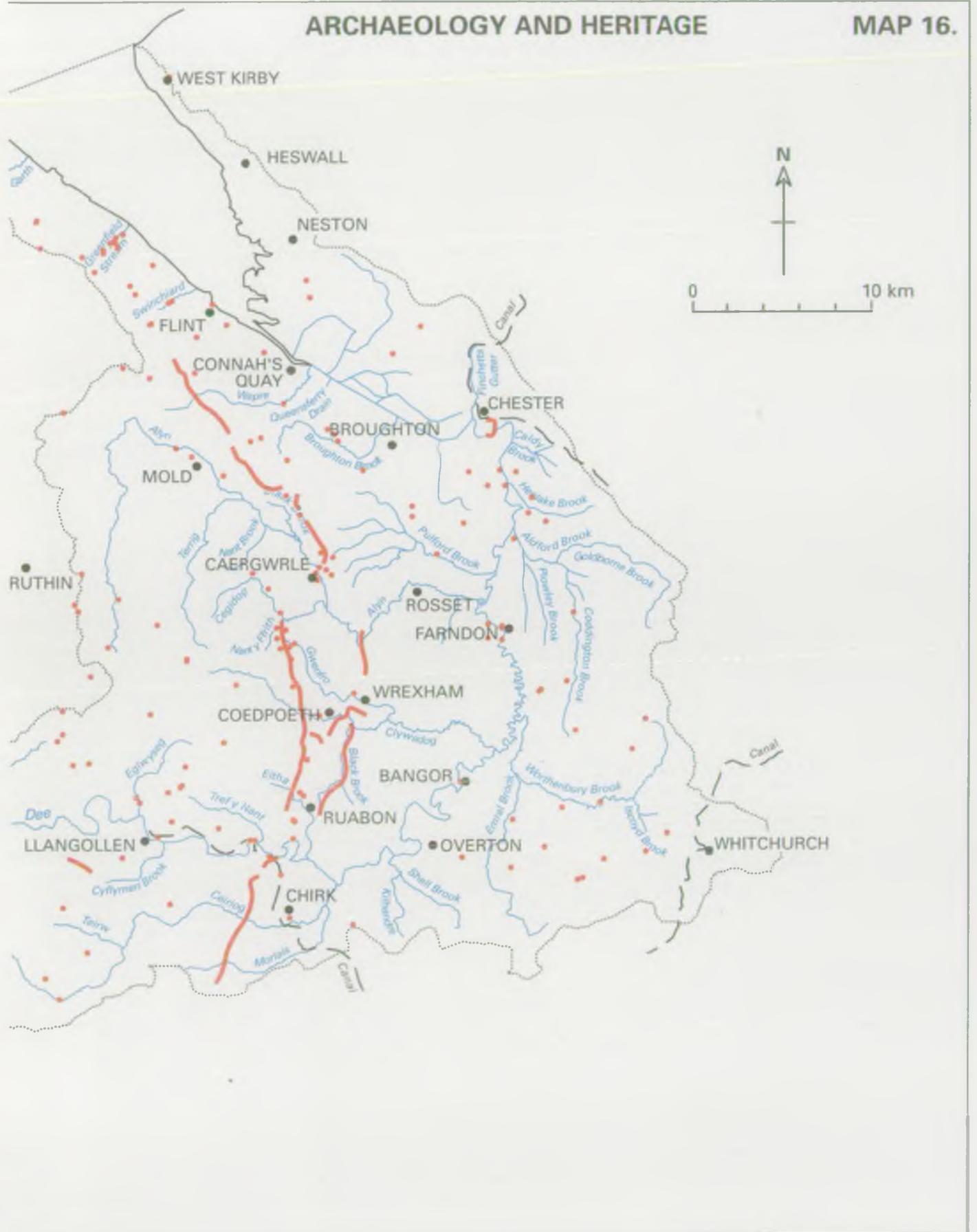
<u>Authority</u>	<u>County</u>
Liverpool Museum	Merseyside
Cheshire County Council	Cheshire
Shropshire County Council	Shropshire
Clwyd & Powys Archaeological Trust	Clwyd
Gwynedd Archaeological Trust	Gwynedd

The sites include prehistoric forts, such as that on the Caer Eini ridge, crop marks such as those at Llanfor, bridges such as Pont Fawr, Llandderfel and Dee Bridge in Chester, the walls, tower gates and posterns of the City of Chester and part of Offa's Dyke.

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 sites although water around such public places should at least conform with the basic Aesthetic Standards.



USES OF THE DEE CATCHMENT

- 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 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.

3.16 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.

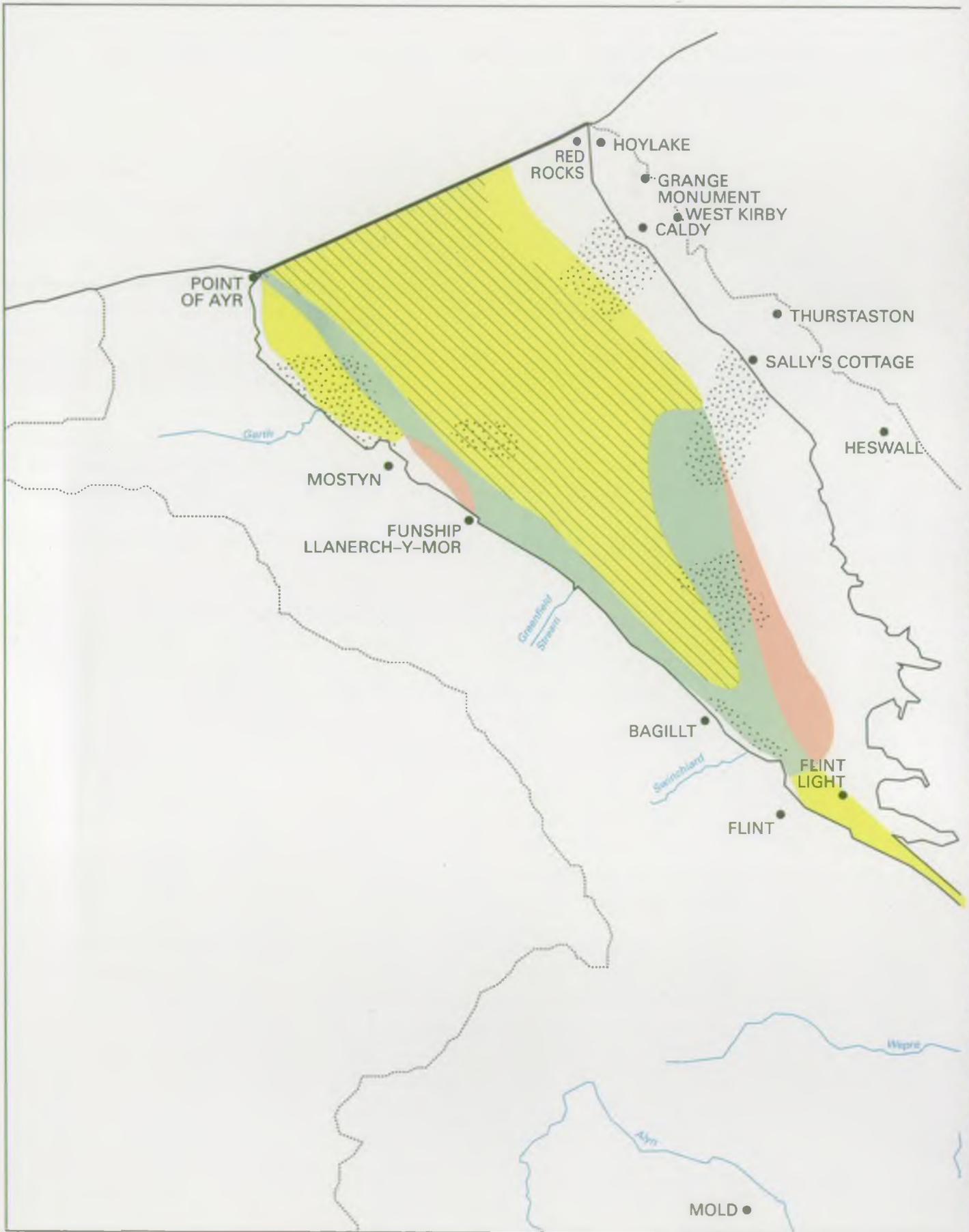
In Wales the Welsh Office monitors fish stocks and catches and is responsible for the registration of fishing vessels and enforcement of quotas.

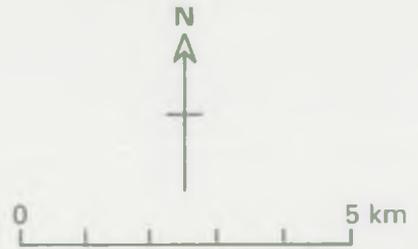
Environmental Health Departments monitor the health and quality of fish flesh.

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

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

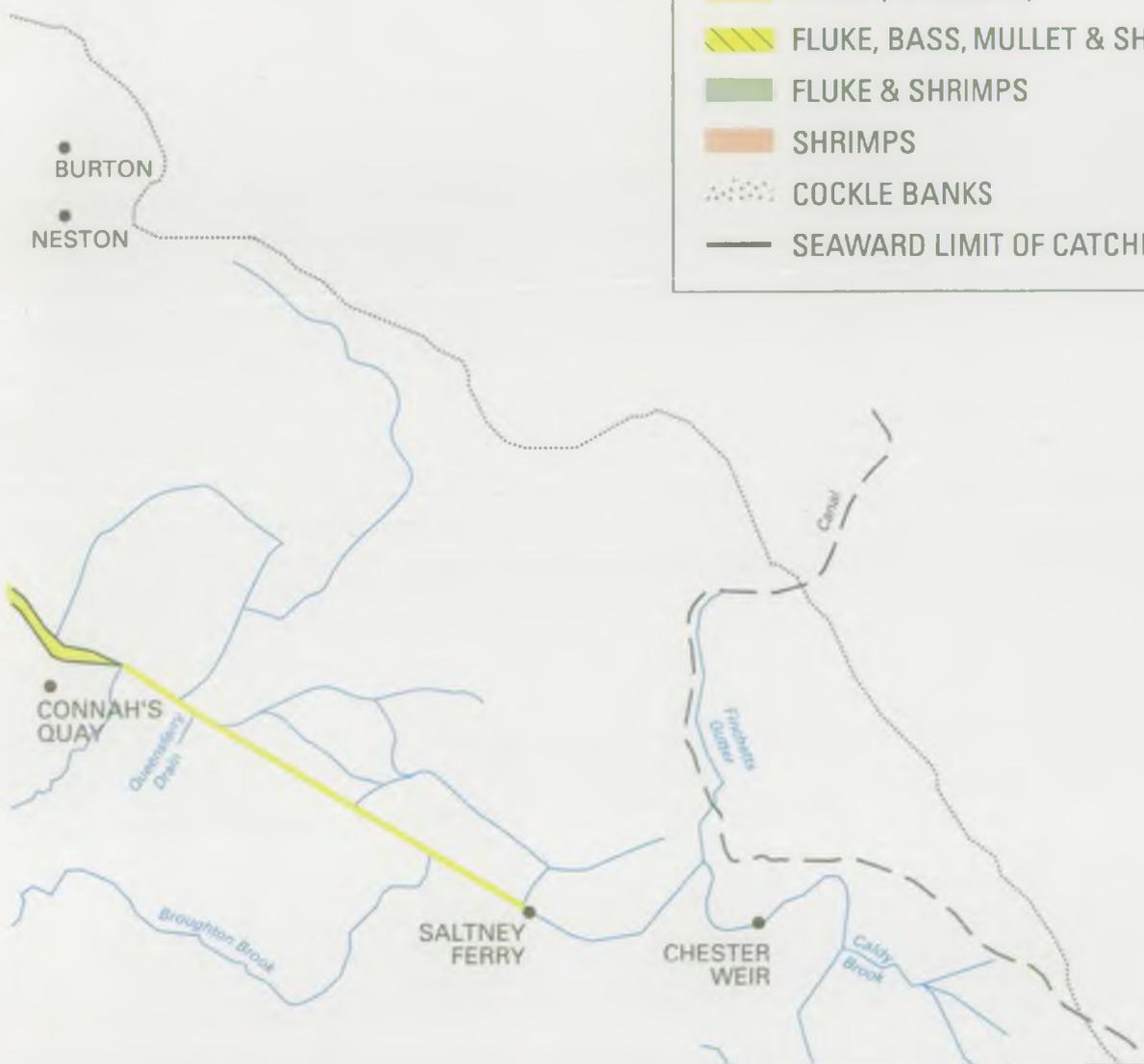
Shellfish are known to concentrate materials such as toxic algae, metals and pathogenic bacteria which can be harmful to people who eat them. Thus the quality of shellfish harvested for sale for human consumption is protected by the EC Shellfish Hygiene Directive which is administered by environmental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





KEY

- CATCHMENT BOUNDARY
- FLUKE (FLOUNDER)
- ▨ FLUKE, BASS, MULLET & SHRIMPS
- FLUKE & SHRIMPS
- SHRIMPS
- ▧ COCKLE BANKS
- SEAWARD LIMIT OF CATCHMENT



Local Perspective

For many years the Dee estuary has provided a notable if not a highly productive sea fishery for species such as flounder, mullet, bass, skate, cod and, in the past, spurling.

Flounder (Platichthys Flesus), are in greatest abundance (locally known as fluke) being found throughout the tideway at different times of year, but most plentiful and of good quality between September and November.

Grey Mullet (Renimugil Labrosus), which graze on the mud banks and in the gutters and grow to good size, are reasonably plentiful although a decline has been observed in recent years.

Bass (Dicentrarchus Labrax), the subject of national control, are to be found to a large size in the outer limits of the estuary. Young bass come further inshore, and will be protected by the recently designated nursery area upriver from Point of Ayr.

Deep water species such as skate and cod are to be occasionally found in the outer limits of the estuary.

On account of the shallowness of the estuary, much of the sea fishing is undertaken by local operators in small craft, but occasionally large fishing vessels enter the outer estuary using draft and trawl nets for more intensive commercial exploitation. Methods of fishing are controlled by Sea Fisheries Byelaws promoted under the Sea Fisheries Regulation Act and administered by the NRA.

The Dee represents one of the major estuaries in Wales where there is a serious problem of illegal netting of salmonids. Much effort has been exerted by the NRA to combat this with intensive bailiff patrols throughout the problem period of the year which extends from March to October. Great impact has been achieved and the higher fines imposed by Courts in recent years has also had a deterrent effect. The problem still continues but new legislation introduced by the NRA in August 1992 has significantly reduced activity.

A licensed salmon net fishery operates from Chester downstream controlled by a Net Limitation Order under the 1975 Salmon and Freshwater Fisheries Act. The 10 year average declared net catch to 1991 is 936 salmon and 130 sea trout. Annual migratory salmonid net and rod catches for the period 1982 to 1991 were:

**ANNUAL SALMON AND SEA TROUT CATCH : DEE NET AND ROD FISHERIES
1982 -1991**

a. Salmon

Year	82	83	84	85	86	87	88	89	90	91	Mean
Nets*	956	1025	915	705	1056	874	920	1212	844	856	936
Rods	546	520	273	576	739	633	1019	273	427	376	538
Both	1502	1545	1188	1281	1795	1507	1939	1485	1271	1232	1474

b. Sea Trout

Year	82	83	84	85	86	87	88	89	90	91	Mean
Nets*	106	133	185	107	148	155	176	108	40	142	130
Rods	133	161	92	140	155	124	146	76	84	41	115
Both	239	294	277	247	303	279	322	184	124	183	245

* Combined Draft and Trammel net catch shown

Presently 30 draft (Seine) and 4 trammel nets are allocated each year, all of which operate within the terms of Local Fisheries Byelaws administered by the NRA. The current Net Limitation Order expires in 2005 and the NRA are currently reviewing the Order. Exploitation by licensed nets is a major concern of anglers and their requests for a reduction in the number of nets will be a key issue during the review process.

Cockling as a major commercial interest has only a recent history and because of the cyclicity of populations in time and space, conservation management has until recently been of lower priority.

Peak years in recent times have been 1983, 1987, 1991 and 1992. In 1987 some £3 million worth of cockles came off the sand banks, with up to 500 gatherers operating around the estuary and the market price commanding around £5 per 80 lb. bag. Towards the end of 1991 this price had risen to over £10 per bag as demand outstripped supply, following the failure of the more traditional cockle grounds in Holland.

Although such production rates are cyclical and variable, the fisheries will continue to provide beneficial local employment and potential for the home and foreign market.

USES OF THE DEE CATCHMENT

Cockles (Cerastoderma Edula), are to be found in six main areas in the outer estuary, namely Mostyn Bank, Salisbury Outer and Inner Bank, Thurstaston Bank, West Kirby Bank and between Bagillt and Greenfield. The NRA is the Sea Fisheries Committee for the Dee estuary, thereby being the enforcement agency and involved with monitoring the trends in cockle production and quality. Two main byelaws presently control cockle exploitation, size limit (thirteen sixteenths of an inch or 21mm) and method (hand raking with a 12 inch or 305mm rake). New bye-laws to improve the management of the fishery have been recently advertised.

Cockle gatherers presently supply two main processors in the area, Wirral Sea Foods at Birkenhead and Fisher Sea Foods at Greenfield. The product is then conveyed to Holland for canning and onward transmission for retail to Spain and Portugal.

The Food Safety Act 1990, has initiated new controls in respect of the handling and processing of shellfish. For this purpose MAFF, under the Shellfish Hygiene Directive (91/492/EEC), has identified and classified shellfish harvesting areas, one of which is the Dee estuary. All cockles from the estuary are able to be treated, but health control requirements are administered by the local District Councils.

Mussels are to be found in a few locations around the outer estuary particularly off West Kirby, Thurstaston and Greenfield, but their distribution tends to have been restricted by the cockle expansion and the type of substrata of the estuary.

Prawns and shrimps are to be found in abundance in the outer estuary at certain times of year and have been the source of a thriving local industry for generations.

- 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.

USES OF THE DEE CATCHMENT

- 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 Dee 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.
 - The current volume of water passing into the estuary should be maintained.

3.17 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 Areas of highest amenity value include the estuary, Chester, Llangollen, Snowdonia National Park (which includes Llyn Tegid), Llyn Brenig, and several lowland country parks. Outside these centres, facilities for car-based visitors (picnic sites, interpretive facilities) are poor.

Riverside access is particularly good with almost continuous footpaths on one or both banks from Connah's Quay to Overton.

These are unlikely to be used for other than short walks and could be better promoted, possibly as a Dee Valley long distance trail. Upstream of Llangollen river access is almost non-existent, with lakeside access restricted on Llyn Tegid and Celyn, although accessibility to Llyn Brenig is good.

Estuarine bird watching is popular with formal events organised by RSPB on Wirral foreshores and at Point of Ayr, although given the international status of the site, bird hide and interpretive facilities are poor. Bird watching facilities on inland reserves are almost non-existent, with the exception of a hide at Brenig.

The Dee Wildfowlers is an active body that uses the estuary in the vicinity of Neston, where estuarine marshland provides cover and feeding areas for ducks and wading birds. In the same area clay pigeon shooting is also pursued. Clay Pigeon Gun Clubs are also present at Sealand and Flint.

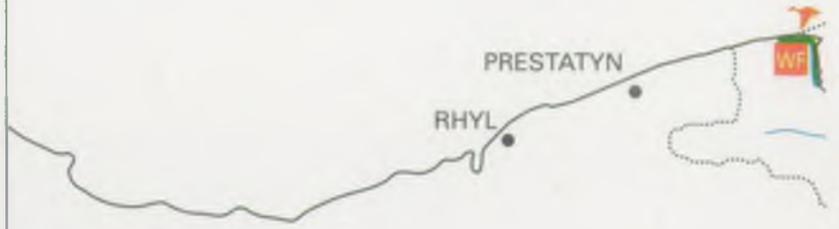
Controlled shoulder gunning is not seen as a significant conflict with the conservation of the estuary. The traditional practice of punt gunning does require further consideration as part of the development of the management strategy. Similar consideration is required for recreational disturbance from walking, horse riding and water sports, activities with a recognised impact on waterfowl.

Objectives - To maintain the water course so that public enjoyment of bankside environment is not impaired.

KEY

- CATCHMENT BOUNDARY
- PUBLIC FOOTPATH
- ⊗ PICNIC SITE
- 🦆 WADER ROOST SITE
- WF WILDFOWLING AREA
- CP COUNTRY PARK
- KEY AMENITY AREAS

1. Grange Rifle Club, Column Road, West Kirby
2. Dee Wildfowlers Association
3. Flint Clay Shooting Range
4. North Wales Shooting School- Sealand Manor



BASIC AMENITY

MAP 18.



USES OF THE DEE CATCHMENT

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

Environmental Requirements

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

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

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

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

3.18. 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

Several reservoirs in the headwaters provide quality trout fishing on a day ticket basis, and Llyn Brenig in particular caters for large match events both for bank and boat fishing. In recent years a multitude of smaller trout lakes have been developed within the catchment as put-and-take fisheries which are predominantly stocked with rainbow trout. Most introduce a few very large rainbow trout, up to 10-lbs (4.5Kg), to increase publicity.

The river itself is an important salmon fishery and salmon are to be caught throughout its length from the tributaries of Llyn Tegid down as far as Farndon on the Cheshire Plain. The catches made in different areas vary according to the time of year and are very much dependent upon the level of activity of fish movement in from the estuary. The 10 year mean declared rod catch to 1991 was 538, with the majority of fish being taken in the period between August and October.

ANGLING

MAP 19.



USES OF THE DEE CATCHMENT

**ANNUAL SALMON AND SEA TROUT CATCH :
DEE NET AND ROD FISHERIES 1982 - 91**

a. Salmon

Year	82	83	84	85	86	87	88	89	90	91	Mean
Nets*	956	1025	915	705	1056	874	920	1212	844	856	936
Rods	546	520	273	576	739	633	1019	273	427	376	538
Both	1502	1545	1188	1281	1795	1507	1939	1485	1271	1232	1474

b. Sea Trout

Year	82	83	84	85	86	87	88	89	90	91	Mean
Nets*	106	133	185	107	148	155	176	108	40	142	130
Rods	133	161	92	140	155	124	146	76	84	41	115
Both	239	294	277	247	303	279	322	184	124	183	245

* Combined Draft and Trammel net catch shown

The salmon season presently extends from 26th January to the 17th October. Analysis of catch returns over the last forty years show a marked decline in "spring" running fish (see table below) :

USES OF THE DEE CATCHMENT

MONTHLY COMPOSITION OF DEE SALMON ROD CATCH 1951 - 90

Month	DECADE							
	1951-1960		1961-1970		1971-1980		1981-1990	
	Mean	%	Mean	%	Mean	%	Mean	%
Mar	324.5	30.5	196.0	17.1	116.1	14.8	32.7	6.3
Apr	280.0	26.3	243.0	21.2	112.3	14.3	49.1	9.5
May	181.1	17.0	223.9	19.6	99.5	12.7	56.3	10.9
Jun	96.8	9.1	85.6	7.5	109.1	13.9	49.2	9.5
Jul	46.9	4.4	95.1	8.3	61.9	7.9	51.1	9.9
Aug	40.8	3.8	95.1	8.3	91.1	11.6	82.2	15.9
Sep	49.4	4.6	108.8	9.5	97.8	12.4	123.7	24.0
Oct	44.5	4.2	96.3	8.4	98.3	12.5	72.1	14.0
ALL	1063.9	100.0	1143.8	100.0	786.1	100.0	516.4	100.0

Proposed changes to the rod and net byelaws were advertised in 1993 aimed at conserving the "spring" salmon. Objections were received which are currently under consideration by the Welsh Office. If confirmed, the rod and line season will commence on 3rd March and the netting season on 1st May instead of 1st March.

Much of the river is privately owned although a number of larger clubs at Corwen, Llangollen and Bangor-on-Dee have salmon fishing available to members with some day tickets sold.

Sea trout are to be found from the Llangollen area downstream and, despite a good run of fish in July and August, few anglers fish for them and catches are consequently low. Although the Dee is not well recognised for its brown trout fishing, the wild stock which is generally of small size is frequently supplemented by hatchery reared fish. The Llangollen Angling Association have their own rearing pool to facilitate this task.

USES OF THE DEE CATCHMENT

Coarse fish are to be found throughout the catchment. Llyn Tegid has coarse fishing available under permit from Snowdonia National Park. On the river, grayling predominate from Bala to Llangollen and are mainly exploited by fishermen at the close of the game fishing seasons in September and October. The species has also spread downstream as far as Bangor-on-Dee and grayling are occasionally taken in coarse fishing matches in the Worthenbury area. The grayling fishing has become of such high quality that the Dee has now become an internationally recognised venue for competition events and, in 1990, staged the World Fly-Fishing Championships.

The Lower Dee constitutes an important match fishery for coarse fishermen, being a centre for winter league events and some national competition. The catches are presently dominated by dace which grow to good size around the one pound (0.5Kg) mark and are to be found between Bangor-on-Dee and Chester. Efforts to improve the stocks of roach, bream and perch are being pursued by the NRA as they have declined in recent years, on account of habitat degradation and environmental pressure.

In the inner estuary immediately downstream of Chester weir little angling takes place, although coarse fish are known to populate the area and move up and down with the tide. In the outer estuary beyond Flint sea angling is limited, even though fluke, mullet and bass are to be caught. In this area sea fish exploitation is commercially orientated by the use of netting techniques.

An Angling Guide for the Dee and Clwyd Area is presently produced by the NRA, which gives detail of all Angling Clubs with interests on the Dee together with the extent of water available to the angler.

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

Environmental Objectives

- 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.

USES OF THE DEE CATCHMENT

- 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.

3.19 WATER SPORTS ACTIVITY

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

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

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

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

Local perspective The catchment throughout has a wide range of immersion sport activity.

Most lake activities are on Llyn Tegid with the Bala Sailing Club organising windsurfing and canoeing competitions with up to 100 participants. There are numerous other adventure and water sport centres providing tuition and access at different points around the lake, via permit. Management of the lake is administered by Snowdonia National Park.

On Llyn Brenig the water sports centre provides windsurfing and canoeing by season and day permit both for the beginner and expert. Alwen Reservoir has limited usage because of problems of seasonal draw-down, but the reservoir does provide one of very few inland waters which are available for water-skiing. The facility extends to a training centre for competent skiers, but only one boat is permitted.

USES OF THE DEE CATCHMENT

The River Tryweryn is internationally recognised for both wild water and slalom canoeing. The World Championships for both disciplines were held here in 1981, and it will be the venue for the 1995 Wildwater World Championships. Rafting has also become very popular in recent years. Access for water sports is by permit, issued from the National White Water Centre (NWWC) operated by the Welsh Canoeing Association, under lease from Meirionnydd District Council. The NRA is the landowner of this site.

The management agreement between NRA and the NWWC provides for 12 days per annum of special ("guaranteed") releases from Llyn Celyn. These releases are agreed in advance for the following year but subject to the exigencies of the system.

Limited canoeing access is available on the Dee which is negotiated by, and under the control of, the Dee User Group. This group, chaired by the Welsh Canoeing Association, represents the different interests of canoeing. At Llangollen a private canoeing centre provides training and limited river access by permit to over 300 visitors per week.

At Chester the river provides more of a training area for novice canoeists than experts, with numerous local schools and the Chester Sailing and Canoe Club utilising the safer conditions available. At Chester weir a canoe lock has been installed by the NRA so that an annual competition event can take place. The fish pass below the weir again provides a challenging facility for novice canoeists but access is controlled by a local agreement.

The deeper water of the lower Dee also enables local Sub-Aqua Groups to provide training to novice divers. The reservoirs in the headwaters provide for this to the more experienced.

In the estuary, shallow water between the tides largely restricts usage for leisure purposes although growth in jet-skiing has been observed near Chester in recent years. At Connah's Quay the Dee Water-Ski Club organises events at suitable states of the tide. In the outer estuary beyond Flint the navigable channel follows the more industrial Welsh side of the estuary, but much of the recreational activity takes place along the north shore off West Kirby. The Metropolitan Borough of Wirral provide the facility of the Marine Lake, which is utilised for windsurfing at all states of tide. This has now become a nationally recognised facility on account of the excellent wave conditions that develop.

USES OF THE DEE CATCHMENT

At West Kirby, bathing waters have been identified under the EC Directive (76/160/EEC) but have consistently failed the mandatory bacteriological standards since their identification in 1991.

- 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.

3.20 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 Boating activities are located on the major reservoirs at the head of the catchment which include Llyn Tegid and Llyn Brenig. On the river, access is restricted and not available until the navigable section between Farndon and Chester, and within the Dee estuary.

On Llyn Tegid, the Bala Sailing Club organises local and national events with at times over 100 participants. A number of smaller clubs around the lake provide access, tuition, and also stage competitions.

Llyn Brenig is more favourable for sailing on account of its more stable water level and the Brenig Sailing Club, with approximately 60 members, organises seasonal events. The Club operates independently even though the reservoir is owned and controlled by Hamdden Limited, a subsidiary of Welsh Water PLC.

At Chester, the historical town attracts a large number of visitors and the river is an important recreational centre for both tourists and local residents, especially for boating. Five large showboats are used for short visitor trips during the day and are chartered for summer evening cruises along the river. Up to 80 smaller rowing and low powered craft are available for hire with a number of different operators from the Groves area within the City limits. In addition, there are over 250 private motorboats seasonally registered with the Chester City Council who are the Navigation Authority between Farndon and Chester weir. A Chester Motor Boat Club has also recently been formed.

Rowing and sailing are actively pursued on the river by local schools, Chester Sailing and Canoe Club, and the Grosvenor Rowing Club. All have small but active memberships and regular events are staged during the summer months.

A single slipway together with appropriate parking is available at Sandy Lane for boat users. A small charge is levied by Chester City Council for parking.

KEY

- CATCHMENT BOUNDARY
-  SAILING
-  RECREATIONAL BOATING
-  ROWING RECREATIONAL BOATING AND SAILING
-  UPPER LIMIT FOR COMMERCIAL VESSELS
-  EXTENT OF NAVIGATION
-  SHROPSHIRE UNION CANAL
-  SLIPWAY (PUBLIC)
-  SLIPWAY (PRIVATE)
-  DOCKS
-  WHARF (PUBLIC)
-  WHARF (PRIVATE)
- H** HIGH WATER
- L** LOW WATER
- IR** IN RIVER



- 1** WEST KIRBY SAILING CLUB
- 2** THURSTASTON SAILING CLUB
- 3** SHOTWICK LAKE
- 4** CONNAH'S QUAY SKI CLUB
- 5** GRESFORD FLASH
- 6** BALA SAILING CLUB

USES OF THE DEE CATCHMENT

Boating in the canalised part of the estuary is virtually limited to the activities of the Chester Sea Cadets at Crane Wharf, because below Chester weir the channel is only navigable at times of high tide or higher freshwater run-off. During high water, movement of small craft can take place by means of a series of lock gates between the Shropshire Union Canal and the Dee. The Shropshire Union canal is a popular venue for those who enjoy boating as a means of seeing the countryside and have an appreciation of old commercial waterways. Along the Welsh coastline boating is more confined to fishing craft than recreational activity, largely because of restricted access and the less appealing industrial landscape. Along the Wirral coastline the River Dee Sailing Club at Thurstaston and the West Kirby Yacht Club utilise the expansive area of the estuary and beyond, and also the West Kirby Marine Lake which is a man-made structure to retain water between the tides.

Public slipways in the estuary are available at Connah's Quay, Flint, West Kirby, Thurstaston and Heswall, but most are for high water usage.

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.

3.21 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 NRA is the Harbour Authority for most of the estuary, but Mostyn Docks Limited is the statutory Harbour Authority for Mostyn Dock and the area immediately surrounding it (see map 22). Mostyn Docks Limited is also the Pilotage Authority, not only for its harbour area but also for the rest of the estuary.

From Farndon Bridge to Chester weir (15 kilometres), the responsibility for navigation is vested with the Chester City Council under the Cheshire County Council Act. The Council regulate usage by a system of licensing but also administer controls through byelaws. All boats have to be licensed, and conditions for usage and measures to protect the environment are included in the legislation. Mooring facilities are for the most part privately owned although rentals are available for leisure boats. Slipway facilities for small craft are available at Sandy Lane, Chester.

Upstream of Farndon Bridge no rights of navigation are in force, and therefore access arrangements to the water space have to be negotiated with individual riparian owners, or pursued through organisations which provide access.

The Dee from Chester weir to Shotton was canalised in the 18th Century to help prevent siltation and to enable navigation to continue up to the Port of Chester.

KEY

- CATCHMENT BOUNDARY
- RESPONSIBILITY FOR NAVIGATION
- MOSTYN DOCK
- N.R.A.
- CHESTER CITY COUNCIL
- BRITISH WATERWAYS
(SHROPSHIRE UNION CANAL)



NAVIGATION

MAP 22.



USES OF THE DEE CATCHMENT

The change was largely unsuccessful and the channel has continued to get progressively shallower. Chester has long since lost its Port and today only shallow drafted craft can pass upstream, on high tides. Under the Dee Conservancy Act 1889, and Water Act 1989, the NRA (Welsh Region) inherited the responsibility for navigation from Chester downstream to the outer limits of the estuary, along an imaginary line between Talacre Lighthouse, in Clwyd, to Red Rocks, on the Wirral.

Prior to the Ports Act, 1991, these responsibilities were confined to the maintenance of navigational aids upstream of Flint whereas, seawards of this point, the servicing of buoys and channel markers was undertaken by Trinity House. The Ports Act 1991 however, enabled agencies who had historically carried responsibility to transfer this to the designated Harbour Authority where appropriate (NRA in the Dee). As a consequence of this change in legislation, Trinity House has recently made formal submission to the Department of Transport for the transfer of 15 buoys in the outer estuary to the NRA.

The main commercial navigational use of the river is made by British Steel Corporation, Shotton, which has identified the Dee as a cheaper means of exporting products to Europe by utilising its own dock at Shotton and the facilities of Mostyn Docks.

The upper limit of navigation for large vessels is considered to be Connah's Quay which is mainly used for the mooring of small fishing craft, although in 1992 a cockle processing vessel was moored at the wharf for several months.

The navigation authority for the Shropshire Union Canal is British Waterways.

- 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.

USES OF THE DEE CATCHMENT

- Physical Features**
- Where waters are 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.

3.22 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.

USES OF THE DEE CATCHMENT

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 maritime District Councils and the NRA.

The Liverpool Bay Coastal Group contains the actual coastal frontage within its area of influence, and annual meetings are held between representatives of District Councils, the NRA, private landowners and other interested bodies to discuss coastal issues.

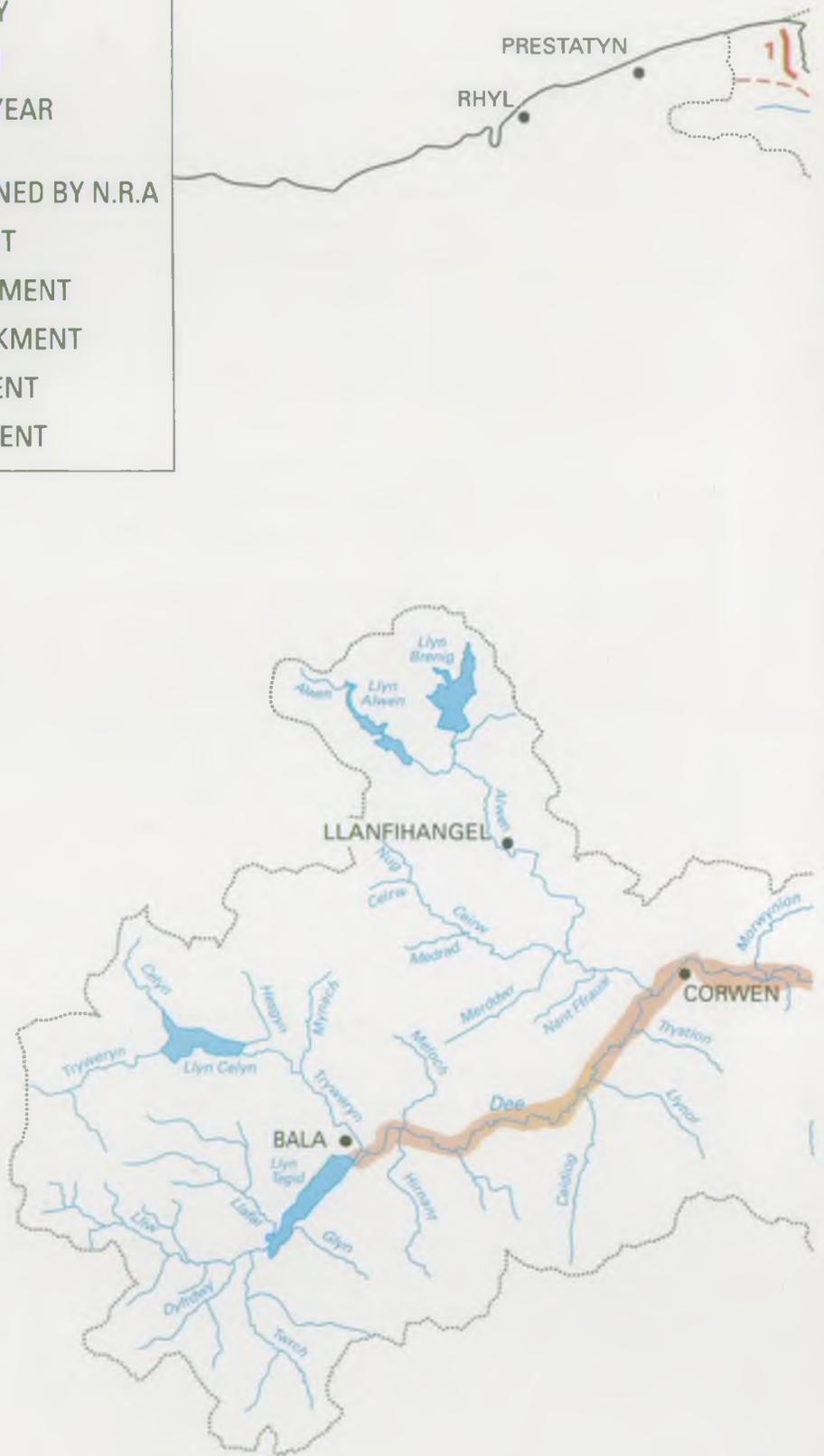
In addition the Tidal Dee Users Group (which is a sub-group of the Dee Forum) contains representation of all interested parties in the ongoing coastal management of the tidal length of the Dee from the mouth of the estuary upstream to Chester. This Group possesses a definitive set of data with regard to coastal processes and influences affecting the estuary, which has proved invaluable in assessing the impact which major developments, like the power station redevelopment and the proposed third Dee crossing, could have on the estuary regime.

The existence of extensive development within the coastal plain has generated a commitment to the provision of adequate sea defences by the District Councils. In addition there are long lengths of defence in private ownership, predominantly by British Rail.

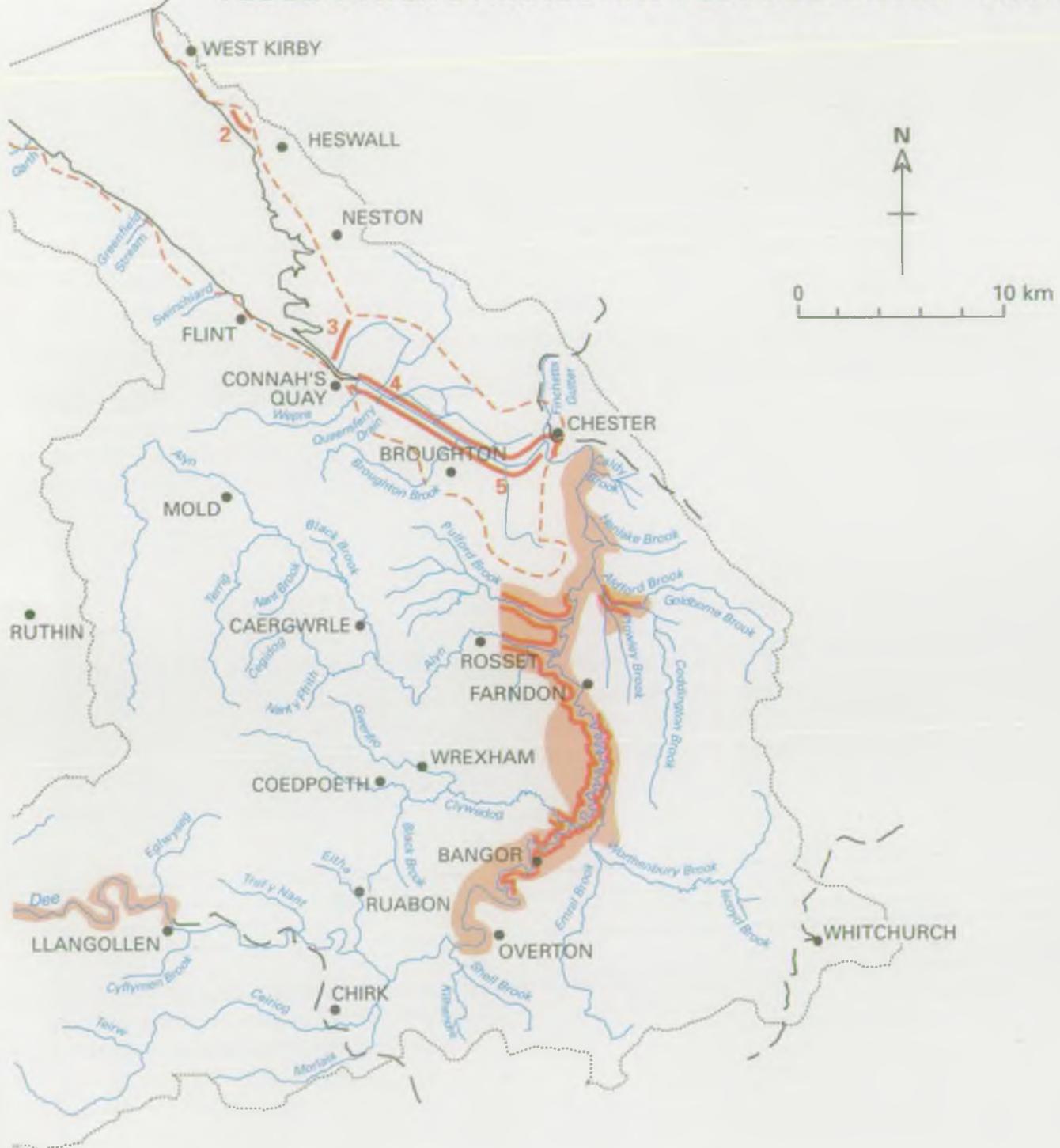
The types of sea defences vary between natural dune systems and the more traditional sea wall.

KEY

- CATCHMENT BOUNDARY
- RIVER DEE FLOOD PLAIN
- - - CONTOUR FOR 1 IN 200 YEAR FLOOD EVENT
- FLOODBANKS MAINTAINED BY N.R.A
- 1 LLANASA EMBANKMENT
- 2 TARGET ROAD EMBANKMENT
- 3 BROKEN BANK EMBANKMENT
- 4 NORTHERN EMBANKMENT
- 5 HAWARDEN EMBANKMENT



FLOOD WATER STORAGE AND FLOOD DEFENCES MAP 23.



USES OF THE DEE CATCHMENT

Prompted by the Towyn incident in February 1990, an extensive programme of repair and improvement work has been carried out by British Rail.

The NRA has only short lengths of sea defence (at Llanasa, Target Road at Heswall and Broken Bank), which are maintained annually, but is extensively involved in the tidal defences along the canalised length of the Dee.

These defences, the Hawarden Embankment to the south and the opposite Northern Embankment, have been recently improved in accordance with the NRA's Level of Service, and provide protection to extensive industrial development within the estuarial flood plain.

The fluvial flood plain of the Dee is principally in the middle reach between Chester and Bangor-on-Dee. This area is largely agricultural in terms of land usage, and contains fluvial defences which give limited protection from inundation.

There are further lengths of fluvial defence within the area, concentrated mainly in urban situations, e.g. the River Alyn at Mold, and the Dee at Bangor-on-Dee.

The existence of such extensive areas of coastal plain and flood plain present drainage difficulties due to the low-lying nature of the land.

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 when and where necessary.

Regulation of the upper catchment of the Dee at Bala provides the opportunity to exercise a degree of flood control and operate a flood warning scheme. The scheme is specifically designed for the benefit of urban developments at Bala, Corwen and Bangor-on-Dee, as well as providing a service to landowners for agricultural/stock protection purposes in the Dee flood plain.

USES OF THE DEE CATCHMENT

Recent study work undertaken by Southampton University in progressing the potential designation of a geomorphological SSSI within part of the flood plain has indicated that the action of regulation has been beneficial in slowing rates of erosion experienced in lengths of active channel sections within the flood plain.

There are no major flooding problems within the area covered by the plan, although progressive development of the Finchetts Gutter catchment in Chester has highlighted the need for an improvement in the Standard of Service provided in the lower reaches of the watercourse. This problem is being addressed by the preparation of an Improvement Scheme programmed for construction during the period 1994-1996. There is already a small flood storage area within the catchment at Knowles Bridge designed to reduce peak flows.

Large areas of agricultural land within the Dee flood plain are subject to annual inundation and there have been reports of minor flooding incidents on non-main (ordinary) watercourses.

Objectives

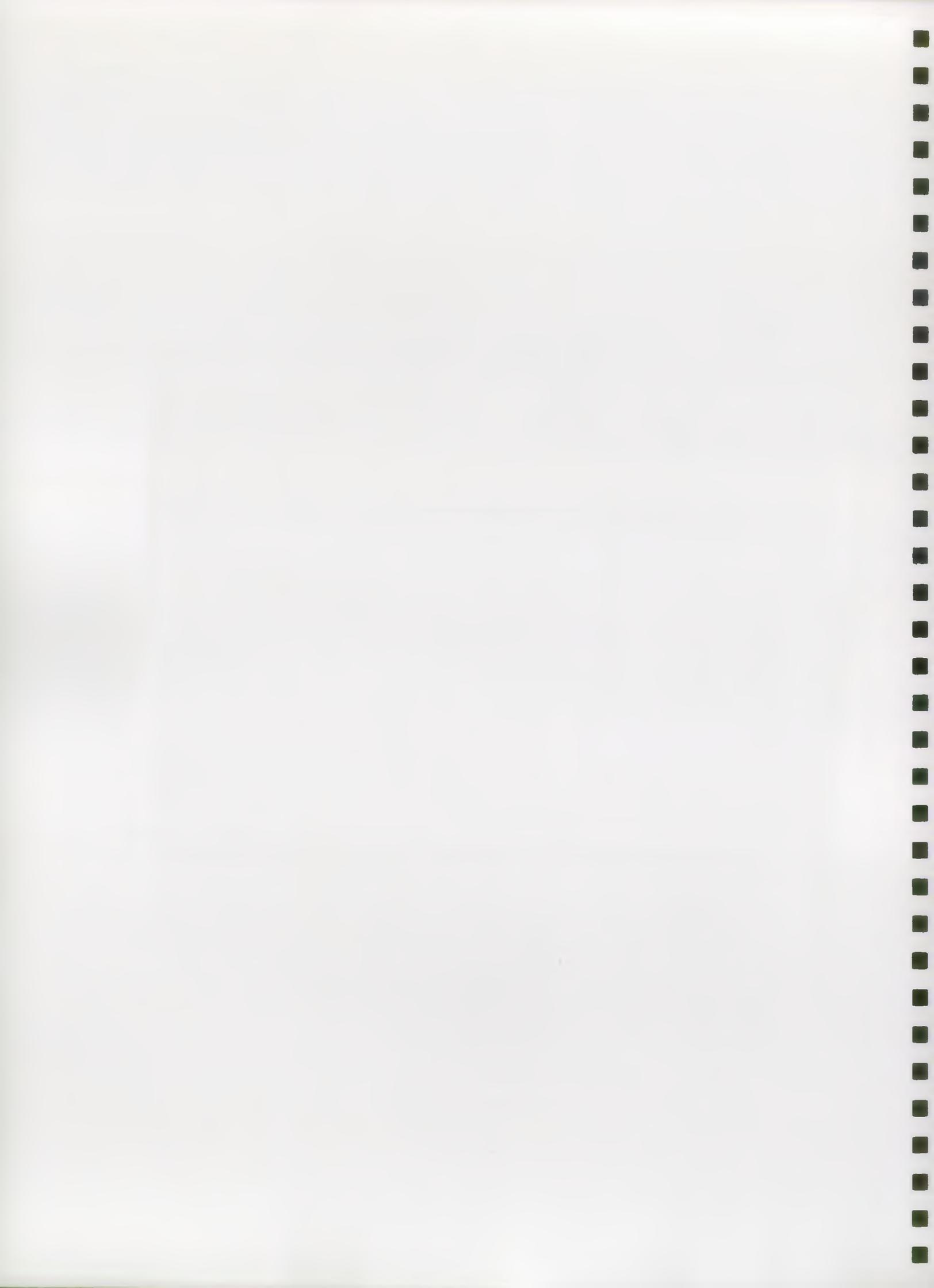
- To maintain existing flood defences for people and property against flooding from rivers and the sea, taking account of environmental requirements.
- To improve the standard of flood defence where appropriate by promoting and constructing new flood defences.
- To maintain effective drainage, taking 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.



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.

WATER QUALITY TARGETS

MAP 24.



CATCHMENT TARGETS

Specific Catchment Targets

There have been twenty-two Uses identified within the catchment, each with its own water quality requirements. The accompanying map (Map 24) shows which Uses are the most demanding in terms of water quality for the different reaches. In the estuary NWC class A is the target, augmented with the need to comply with the EC Bathing Water Directive standards at West Kirby. 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 Used for Potable Abstraction Directive where abstractions occur. The fisheries in the catchment are predominantly salmonid and require a target of Fisheries Ecosystem classes 1/2. Some tributaries of the Dee are targeted to support cyprinids. High quality water in the Dee is also required to protect other biological interests, such as dippers and rare aquatic insects.

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

To protect the other Uses in the catchment, the need to ensure that all discharges comply with environmentally protective consent conditions 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, or earlier where appropriate and particularly where 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. The Authority 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:-

- (i) waste disposal to land.
- (ii) disposal of slurries and sludge to land.
- (iii) physical disturbance of aquifers affecting quality and quantity.
- (iv) contaminated land.
- (v) 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.

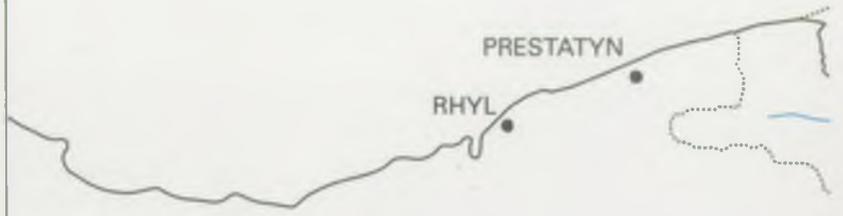
Specific Catchment Targets

The River Dee is regulated in accordance with the Dcc General Directions. Water is released from Llyn Celyn into Afon Tryweryn to maintain discharges from Llyn Tegid during periods of low flow in the main River Dee. These releases and those from Llyn Brenig are required to supplement low flows and hence to safeguard large public water supply abstractions in the lower reaches of the river and to maintain a minimum flow over Chester weir. When flow in the River Dee is above a certain threshold these releases are not required and water is conserved in the reservoirs. When releases are not required to supplement low river flows, the reservoirs discharge seasonally varying compensation waters which are required to protect the aquatic environment downstream.

In addition to the regulation of flows in the river during low flow periods, the NRA also exercises control over the discharge from Llyn Tegid in order to mitigate flooding in the Dee catchment downstream.

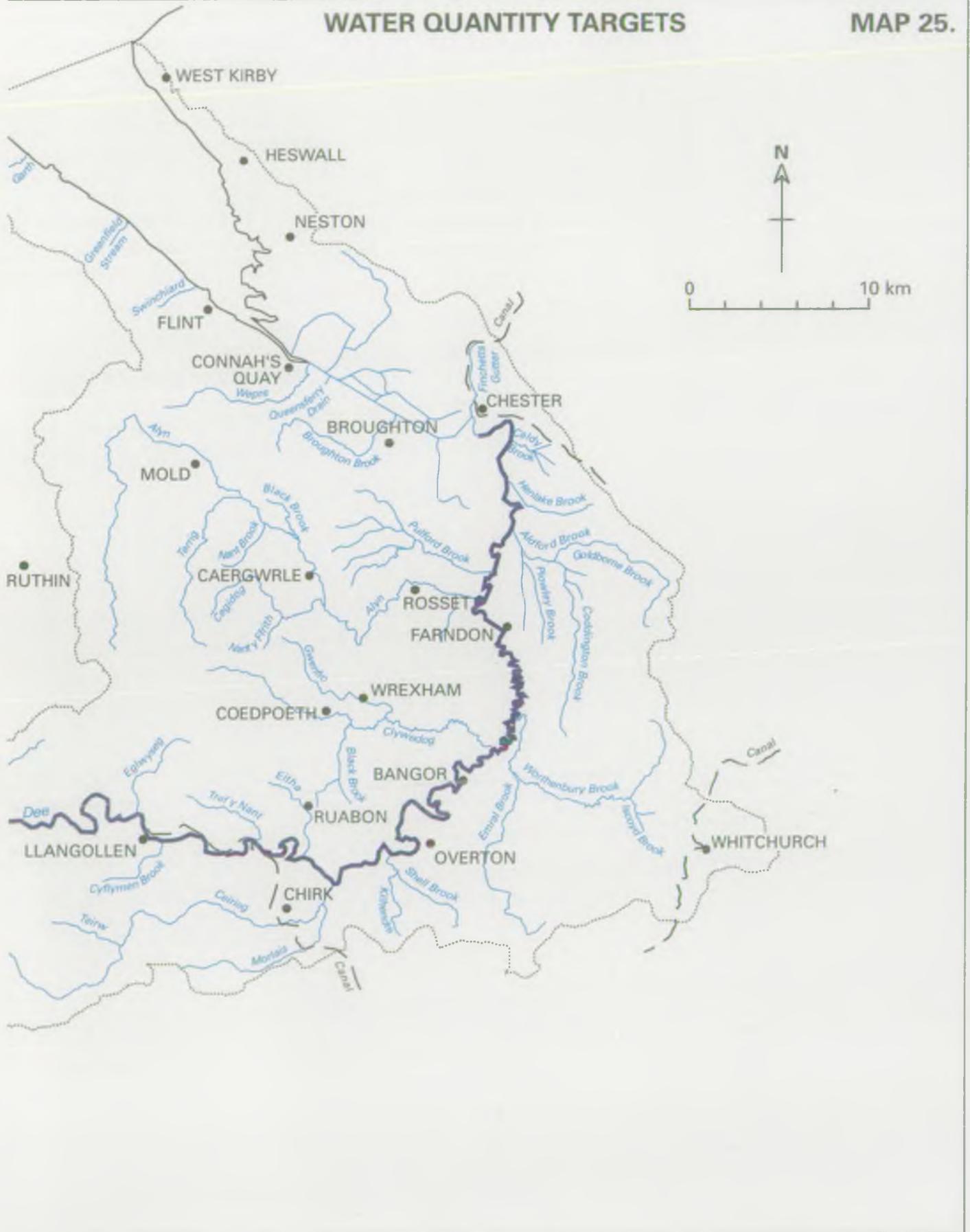
KEY

- CATCHMENT BOUNDARY
- REGULATE IN ACCORDANCE WITH DEE GENERAL DIRECTIONS
- RIVER
- RESERVOIR



WATER QUANTITY TARGETS

MAP 25.



CATCHMENT TARGETS

Control rules have been drawn up which will afford as much protection from flooding downstream of Llyn Tegid as can be achieved, without increasing the risk of flooding in Bala and other areas around the lake.

These control rules are incorporated in the Dee General Directions, which define the way in which the Dee Regulation Scheme is operated. The Dee General Directions are drawn up by the NRA with the advice of the Dee Consultative Committee comprising, with the NRA, the major abstractors. They incorporate management rules and define the water quantity targets for the regulated Dee System. These water quantity targets are in terms of reservoir storages, reservoir discharge requirements, and main river flows.

When revising the Dee General Directions the Authority will consider the needs of the environment, the needs of the abstractors and the needs of other river users.

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 with their own physical features requirements, many are shown on the accompanying map (Map 26).

The following targets include those shown on the map, but they also include those targets which cannot be well illustrated on a map.

Fisheries Ecosystem

Provision and maintenance of a diversity of natural river features to ensure variety of habitat to maximise production of fish populations. This target can be progressed by taking one or more of the following actions:-

- Removal of migration barriers where appropriate.
- Maintenance of fish passes.
- Enhancement of Lower Dee coarse fish populations by management of corridor habitats and off-stream areas.
- Enhancement of recruitment in Aldford and Pulford brooks by coarse fish stocking.

KEY

- CATCHMENT BOUNDARY
- Floodbanks maintained by N.R.A
- ▭ NRA land holdings to be managed for conservation and recreation
- ▭ Develop Dee estuary strategy
- Develop restoration and enhancement plan for British Coal estuary tip
- ▨ Cockle fishery to be regulated
- Establish need and potential for "Dee Plains" trail
- ↻ Promote barn owl conservation
- H Improve Dee fishery information
- Improve efficiency of brood stock collection
- ▭ Establish means of promoting new wetlands (particularly reedbeds and wet grasslands)
- ↻ Conserve river morphology
- ↕ Protect macrophyte communities
- ∞ Maximise production of fish populations
- ~ Establish benefits to fishery of overcoming migration barrier



- 1 LLANASA EMBANKMENT
- 2 TARGET ROAD EMBANKMENT
- 3 BROKEN BANK EMBANKMENT
- 4 NORTHERN EMBANKMENT
- 5 HAWARDEN EMBANKMENT

PHYSICAL FEATURES TARGETS

MAP 26.



CATCHMENT TARGETS

- Maintenance of adequate facilities for stock enhancement (upgrade fish trap) and stock enumeration (Manley Hall fish counter).
- Implementation of appropriate recommendations of the NRA R&D project on rare fish species to protect smelt and migratory lampreys.

Boating

Maintenance and, as required, improvement of access and associated facilities. This target can be progressed by taking one or more of the following actions:-

- Monitoring of pleasure boat impact in Lower Dee.
- Enforcement of present speed limits on Lower Dee.
- Production of guidance leaflet on environmental impacts of boating.
- Evaluation of impacts of boating on ecology of Lower Dee.
- Facilitation of low water access to estuary.

Water Sports Activity

Protection and, when possible, improvement of access to contact/recreation waters. This target can be progressed by taking one or more of the following actions:-

- Development of a management and business plan for Canolfan Tryweryn.
- Promotion of the use of the canalised section for water-skiing/jet-skiing to reduce pressure on sensitive sites.
- Recognition of existing canoe use of private stretches of river by access agreements.
- Consideration of the scope for developing canoe usage of private stretches of the Dee and other rivers.

Navigation

No obstruction to passage of vessels within the Dee estuary. Maintenance of training walls, fixed lights and markers to Trinity House standards.

CATCHMENT TARGETS

Fisheries and Shellfish

Maintenance and where required, improvement of access and associated facilities. Regulation of the cockle fishery, which can be progressed by the implementation of byelaws.

Angling

Safe access to and from the waterside materials should be promoted, particularly for the disabled. The waterside features required for successful angling should be maintained and developed.

General Conservation and Landscape

Maintenance and enhancement of natural river landscapes and habitats through development control, NRA consents and NRA operations. Particular attention will be paid to methods of erosion control, general development and landfill within the river corridor.

The following actions identify key areas of concern to be addressed if this target is to be progressed.

- Maintenance and enhancement of the conservation and fisheries interest of palaeo channels. 10% of these features to be assessed and managed (where possible) by 1998.
- Maintenance and enhancement of other wetland habitats (damp pasture, marshy grassland, fen and bog), establish (where possible) 25 ha of damp grassland for breeding waders by 1998.
- Establishment of (where possible) a 25 ha (minimum) reed-bed by 1998.
- Establishment of riparian fencing at a minimum rate of 0.5km/year.
- Identification of roosting and breeding areas for bat species dependent on the river corridor.
- Evaluation of the perceived fisheries impacts of piscivorous birds.
- Maintenance and, where possible, enhancement of key rare and protected species, e.g. otter, great crested newt, macroinvertebrates - Gomphus vulgatissimus, Isogenus nubecula and Bidessus minutissimus.
- Increase in barn owl breeding sites by 25% in the lower catchment by 1998.

- Maintenance of the rare macrophyte communities of the Middle Dee.
- Production of site management plans for all NRA land holdings by 1996.

Archaeology and Heritage

Protection of features of archaeological interest within the river corridor or associated wetlands, by consultation on development control, NRA operations and consents.

Special Ecosystems

Maintenance and enhancement of the special features of key sites through development control, NRA's regulatory powers and operations. The following actions would help considerably the progressing of this target.

- Participation in the preparation and implementation of the Dee Estuary Strategy.
- Maintenance of the current access agreement with RSPB for management of NRA's estuary land holding and development of a work programme arising from the Site Management Plan.
- Resolution of environmental consideration associated with lease of NRA land to British Coal at Point of Ayr.
- Maintenance of current monitoring levels of cockle beds within the estuary.
- Development of a river management strategy for the proposed Dee meanders SSSI in association with English Nature, CCW and local landowners.
- Agreed standards of service with CCW for NRA operations affecting SSSIs.

Basic Amenity

Promotion and/or development of footpaths, picnic sites and access points where appropriate.

- The following action should significantly contribute to the progressing of this target. Assistance in the development of a "Dee Plains" trail between Chester and Erbistock by facilitating existing access through trail guides, way marking and information boards.

- Investigation of the impacts of recreation on the wildlife resource of the estuary and development of management strategies through the Dee Estuary Strategy.
- Promotion of bird watching facilities, particularly on NRA land holdings in the estuary.

Flood Storage/Defence

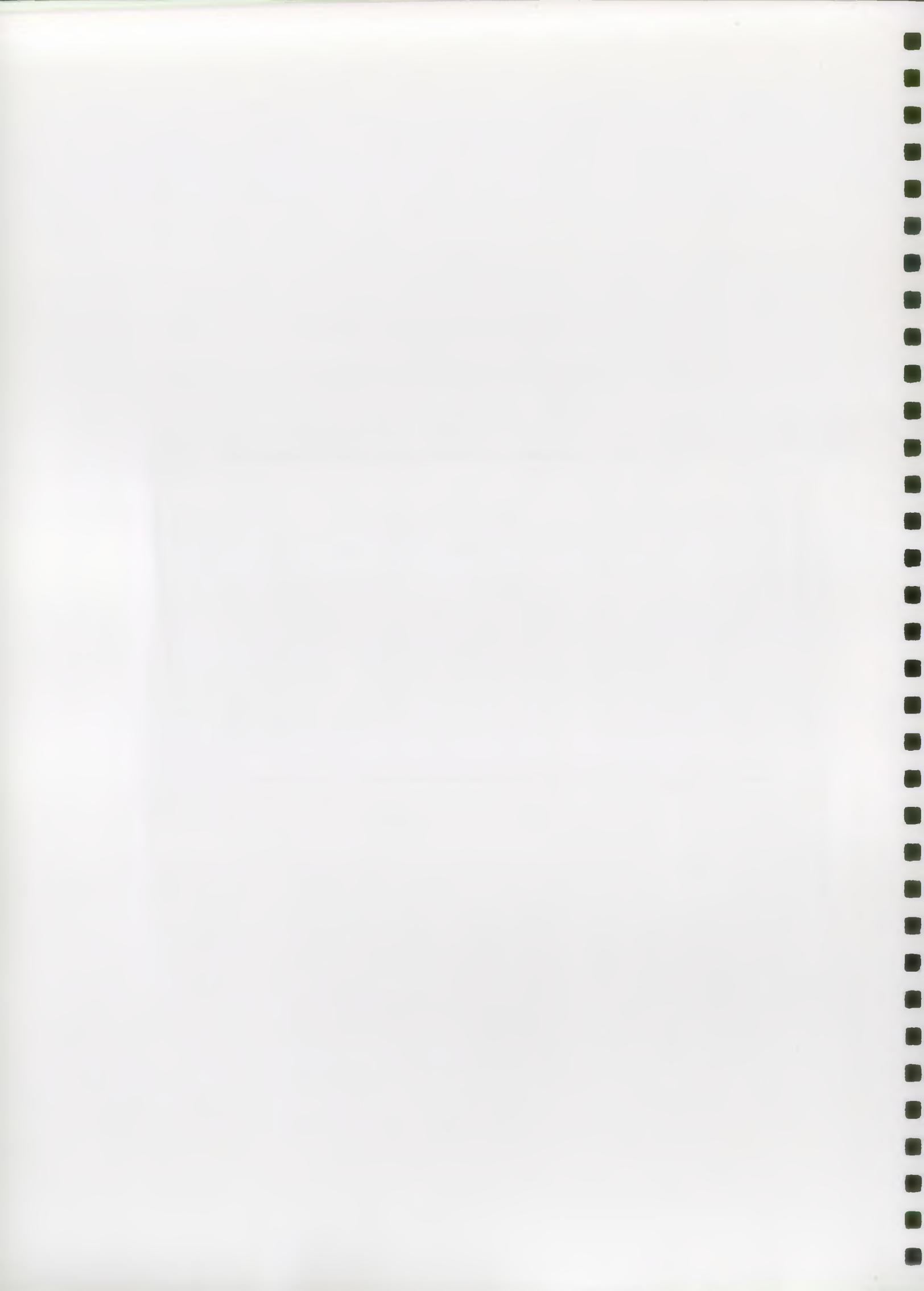
Design and implementation of maintenance and improvement works so that the natural water environment is protected and enhanced.

Prevention of development which could impair the effectiveness of any flood defence scheme, prevent access for maintenance purposes, or significantly impact on any watercourse receiving surface water from the development, such that flooding situations are created or aggravated downstream of the site.

Maintenance of tidal and fluvial defences protecting people and industrial/residential property to a 1 in 100 return period, agricultural land to a 1 in 10 (maximum) return period.

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.



5.1 WATER QUALITY

General

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

Issues Identified

The issues identified working from the estuary to the source of the river are as follows:

- West Kirby's identified bathing waters have failed to comply with the EC Directive bacteriological standards (76/160/EEC) since their identification in 1991. (Issue 1 Section 7).
- The estuary near Heswall is in Class B primarily due to the unsatisfactory sewage discharge from both the Sewage Treatment Works (STW) and prematurely operating overflows on the sewerage system at Heswall. (Issue 2 Section 7).

KEY

- CATCHMENT BOUNDARY
- IN CLASS B OF NWC ESTUARY CLASSIFICATION
- NON COMPLIANCE WITH POTABLE ABSTRACTION EC DIRECTIVE (75/440/EEC)

FISHERIES ECOSYSTEM CLASSIFICATION

- FE 2
- FE 3
- FE 4
- FE 5
- FE 6



THE STATE OF THE CATCHMENT

- Afon Garth is in Fisheries Ecosystem (FE) 5 because of the high zinc content as the result of diffuse abandoned mine inputs. (Issue 3 Section 7)
- Queensferry drain is in FE6 because of BOD and ammonia derived from the presence of disproportionate amounts of sewage effluent from the Queensferry STW, and the stream being tide locked. (Issue 4 Section 7).
- Finchetts Gutter is in FE5 due to depressed DO and elevated ammonia from the compounded effects of combined storm overflows into its tributary Bache Brook, tip leachate and localised dairy, private STW, contaminated surface water and zoo outfalls. (Issue 5 Section 7).
- The colliery spoil at Point of Ayr mine causes unacceptable localised pollution from fines washing and leachate generation. (Issue 6 Section 7).
- Past industrial uses and current activities have produced large areas of contaminated land in the estuary, particularly along the Welsh coastline. These sites cause pollution and are a persistent threat to ground and surface waters. (Issue 7 Section 7).
- The inner estuary currently contains high levels of ammonia from diffuse and point source inputs. (Issue 8 Section 7).
- The estuary is currently at the limit of Environmental Quality Standards for copper, zinc, and organotins. These limits are sometimes exceeded. (Issue 9 Section 7).
- Many industrial discharges cause significant visual impact upon receiving waters. (Issue 10 Section 7).
- Water quality of many tributaries is affected by diffuse and point source agricultural pollution. (Issue 11 Section 7).

THE STATE OF THE CATCHMENT

Stream / River		Current Classification	Reason for non-compliance with target			
			BOD	DO	Ammonia	Low Flow
*	Finchettes Gutter	FE5		/	/	
	Balderton Brook	Not Classified	/	/	/	
	Caldy Brook	FE3	/	/	/	
**	Henlake Brook	FE6	/	/	/	/
	Aldford Brook	FE5/FE6	/	/	/	
	Coddington Brook	FE4			/	
***	Plowley Brook	FE6	/	/	/	/
	Afon Terrig	FE2	/			
	Wych Brook (upstream of High Wych)	FE3	/	/	/	
	Emral Brook	FE3	/			
	Kilhendre Brook and part of Shell Brook	FE4			/	
	Iscoyd Brook	FE4	/		/	

- * Other inputs contribute to problem - see Issue 5
- ** -do- - see Issue 15
- *** -do- - see Issue 22

- Bacterial levels in the estuary around Heswall are unacceptable as the result of sewage inputs and lack of dilution. (Issue 12 Section 7).
- The Dee from Chester weir to a point downstream of its confluence with the Caldly Brook is in FE3 due to marginally high zinc and temperature and low DO, the result of the depth and low flow conditions that exist within the stretch. (Issue 13 Section 7).
- The Dee above Chester weir is used for major potable abstractions and NRA management proposals under S.93 Water Resources Act 1991, if ratified, will exert greater control over activities which have accompanying unacceptable pollution risks. (Issue 64 Section 7).

THE STATE OF THE CATCHMENT

- The Dee from its confluence with Aldford Brook to its confluence with the Worthenbury Brook fails its target due to marginally elevated temperatures. This is due to the depth and low flow conditions that exist within the stretch. (Issue 14 Section 7).
- Aldford Brook including Goldborne Brook is in FE5 or FE6 due to elevated BOD and ammonia and depressed DO, as the result of farm discharges, and a fall in the base flow. (Issue 15 Section 7).
- Pulford Brook is in FE5 due to low DO as a result of poor reaeration characteristics within the downstream reaches. (Issue 16 Section 7).
- The Alyn up to its confluence with the Terrig is in FE2 due to different combinations of low DO and elevated BOD and ammonia along its length, primarily as a result of sewage discharges from Gresford, Leeswood, Ty Gwyn and Mold STWs. (Issue 17 Section 7).
- The Cegidog is in FE2 due to elevated BOD. The source of degradation is a combination of treated and crude sewage discharges. (Issue 18 Section 7).
- The Nant-y-Ffrith is in FE3 due to marginally elevated zinc levels which originate naturally from the metal rich feeder streams. (Issue 19 Section 7).
- Black Brook (Alyn) is in FE5 due to elevated ammonia and low DO, due to sewage discharges from Ty Gwyn STW. (Issue 20 Section 7).
- A part of the Alyn upstream of its confluence with the Terrig is in FE3 due to low DO as the result of the depth and low flow conditions that exist within the stretch. (Issue 21 Section 7).

THE STATE OF THE CATCHMENT

- Worthenbury Brook at Higher Wych is in FE3 primarily due to BOD and marginally elevated levels of ammonia, and marginally depressed DO. This is due to a combination of sewage discharges and farming practices. (Issue 22 Section 7).
- The Clywedog from its confluence with the Dee to its confluence with the Black Brook is in FE3, and FE5 upstream of this confluence primarily because of the levels of zinc present, the source of which is extensive mining for zinc and lead over the past several hundred years in the upper catchment at Minera. (Issue 23 Section 7).
- The Gwenfro downstream of Wrexham fails its targets in part due to the elevated ammonia levels, and also BOD further downstream, the source of these being problematic combined storm overflows. (Issue 24 Section 7).
- A part of the Dee downstream of its confluence with Shell Brook fails its target because of marginally elevated temperatures. This also applies to stretches upstream to the Dee's confluence with the Morwynion, and with marginally depressed DO near Llangollen. (Issue 25 Section 7).
- The Cyflymen is in FE2 due to marginally elevated ammonia levels, due to an unknown source. (Issue 26 Section 7).
- The Morwynion is in FE2 because of marginally elevated BOD levels, due to an unknown source. (Issue 27 Section 7).
- The Alwen lake, its feeder stream and the Alwen to its confluence with the Brenig are in FE5 due to low pH values. This may well be a natural feature of this catchment. (Issue 28 Section 7).
- The Nug is in FE2 because of marginally depressed DO. (Issue 29 Section 7).
- The Ceidiog fails its target due to low pH as the result of acidification in the upper reaches of the catchment, although its biological assessment indicates good water quality. (Issue 30 Section 7).

THE STATE OF THE CATCHMENT

- All waters upstream of the Tryweryn and Mynach confluence fail their targets because of low pH, and in the case of the Tryweryn and Celyn above Llyn Celyn, elevated copper levels are found and may originate from very old (Roman) mines. Biological assessments of the Hesgyn, Celyn and Tryweryn indicate good water quality. (Issue 31 Section 7).
- The Glyn is in FE5 because of the low pH, the result of general acidification in the upland waters. (Issue 32 Section 7).
- The Shropshire Union Canal at Waverton near Chester fails its target due to BOD and particulate solids. As it passes through the south eastern corner of the catchment it fails its target due to marginally elevated particulate solids. (Issue 33 Section 7).
- Water quality of abstracted water at Brithdir Mawr, Llyncyfynwy, Pendinas and Llidiardau, is not consistent with the treatment provided because of elevated ammonia levels. (Issue 34 Section 7).
- The whole catchment upstream of the Dee and Worthenbury Brook confluence with the exception of the Clywedog, Shell Brook, Morwynion, upper reaches of the Alwen, Ceidiog, reaches above the Mynach and Tryweryn confluence, and the Glyn, fail their targets due to the inexplicable presence of metals, primarily zinc and copper. This is a matter which merits further investigation and, in the first instance the methodology for deriving the standards for these metals in waters of particularly low hardness, as found in the upper half of the Dee catchment, needs reappraising. Certainly the invertebrate and fishery biology data is inconsistent with the findings based on the current standards. These 'metal failures' are not shown on the accompanying map for these reasons. (Issue 35 Section 7).
- Biological indicators show acidification to be evident in the upper reaches of the Alwen, in the Brenig downstream of the reservoir, Ceirw, Dylo, upper Tegid, upper Hirnant, tributaries of the Ceidiog, upper Ceiriog and tributaries of the Dee between the Morwynion and Alwen. Whilst some are afforested others are not. The picture is further compounded by acidification being evident in so-called non-sensitive areas as well as in the recognised sensitive areas. (Issue 36 Section 7).

GUIDELINE STANDARDS - DISCUSSION NOTE

Water Abstractions

Of the 18 surface waters abstractions for potable supplies 14 would fail when assessed against guideline standards (EC Surface Water Directive) for some determinands. For example, all 14 would fail on the basis of material present which is extractable in chloroform (though marginal in the case of Pen-y-Cae Bottom), and 7 solely for this reason, namely Sutton Hall Intake, Berwyn (Vivod stream, and at Horseshoe Falls), Legacy, Pen-y-Cae Top and Alwen (there would also be marginally elevated phosphate at Alwen).

Of the remaining 7, Cilcain Nos. 3 and 4 would fail due to copper levels, with Pen-y-Cae Bottom marginally failing.

Phosphate failures would arise at Llidiardau, and a marginal one at Alwen. Bacteriological failures would arise at Brithdir Mawr, with marginal failures at Llyncyfynwy and Llidiardau.

HOWEVER THE PROTOCOL IS THAT COMPLIANCE IS ASSESSED AGAINST IMPERATIVE STANDARDS

General Water Quality

Assessment of quality of surface waters against guideline standards (EC Freshwater Fish Directive) would have resulted in a significant part of the Dee catchment failing in terms of phosphate and nitrite. It is however generally recognised that phosphate has little impact, if any, on fisheries although high nitrite values in combination with low dissolved oxygen values can prove toxic to fish. Combinations of low DO and high nitrite (greater than 100X guideline standard) have been identified, namely the Queensferry Drain which has been identified as an Issue, and of more concern the Alyn, but which again has been picked up as an Issue.

Whilst eutrophication is not a problem within the Dee catchment, relatively high values of phosphate, (up to 45 x guideline standard) have been recorded. Normally, high phosphate values are considered indicative of eutrophication.

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.

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

Low Flow Issues Identified

The NRA is concerned about falling groundwater levels in the Triassic Sandstone which underlies the Lower Dee surface catchment.

- Groundwater issuing from springs in the Aldford Brook and Worthenbury Brook catchments supports flow in these tributaries during periods of low rainfall. It is particularly notable in the Aldford Brook catchment that the level of base flow represented by the 95 percentile low flow has reduced in recent years. The Aldford Brook catchment has been identified as requiring further investigation. (Issue 37 Section 7).
- There are no flow gauging stations within the Worthenbury Brook catchment on which to base an assessment of the impact of the falling groundwater levels on this catchment. The Authority considers it important to improve the understanding of the flow regime within the catchment particularly in the light of recent experience on the Aldford Brook.

KEY

..... CATCHMENT BOUNDARY

LOW FLOW INVESTIGATIONS

— DOLFECHLAS BROOK

— R. CLYWEDOG

ALDFORD BROOK CATCHMENT

WORTHENBURY BROOK CATCHMENT



STATE OF THE CATCHMENT - WATER QUANTITY MAP 28.



THE STATE OF THE CATCHMENT

There is currently a scheme to look at the feasibility of constructing a new gauging station within the catchment. This feasibility study is due to be carried out during 1994/95 with construction in 1995/96. (Issue 38 Section 7).

- An investigation into the groundwater resources of the Dee catchment is due to start in March 1994 and it may well identify a requirement for enhanced monitoring in both the Aldford Brook and Worthenbury Brook catchments.
- There are further two tributaries that are currently identified for further investigation.
- Firstly the Afon Clywedog which is affected by a licensed abstraction from the mine drainage system in the Esclusham Mountain. This tributary has been identified in the recently published report on "Low Flows and Water Resources" and the Authority is currently discussing ways of alleviating this problem with the abstractor concerned. (Issue 39 Section 7).
- The second is the Dolfechlas Brook which is a tributary of the River Alyn. During low flow periods flows in the Dolfechlas Brook represent the source of the River Alyn downstream of Rhydymwyn. Upstream of Rhydymwyn all low flow is lost through naturally occurring swallow holes in the bed of the River Alyn. A report prepared for the NRA by Howard Humphreys and Partners in 1991 considered three options for low flow augmentation in the Alyn. The cost of implementation of the preferred option was £1.1m, and although it would have provided landscape, amenity, ecological and fisheries benefits, the scheme could not be justified in terms of benefits relative to the cost.
- Flows in the Dolfechlas Brook are themselves affected by a licensed abstraction near Hendre which does not have a residual flow condition to protect the aquatic environment. The Authority is currently investigating ways of reducing the impact of this abstraction on the low flows in the Dolfechlas Brook. (Issue 40 Section 7).

5.3 PHYSICAL FEATURES

General

Since physical features targets 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 accompanying map (Map 29) illustrates the current state of the catchment and identifies areas where there are perceived deficiencies.

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.

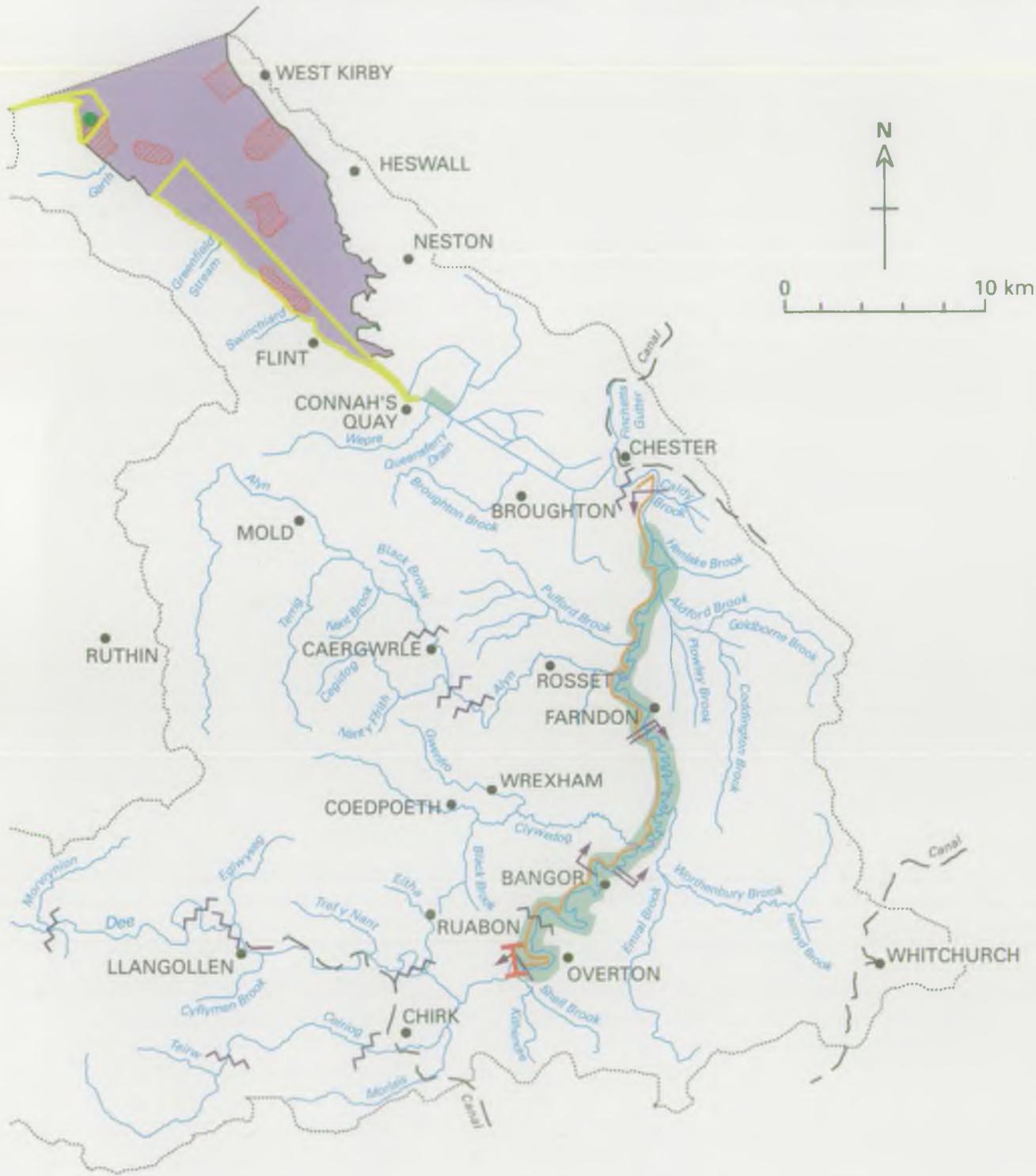
The estuary, within which NRA is a major landowner, is exposed to a range of environmental planning and management pressures. The effects may be unclear, effective action difficult to resolve or implement and the number and complexity of organisations involved in issues make resolution difficult. Key issues such as industrial development and habitat loss are particularly significant in an area of international importance for waterfowl.

The freshwater environment has been profoundly influenced by the activities of NRA's predecessors, development and agriculture resulting in the loss of a range of wetland habitats, particularly through drainage and fluvial management. Positive management is required to restore these degraded habitats and maintain the salmonid fishery, integrated with the requirements for recreation within the catchment.

Issues Identified

- Byelaws to regulate cockle fishery not yet implemented. (Issue 41 Section 7).
- Impacts from recreation and cockling on estuarine birds poorly defined. (Issue 42 Section 7).
- Management of spoil tip at Point of Ayr unresolved. (Issue 43 Section 7).

STATE OF THE CATCHMENT - PHYSICAL FEATURES MAP 29.



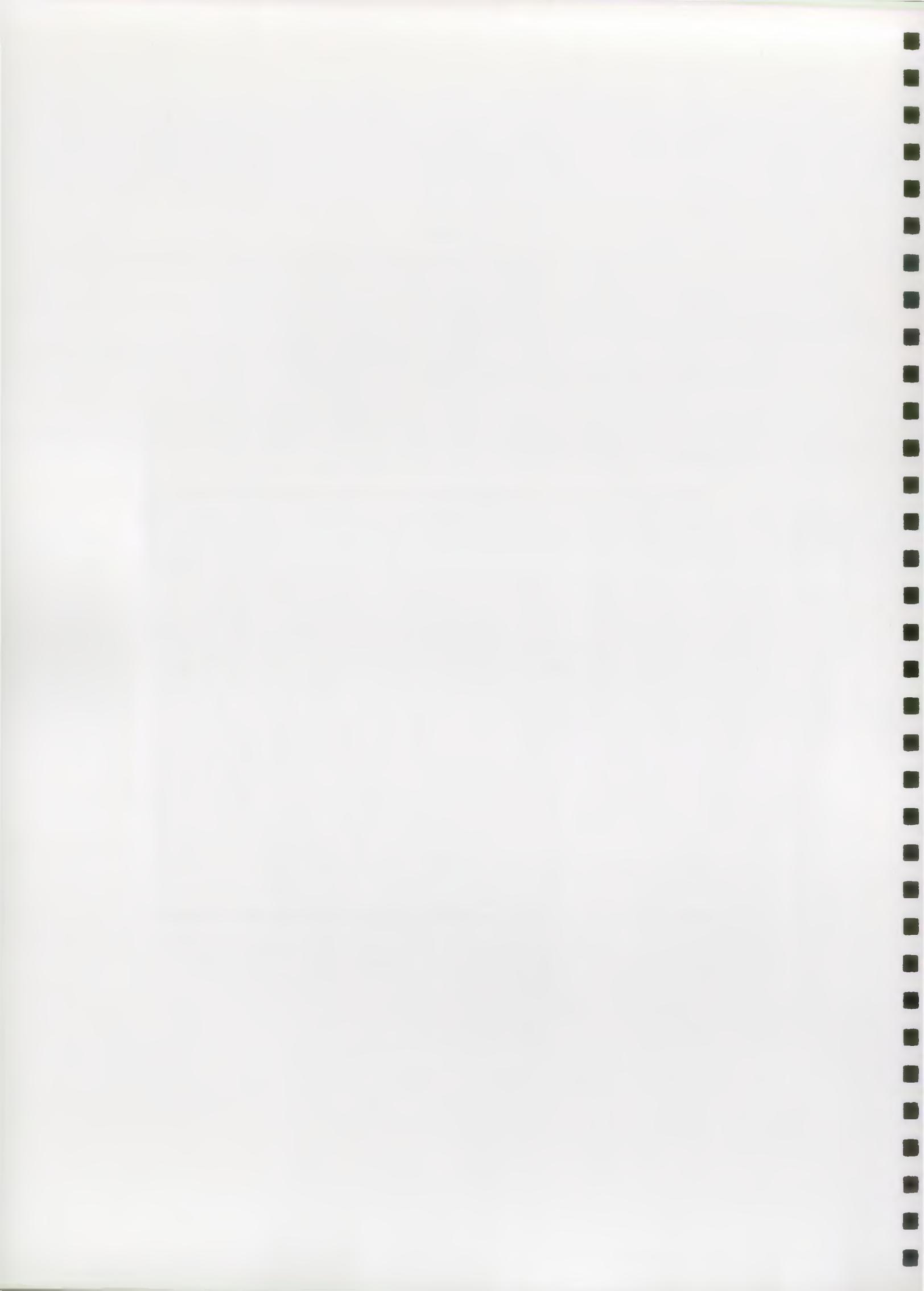
THE STATE OF THE CATCHMENT

- Management plan for NRA landholdings incomplete. (Issue 44 Section 7).
- Comprehensive strategy for estuarine management not yet available. (Issue 45 Section 7).
- Fragmented landscape designation for the estuary. (Issue 46 Section 7).
- Boundary of Dee estuary SSSI requires review. (Issue 47 Section 7).
- Changes to Net Limitation Order for Licensed Netting of Salmonids by 1995. (Issue 48 Section 7).
- Perceived interference of salmonid movement from the estuary over Chester weir during low flows. (Issue 49 Section 7).
- Low numbers of coarse fish in Lower Dee. (Issue 50 Section 7).
- Impacts of boating on ecology of Lower Dee. (Issue 51 Section 7).
- Insufficient low water slipways in estuary. (Issue 52 Section 7).
- Inaccessibility of certain tributaries to migratory salmonids. (Issue 53 Section 7).
- Degraded bankside and instream habitat e.g. Afon Iwrch, Lower Dee. (Issue 54 Section 7).
- River bank management conflicts with environmental requirements e.g. Holt-Worthenbury meanders, Llandderfel-Carrog meanders. (Issue 55 Section 7).
- General lack in numbers and diversity of wetland habitats. (Issue 56 Section 7).
- Lack of promotion of riverside amenity features, poor bird watching facilities at key sites. (Issue 57 Section 7).
- Low numbers of barn owls below Bangor-on-Dee, high numbers of piscivorous birds. (Issue 58 Section 7).

THE STATE OF THE CATCHMENT

- Poor facilities for fish stock assessment and monitoring. (Issue 59 Section 7).
- Localised fry recruitment problems in the Dee and Alyn. (Issue 60 Section 7).
- Low temperature impact on fisheries in the catchment as a consequence of regulated flows. (Issue 61 Section 7).
- Impact of acidified water released on the fisheries of the River Alwen. (Issue 62 Section 7).
- Access for, and regulation of canoeists. (Issue 63 Section 7).
- Loss of young salmon and sea trout at existing fish farms without suitable screens. (Issue 65 Section 7).
- Risk of damage to brown trout genetic integrity from stocking. (Issue 66 Section 7).
- Decline in "spring" running salmon. (Issue 67 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

- **River bank management conflicts with environmental requirements.**
Key areas for resolution include a management strategy and methodology for bank maintenance within the PSSSI, landowner requirements and compensation payments, costs to NRA and NRA policy relating to erosion protection. (Issue 55 Section 7).

- **General lack in number and diversity of wetland habitats.**
Key area for resolution will be resistance to change and mechanisms of landowner compensation for decrease in production. (Issue 56 Section 7).

- **High levels of fish eating birds in catchment.**
Key areas for resolution will be the disparate views of angling and conservation interest groups should control measures be required. (Issue 58 Section 7).

- **Inadequate facilities for canoeists, conflicts with other uses.**
Key areas for resolution include potential for licensing, access agreements with landowners and zoning rivers. (Issue 63 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 : 2	SEWAGE DISCHARGES FROM HESWALL STW AND CSOs DEGRADE THE ESTUARY IN THE VICINITY TO CLASS B		
OPTIONS	Responsibility	Advantages	Disadvantages
Improve Heswall STW to ensure effluent is adequately treated.	DCWW	Target Class A achieved throughout estuary.	Cost (unknown).
Relocate Heswall STW outfall to achieve greater dilution.	DCWW	Greater dilution should ensure Class A achieved.	May not ensure Class A is achieved. Cost (unknown).
Discharge effluent from Heswall STW only on the ebb tide to achieve greater dilution.	DCWW	Greater dilution should ensure Class A achieved.	Cost (unknown). May not achieve Class A.
Provide screening to CSO to prevent discharge of debris.	DCWW	Aesthetic improvements.	Cost (unknown) Improvement.
Relocate CSO to below Mean Low Water Spring Tide Level.	DCWW	Aesthetic improvements.	Dynamic changes difficult to predict. Cost (unknown). Improvement only aesthetic.
Provide storage in sewer to reduce discharges.	DCWW	Reduced number of discharges. Water quality improvement.	Cost (unknown).

ISSUE No : 3		AFON GARTH IS IN FE 5 BECAUSE OF DIFFUSE INPUTS OF ZINC FROM ABANDONED MINES	
OPTIONS	Responsibility	Advantages	Disadvantages
Identify inputs and monitor to quantify problems by 1996.	NRA	Greater understanding of any impact.	Cost (unknown).
Obtain derogation for zinc if no biological impact established.	NRA	No cost. Target class achieved.	Source not determined.

ISSUE No : 4		QUEENSFERRY DRAIN IS IN FE 6 BECAUSE OF SEWAGE EFFLUENT FROM THE QUEENSFERRY STW AND STREAM BEING TIDE LOCKED	
OPTIONS	Responsibility	Advantages	Disadvantages
Relocate STW outfall direct to the Dee Estuary by mid 1994.	DCWW	Achievement of water quality target.	Cost (unknown). May not fully achieve water quality target.

ISSUE No : 5	FINCHETTS GUTTER IS IN FE5 DUE TO DEPRESSED DO AND ELEVATED AMMONIA DERIVED FROM VARIOUS INPUTS		
OPTIONS	Responsibility	Advantages	Disadvantages
Provide screening and/or storage to reduce CSO impact and operations.	DCWW	Reduced number and impact of discharges.	Cost (unknown).
Monitor tip leachate input and derive contaminated land reclamation scheme to prevent pollution.	NRA/Landowner.	Contribution to water quality improvement.	Cost (unknown).
Provide increased treatment or alternative disposal options for private STW inputs.	Discharger	Contribution to water quality improvement.	Cost (unknown).
Review consent for dairy and improve quality of discharges.	NRA/Discharger	Contribution to water quality improvement.	Cost (unknown).
Provide increased treatment for discharges from Chester Zoo.	Chester Zoo	Contribution to water quality improvement.	Cost (unknown).
Ensure consents are environmentally protective.	NRA	Protective standards.	Discharge costs higher for Zoo.

ISSUE No 6	THE COLLIERY SPOIL TIP AT POINT OF AYR MINE CAUSES UNACCEPTABLE LOCALISED POLLUTION FROM FINES WASHING AND LEACHATE GENERATION		
OPTIONS	Responsibility	Advantages	Disadvantages
Provide sea defence and pollutant barrier around tip site.	British Coal	Prevents polluting discharge.	Cost about £1 m.
Install monitoring boreholes to assess impact on groundwater quality.	British Coal	Impact quantified.	Cost (unknown).

ISSUE No : 7	PAST INDUSTRIAL USES AND CURRENT ACTIVITIES HAVE PRODUCED LARGE AREAS OF CONTAMINATED LAND IN THE ESTUARY, PARTICULARLY ALONG THE WELSH COASTLINE. SITES CAUSE POLLUTION AND A CONSTANT THREAT TO GROUND AND SURFACE WATERS		
OPTIONS	Responsibility	Advantages	Disadvantages
Site investigations to assess extent of impact.	NRA/Site Owners	Enables targeting of sites for improvements.	Cost (unknown).
Reclamation of contaminated sites.	NRA/Site Owners	Improves water and soil quality.	High costs (£millions).
Development of contaminated land only after reclamation.	NRA/Local Authorities	Environmental improvements and protection. Land value increased.	Delays development. Land cost increased.
Implement the NRA groundwater protection policy.	NRA	Water quality protected.	Restriction on activities/development.

ISSUE No : 8	THE INNER ESTUARY CONTAINS HIGH LEVELS OF AMMONIA DERIVED FROM POINT SOURCE AND DIFFUSE INPUTS		
OPTIONS	Responsibility	Advantages	Disadvantages
Improve treatment at Chester STW to reduce ammonia discharge.	DCWW	Water quality improved.	Cost (unknown).
Improve treatment at Queensferry STW to reduce ammonia discharge.	DCWW	Water quality improved.	Cost (unknown).
Reclaim contaminated groundwater in the Broken Bank area of Deeside.	Clwyd County Council	Water quality improved.	Cost (unknown).
No new discharges of ammonia to the inner estuary until levels are reduced.	NRA	No cost.	May limit industrial growth.

ISSUE No : 9	THE ESTUARY IS CURRENTLY AT THE LIMIT OF ENVIRONMENTAL QUALITY STANDARDS FOR COPPER, ZINC AND ORGANOTINS, AND AT TIMES THESE LEVELS ARE EXCEEDED		
OPTIONS	Responsibility	Advantages	Disadvantages
Review all point source discharge consents to restrict discharges of these materials.	NRA/Dischargers	Effluent and water quality improved.	May not achieve EQS compliance. Cost (unknown).
Investigate the levels of organotins around past and present docking facilities to identify areas of high contamination.	NRA	Areas of concern identified.	Survey costs (unknown).
Produce an inputs budget for copper and zinc to the estuary to identify the main sources including abandoned mines and river sediments.	NRA	Enables targeting of sites for improvements.	Survey costs (unknown).
Restrict any new discharge that may contain these materials until levels are reduced below EQS.	NRA	Prevents further deterioration.	May limit industrial growth.

ISSUE No : 10	MANY INDUSTRIAL DISCHARGES CAUSE SIGNIFICANT VISUAL IMPACT UPON THE RECEIVING WATER IN THE ESTUARY AREA		
OPTIONS	Responsibility	Advantages	Disadvantages
Review discharge consents.	NRA	Basic amenity standards achieved.	Cost (unknown).
Ensure outfalls and effluents comply with reviewed standards.	NRA/Dischargers		

ISSUE No : 11	WATER QUALITY OF MANY TRIBUTARIES IS AFFECTED BY DIFFUSE AND POINT SOURCE AGRICULTURAL POLLUTION		
OPTIONS	Responsibility	Advantages	Disadvantages
Farm inspection/ advice programme.	NRA	Establish targeting of sites for improvement.	Cost (unknown).
Improvements to farm effluent storage facilities and safer effluent disposal.	Farmers	Water quality improvements. Reduced risk of prosecution.	Cost (unknown) but 25% of work can be grant aided.

ISSUE No : 12		BACTERIAL LEVELS IN THE ESTUARY AROUND HESWALL ARE TOO HIGH	
OPTIONS	Responsibility	Advantages	Disadvantages
Provide adequate sewage treatment and disposal at Heswall STW.	DCWW	Improved water quality will benefit tourism and shellfishery.	Cost (unknown).
Provide storage for sewage to reduce storm water spills.	DCWW	Reduced spill events and improved water quality.	Cost (unknown).

ISSUE No : 13		THE DEE FROM CHESTER WEIR TO ITS CONFLUENCE WITH CALDY BROOK IS IN FE3 DUE TO MARGINALLY HIGH ZINC LEVELS AND TEMPERATURE, AND LOW DO LEVELS	
OPTIONS	Responsibility	Advantages	Disadvantages
Ongoing investigation programme to evaluate diurnal variations in DO and temperatures.	NRA	Establish if natural or not.	NRA cost (unknown).
Investigate zinc issue further.	NRA	Confirm whether it is an issue.	NRA cost (unknown).

ISSUE No : 14	THE DEE FROM ITS CONFLUENCE WITH ALDFORD BROOK TO ITS CONFLUENCE WITH WORTHENBURY BROOK FAILS TO ACHIEVE ITS TARGET OF FE2 DUE TO marginally ELEVATED TEMPERATURES		
OPTIONS	Responsibility	Advantages	Disadvantages
Ongoing investigation programme to evaluate the diurnal variation.	NRA	Establish if natural or not.	NRA cost (unknown).

ISSUE No : 15	ALDFORD BROOK IS IN FE5 OR FE6 DUE TO ELEVATED BOD AND AMMONIA, AND REDUCED DO LEVELS		
OPTIONS	Responsibility	Advantages	Disadvantages
Farm inspection/ advice programme.	NRA	Establish targeting of sites for improvements.	NRA cost (£750).
Improvements to farm effluent storage facilities and safer effluent disposal.	Farmers	Water quality improvements. Reduced risk of prosecution.	Cost (£100K), but 25% work can be grant aided.
Ensure Tattenhall STW complies with consent conditions.	NRA/DCWW	Water quality improvements.	Operational costs- DCWW (£30K) NRA cost (£1K).

ISSUE No : 16	PULFORD BROOK IS IN FE5 DUE TO LOWERED DO LEVELS		
OPTIONS	Responsibility	Advantages	Disadvantages
Suitability of sampling point to be reviewed (Result suspect).	NRA	More representative sampling point may be found. Target achieved.	Cost (unknown).

ISSUE No : 17	THE ALYN UP TO ITS CONFLUENCE WITH THE TERRIG IS IN FE2 DUE TO DIFFERENT COMBINATIONS OF LOW DO, ELEVATED BOD AND AMMONIA ALONG ITS LENGTH		
OPTIONS	Responsibility	Advantages	Disadvantages
Monitoring to ensure that STWs comply with their consents.	NRA	Consistently good quality discharges will safeguard water quality.	Cost (unknown).
Ensure compliance at STWs through effective works operation and trade effluent control.	DCWW	Water quality target achieved. Reduced risk of prosecution.	Cost (£50K).
Improvements at Ty Gwyn STW.	DCWW	Water quality improvement. Compliance with UWWTD.	Cost (£500K).

ISSUES AND OPTIONS

ISSUE No : 18		THE CEGIDOG IS IN FE2 DUE TO ELEVATED BOD LEVELS	
OPTIONS	Responsibility	Advantages	Disadvantages
Monitoring to ensure STWs comply with consent conditions.	NRA	Consistently good quality discharges will safeguard water quality.	Cost (unknown).
Ensure STWs comply with consents through effective works operation.	DCWW	Water quality target achieved Reduced risk of prosecution.	Cost (£30K).

ISSUE No : 19		THE NANT-Y-FFRITH IS IN FE3 DUE TO MARGINALLY ELEVATED ZINC LEVELS	
OPTIONS	Responsibility	Advantages	Disadvantages
Confirm that this is a natural phenomenon.	NRA	Enables review of target.	Cost (unknown). Lower target.

ISSUE No : 20		BLACK BROOK (ALYN) IS IN FE5 DUE TO ELEVATED AMMONIA AND LOW DO LEVELS	
OPTIONS	Responsibility	Advantages	Disadvantages
Treatment extensions at Ty Gwyn SDW.	DCWW	Water quality target achieved. Compliance with UWWTD.	Cost (£500K).

ISSUE No : 21	A PART OF THE ALYN UPSTREAM OF ITS CONFLUENCE WITH THE TERRIG IS IN FE3 DUE TO LOW DO LEVELS		
OPTIONS	Responsibility	Advantages	Disadvantages
Review data to confirm this as a function of the depth and low flow of this stretch.	NRA	Enables review of target.	NRA cost (unknown). Lower target.

ISSUE No : 22	WYCH BROOK UPSTREAM OF HIGH WYCH IS IN FE3 DUE TO BOD AND MARGINALLY ELEVATED AMMONIA LEVELS, AND MARGINALLY DEPRESSED DO LEVELS		
OPTIONS	Responsibility	Advantages	Disadvantages
Ongoing farm inspection and advice programme to resolve problems.	NRA	Enables targeting of sites for improvements.	Cost (£1K).
Improvements to farm effluent storage facilities and safer effluent disposal.	Farmers	Improvements in water quality.	Cost (£100K), but 25% work can be grant aided.
Ensure Whitchurch STW sustains its compliance with consent through good operational and trade effluent control.	DCWW	Improvements in water quality.	Cost (£30K).
Environmental improvements at H.H. Wardle (Metals) Ltd Fenns Bank.	H.H. Wardle (Metals) Ltd.	Water quality benefit within Red Brook.	Cost (£500K).

ISSUE No : 23	THE CLYWEDOG FROM ITS CONFLUENCE WITH THE DEE TO ITS CONFLUENCE WITH THE BLACK BROOK IS IN FE3 AND IN FE5 ABOVE THIS, DUE TO ZINC LEVELS		
OPTIONS	Responsibility	Advantages	Disadvantages
Investigation to locate source of input of zinc.	NRA	Identify source and potential for control.	NRA cost (unknown).
Reduce input of zinc by controlling run-off from old mine workings.	Local Authority/ WDA	Water quality target achieved.	Cost (£100K). May not be practicable.

ISSUE No : 24	THE GWENFRO DOWNSTREAM OF WREXHAM FAILS ITS TARGET DUE TO AMMONIA AND BOD LEVELS		
OPTIONS	Responsibility	Advantages	Disadvantages
Reduce input of storm sewage into the Gwenfro from CSOs by providing greater storage capacity within system.	DCWW	Water quality target achieved.	Cost (£1 million+).

ISSUE No : 25	PARTS OF THE DEE BELOW ITS CONFLUENCE WITH SHELL BROOK AND THE MORWYNION HAVE ELEVATED TEMPERATURES, WHILST DO IS DEPRESSED NEAR LLANGOLLEN		
OPTIONS	Responsibility	Advantages	Disadvantages
Confirm that this reflects the natural state of these reaches.	NRA	Information to enable action decision/review target.	NRA cost (unknown). Lower target.

ISSUE No : 26	THE CYFLYMEN IS IN FE2 DUE TO marginally ELEVATED AMMONIA LEVELS		
OPTIONS	Responsibility	Advantages	Disadvantages
Investigation to locate inputs of ammonia.	NRA	Enables targeting of sites for improvements. Water quality target achieved.	NRA cost (unknown). Sources may be diffuse and difficult to resolve.

ISSUE No : 27	THE MORWYNION IS IN FE2 DUE TO marginally ELEVATED BOD LEVELS		
OPTIONS	Responsibility	Advantages	Disadvantages
Investigation to locate inputs of BOD.	NRA	Enables targeting of sites for improvements. Water quality target achieved.	NRA cost (unknown).

ISSUE No : 28	THE ALWEN LAKE, ITS FEEDER STREAM, AND THE AFON ALWEN TO ITS CONFLUENCE WITH THE AFON BRENIG ARE IN FE5 DUE TO LOW pH VALUES		
OPTIONS	Responsibility	Advantages	Disadvantages
<p>Identify local causes of acidification (e.g. acid rain/afforestation). Cost benefit liming as remedial measure.</p>	NRA	<p>Information to determine action. Increasing pH benefit to fisheries.</p>	<p>NRA cost (unknown). Liming costs (£20K pa). Damage to acidic habitats.</p>
<p>Long term investigation to assess temporal changes in water quality.</p>	NRA	<p>Better understanding of range of water quality.</p>	<p>NRA cost (unknown). No improvement in current position.</p>

ISSUE No : 29	THE NUG IS IN FE2 DUE TO marginally DEPRESSED DO		
OPTIONS	Responsibility	Advantages	Disadvantages
<p>Investigate the causes of dissolved oxygen depletion within the upper catchment.</p>	NRA	<p>Identify source of problem and target remedial action where appropriate.</p>	<p>NRA cost (unknown).</p>

ISSUE No : 30	THE CEIDIOG FAILS ITS TARGET DUE TO LOW pH VALUES		
OPTIONS	Responsibility	Advantages	Disadvantages
Identify local causes of acidification and investigate cost benefit of liming as a remedial measure.	NRA	Information for determining action. Increasing pH would benefit fisheries.	NRA cost (unknown). Liming costs (£20K pa). Damage to naturally acidic habitats.

ISSUE No : 31	ALL WATERS UPSTREAM OF THE TRYWERYN AND MYNACH CONFLUENCE FAIL TO MEET TARGETS DUE TO LOW pH. THE TRYWERYN AND THE CELYN ABOVE LLYN CELYN ALSO FAIL TO MEET TARGET LEVELS OF COPPER		
OPTIONS	Responsibility	Advantages	Disadvantages
Identify local causes of acidification and investigate cost benefit of liming as a remedial measure.	NRA	Information for determining action. Increasing pH would benefit fisheries.	NRA cost (unknown). Liming costs (£30K pa). Damage to naturally acidic habitats.
Identify local inputs of copper and quantify problem. Determine action.	NRA	Information for determining action.	NRA cost (unknown).
Reconcile water quality results with biological assessments.	NRA	Quantification of problem and most appropriate monitoring procedure.	NRA cost (unknown). Cost of long term monitoring (unknown).

ISSUES AND OPTIONS

ISSUE No : 32	THE GLYN IS IN FE5 DUE TO LOW pH		
OPTIONS	Responsibility	Advantages	Disadvantages
Identify local cause of acidification and investigate cost benefit of liming as a remedial measure.	NRA	Information for determining future action. Liming would benefit fisheries.	NRA cost (unknown). Liming cost (£20K pa). Potential damage to naturally acidic habitats.

ISSUE No : 33	THE SHROPSHIRE UNION CANAL FAILS ITS TARGET NEAR WAVERTON, CHESTER (BOD/PARTICULATE SOLIDS) AND AT GRINDLEY BROOK NEAR WHITCHURCH (MARGINALLY ELEVATED PARTICULATE SOLIDS)		
OPTIONS	Responsibility	Advantages	Disadvantages
Investigation to identify sources of inputs.	NRA	Provision of information to determine action.	NRA cost (unknown).

ISSUE No : 34	THE QUALITY OF ABSTRACTED WATER AT BRITHDIR MAWR, LLYN CYFYNWY, PENDINAS AND LLIDIARDAU IS NOT CONSISTENT WITH THE TREATMENT PROVIDED, DUE TO ELEVATED AMMONIA LEVELS		
OPTIONS	Responsibility	Advantages	Disadvantages
Increase investigations of these reservoirs to locate inputs.	NRA	Provision of information to determine action.	NRA cost (unknown).

ISSUE No : 35	THE RESULTS FOR THE METALS COPPER AND ZINC ARE OFTEN INEXPLICABLY HIGH AND INCONSISTENT WITH BIOLOGICAL INFORMATION		
OPTIONS	Responsibility	Advantages	Disadvantages
Investigation of methodology used to derive metal standards for low hardness waters. The current methodology may be inappropriate in parts of the Dee catchment.	NRA	Establish which standards should be used to evaluate the metal content of Dee and similar waters.	NRA cost (unknown). Metals are a problem if standards are appropriate.

ISSUE No : 36	BIOLOGICAL INDICATORS SHOW ACIDIFICATION TO BE A PROBLEM IN MANY OF THE UPPER REACHES. THERE IS NO CONSISTENCY IN THE RESULTS WITH 'SENSITIVE AREAS' OR WITH CONIFEROUS AFFORESTATION		
OPTIONS	Responsibility	Advantages	Disadvantages
Further evaluation of the results, the accuracy of 'sensitivity' maps and afforestation practices.	NRA	Better understanding of the acidification problem will provide sound basis for future actions in the Dee and elsewhere.	NRA cost (unknown).

ISSUE No : 37	FALLING GROUNDWATER LEVELS AND BASE FLOWS IN THE ALDFORD BROOK CATCHMENT		
OPTIONS	Responsibility	Advantages	Disadvantages
Nationally approved methodology for establishing severity of problem to be applied.	NRA	Assess severity of problem as basis for further action.	NRA cost (unknown).
Investigation and modelling of groundwater flows and levels in Triassic Sandstone.	NRA	Establish cause and impact of falling groundwater table in the Triassic Sandstone.	Cost (£100K).

ISSUE No : 38		IMPACT OF FALLING GROUNDWATER TABLE ON WORTHENBURY BROOK CATCHMENT	
OPTIONS	Responsibility	Advantages	Disadvantages
Carry out low flow gauging surveys on Worthenbury Brook catchment.	NRA	Assess severity of problem as basis for further action.	NRA cost (unknown). Weather dependent.
Construct flow measurement station on Worthenbury Brook.	NRA	Enables continuous measurement and observation of trends in flow over time.	Cost (£150K).
Investigate and model groundwater levels and flow in Triassic Sandstone.	NRA	Establish cause and impact of falling groundwater table in the Triassic Sandstone.	Cost (£100K).

ISSUE No : 39		ALLEVIATION OF LOW FLOWS IN CLYWEDOG CATCHMENT	
OPTIONS	Responsibility	Advantages	Disadvantages
Identify alternative resource as a replacement for existing licensed abstraction.	NRA/ Abstractor	Cause of problem removed and improved flows below current point of abstraction.	Cost (under negotiation).

ISSUE No : 40.	LOW FLOWS IN DOLFECHLAS BROOK		
OPTIONS	Responsibility	Advantages	Disadvantages
Investigate further the low flow situation in the Dolfechlas Brook by current meter low flow gauging survey.	NRA	Identification of problem areas and potential for improving the situation.	Cost (unknown). Weather dependent.
Investigate alternative sources to reduce impact of existing abstraction.	NRA/ Abstractor	Better management of resources to reduce impact of abstraction.	Cost (unknown).
Nationally approved methodology of establishing severity of problem to be applied.	NRA	Assess severity of problem as basis for further action.	Cost (unknown).

ISSUE No : 41		BYELAWS TO REGULATE COCKLE FISHERY	
OPTIONS	Responsibility	Advantages	Disadvantages
Implement proposed byelaws when approved.	NRA	Control of fishery Conservation benefits. Improved management of commercial resource. Integration of controls with District Councils responsible for access to foreshore and health monitoring.	Total cost (unknown). Increased administration costs (£10K).

ISSUE No : 42		IMPACTS FROM RECREATION AND COCKLING ON ESTUARINE BIRDS IN THE DEE ESTUARY POORLY DEFINED	
OPTIONS	Responsibility	Advantages	Disadvantages
Investigate impacts.	NRA/RSPB	Provides management data for effective application here and in other similar coastal areas. Costs already allocated in RSPB management agreement.	Total cost (unknown).

ISSUE No : 43	MANAGEMENT OF SPOIL TIP-AT POINT OF AYR		
OPTIONS	Responsibility	Advantages	Disadvantages
Sign lease with British Coal.	NRA/ British Coal	Site protection, restorations and enhancement.	Delays could jeopardise conservation interests in the estuary.

ISSUE No : 44	MANAGEMENT PLAN FOR NRA LANDHOLDINGS		
OPTIONS	Responsibility	Advantages	Disadvantages
Complete management plans.	NRA	Planned strategy for management.	Preparation costs (£5K). Implementation costs (unknown).

ISSUE No : 45	COMPREHENSIVE STRATEGY FOR ESTUARINE MANAGEMENT		
OPTIONS	Responsibility	Advantages	Disadvantages
Issue strategy document.	EN/CCW/LAs	Integrated estuarine management.	Potential conflicts between interested parties.

ISSUE No : 46	FRAGMENTED LANDSCAPE DESIGNATION FOR DEE ESTUARY		
OPTIONS	Responsibility	Advantages	Disadvantages
Review designation.	County Councils	Entire estuary designation would rationalise planning and landscape issues.	Conflicts arising from designations. Impact on land value.

ISSUE No : 47	BOUNDARY OF DEE ESTUARY SSSI REQUIRES REVIEW		
OPTIONS	Responsibility	Advantages	Disadvantages
Reassess extent of SSSI.	CCW/EN	Extending area would further protection of fragile and threatened habitats.	Cost implications. Conflicts arising from wider designations.

ISSUE No : 48	CHANGES TO NET LIMITATION ORDER FOR LICENSED NETTING OF SALMONIDS BY 1995		
OPTIONS	Responsibility	Advantages	Disadvantages
Statutory responsibility to Review Net Limitation Order every 10 years.	NRA	Assessment of present and past netting operation in regard to salmon exploitation.	Conflict with operators if numbers of nets are to be reduced.

ISSUE No : 49		INTERFERENCE OF SALMON MIGRATION FROM THE ESTUARY TO FRESHWATER UNDER LOW FLOWS	
OPTIONS	Responsibility	Advantages	Disadvantages
Examine impact of Chester weir and determine flow requirement for successful migration.	NRA	Establishes most suitable flow regime for salmonid migration.	Cost (£50K).
Undertake studies to evaluate benefits of artificial freshets.	NRA	Best use of available water identified.	May be insufficient yield within system to adopt best practice.

ISSUE No : 50		NUMBERS OF COARSE FISH IN LOWER DEE BELOW OPTIMUM	
OPTIONS	Responsibility	Advantages	Disadvantages
Habitat management.	NRA/Chester Waterways	Low cost. Conservation enhancement.	Landowner consent required.

ISSUE No : 51	IMPACTS OF BOATING ON ECOLOGY OF LOWER DEE		
OPTIONS	Responsibility	Advantages	Disadvantages
Enforce speed limits.	Chester City Council	Control erosion . Improve amenity. Habitat enhancement.	Difficult to enforce.
Produce guidance leaflet.	Chester City Council	Increase public awareness.	Cost (£5K).
Use NRA R&D report to evaluate impact of boat traffic/hull design and consider scope for change, if necessary.	Chester City Council/ NRA	Regulation proposals based on scientific evidence.	Cost (£50K). User resistance.

ISSUE No : 52	SHORTAGE OF LOW WATER SLIPWAYS IN THE ESTUARY		
OPTIONS	Responsibility	Advantages	Disadvantages
Provision of new slipways.	Joint Councils/ NRA	Greater access for river users.	Cost (some £30K per slipway).

ISSUE No : 53		INACCESSIBILITY OF SOME TRIBUTARIES TO MIGRATORY SALMONIDS	
OPTIONS	Responsibility	Advantages	Disadvantages
Cost benefit analysis of removal of barrier and/or installation of fish pass.	NRA	Establish benefits of overcoming barriers e.g. increase rod catch.	Costs (£200K). Genetic implications to native trout.

ISSUE No : 54		DEGRADED BANKSIDE AND INSTREAM HABITAT	
OPTIONS	Responsibility	Advantages	Disadvantages
Reduce cattle damage by restricted access.	NRA	Improve fish population. Environmental/landscape enhancement. Reduce flood defence commitment. NRA Maintenance costs reduced.	Landowner consent required.
Reduce tree shading to promote instream weed growth.	NRA/Landowner	As above.	Landowner consent required. Conflicts with conservation interests.
Improve instream habitat.	NRA	As above.	Cost (unknown).

ISSUE No : 55	RIVER BANK MANAGEMENT CONFLICTS WITH ENVIRONMENTAL REQUIREMENTS		
OPTIONS	Responsibility	Advantages	Disadvantages
Continue traditional methods.	NRA	Preferred options by Local Flood Defence Committee.	Damages conservation and landscape interest.
Discontinue erosion control upstream of Llangollen.	NRA	Enhance conservation and landscape value of corridor. Cost savings.	May not conform to NRA policy. Landowner resistance.
'Soft' engineering options.	NRA	Enhance conservation and landscape value of corridor. Cost savings.	Landowner /Local Flood Defence Committee resistance. Compensation may be sought.

ISSUE No : 56		GENERAL LACK IN NUMBER AND DIVERSITY OF WETLAND HABITATS FOR FISHERIES AND WILDLIFE	
OPTIONS	Responsibility	Advantages	Disadvantages
Create new habitats.	NRA/CCW/EN	Statutory duty.	Cost implications (Dependent upon scheme). No compensatory mechanisms. Landowner resistance. Requirement for ongoing management.
Manage existing habitats.	NRA	Statutory duty. Cost effective. Compensation available.	Conflicts with Geological Conservation Review. Landowner resistance.

ISSUE No : 57		LACK OF PROMOTION OF RIVERSIDE AMENITY FEATURES, POOR BIRDWATCHING FACILITIES	
OPTIONS	Responsibility	Advantages	Disadvantages
Promote riverside amenity in line with NRA Recreation strategy.	NRA/ County and District Councils/ CCW/EN	Statutory recreation duty. NRA as facilitator reduces single authority costs. Increase public awareness of the environment.	Costs (unknown). Landowner objections.

ISSUE No : 58		HIGH LEVELS OF PISCIVOROUS BIRDS AND LOW NUMBERS OF BARN OWLS IN CATCHMENT	
OPTIONS	Responsibility	Advantages	Disadvantages
R&D Study to assess management options for piscivorous birds.	NRA	Establishes impact on fisheries resource.	Problems of conflicting interest if control required. Cost (unknown).
Enhance barn owl habitats.	NRA/CCW/ Wildlife Trusts/ Landowners/ Hawk & Owl Trust	Can be integrated through current NRA operations. Cost effective.	Cost (unknown).

ISSUE No : 59		POOR FACILITIES FOR STOCK ASSESSMENT AND MONITORING	
OPTIONS	Responsibility	Advantages	Disadvantages
Improve facilities a) Manley Hall Fish Counter (Repair), b) Pont Barcer Fish Trap (Repair), c) Smolt Trap Installation (New).	NRA	Statutory requirement. Compliments Dec Stock Assessment Programme.	Cost. a) (£70K), b) (£35K), c) (£100K).

ISSUE No : 60		LOCALISED RECRUITMENT PROBLEMS IN THE DEE AND ALYN	
OPTIONS	Responsibility	Advantages	Disadvantages
<u>River Dee</u> Investigate to establish cause.	NRA	Management information to determine future action.	Cost (£50K).
<u>River Alyn</u> Investigate methods for reducing compaction of spawning gravels.	NRA	Information for determining future action.	Cost (£50K).

ISSUE No : 61		LOW TEMPERATURE IMPACT ON FISHERIES IN PARTS OF THE DEE AS A CONSEQUENCE OF REGULATED FLOWS	
OPTIONS	Responsibility	Advantages	Disadvantages
Examination of the temperature regime in the storage reservoirs and its implication to the river.	NRA	Information for determining future action. Regulation changes may benefit fisheries, and reduce anglers' concern.	NRA cost (£20K). Regulation complex. Possible conflicts with DCWW.

ISSUE No : 62	IMPACT OF ACIDIFIED WATER RELEASES ON THE FISHERIES OF THE RIVER ALWEN		
OPTIONS	Responsibility	Advantages	Disadvantages
Optimise control regime to minimise impact on fisheries. (Alwen acidification is considered in Issue No. 36).	NRA/DCWW	Perceived that modifications would improve juvenile recruitment on the River Alwen, and enhance adult returns to the Dee catchment.	Modifications to Control Rules. Costs to NRA/DCWW (£50K).

ISSUE No : 63	ACCESS FOR, AND REGULATION OF, CANOEISTS		
OPTIONS	Responsibility	Advantages	Disadvantages
Encourage advancement of legislation to licence.	NRA/BCU and WCA	Greater control over violation of access agreements. Likely increased availability of canoeing water.	Enforcement Agency required. Cost implication. Conflicts of opinion within canoeing bodies.
Encourage land owner agreement for access.	NRA/BCU and WCA	Increase accessibility for canoeists. Reduce conflicts.	None.

ISSUE No : 64		NRA MANAGEMENT PROPOSALS UNDER S.93 WATER RESOURCES ACT 1991	
OPTIONS	Responsibility	Advantages	Disadvantages
Public consultation (Completed 1994).	NRA	Establish public view of proposals to determine future action.	Cost (unknown).
If proposals supported, submit to Secretary of State for Wales for designation.	NRA/ Secretary of State for Wales	Designation would enable more effective pollution prevention.	Cost to industry etc.
Pipe water from upstream of industrialised part of catchment to the abstractors, and/or provide bankside storage.	Water undertakers	Pre-empt need for S.93 Order. Supplies with greatly reduced risk of contamination made available.	Enormous cost (Costs to date have been prohibitive). Environmental degradation.

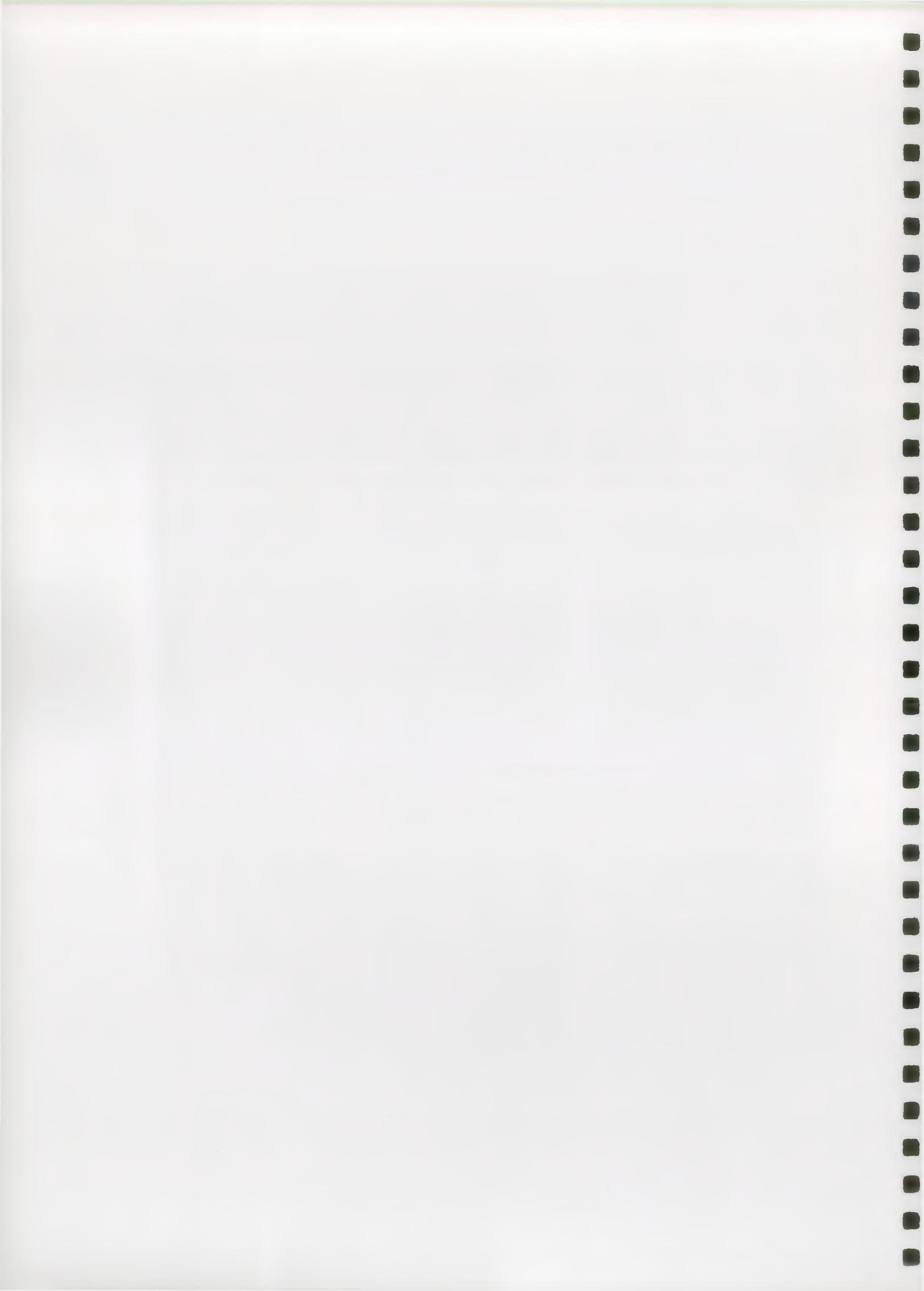
ISSUE No : 65		LOSS OF YOUNG SALMON AND SEA TROUT AT EXISTING FISH FARMS WITHOUT SUITABLE SCREENS	
OPTIONS	Responsibility	Advantages	Disadvantages
NRA buys screen and enters agreement whereby fish farmer agrees non-liability on NRA and agrees to maintain screen.	NRA/Fish Farmer	Conserves valuable smolts and saves NRA cost of mounting annual rescue.	Cost (unknown). Obtaining agreement with fish farm owner.

ISSUES AND OPTIONS

ISSUE No : 66		RISK OF DAMAGE TO BROWN TROUT GENETIC INTEGRITY FROM STOCKING	
OPTIONS	Responsibility	Advantages	Disadvantages
Identify pristine reaches of river in consultation with local angling interest and retain as wild brown trout fisheries.	NRA/ Local Anglers	Maintains a pool of genetically true Dee brown trout.	Most likely to involve small reaches of tributary upstream of "barriers" to migration.
Refuse to "consent" further introductions of brown trout unless of Dee parentage.	NRA	Reduces risk and in long term may improve brown trout stocks and catches.	Local angling interest would have reduced supply of fish.
Hatchery supplies of brown trout bred from Dee parents made available. Policy decision required to implement this.	NRA	Ready supply of brown trout available for restocking. Maintains integrity of native trout.	Cost of suitable rearing facilities (unknown). Sufficient brood stock may not be available.

ISSUE No : 67		DECLINE IN "SPRING" RUNNING SALMON	
OPTIONS	Responsibility	Advantages	Disadvantages
Confirmation of byelaws to delay the commencement of angling and netting seasons.	NRA/ Welsh Office	Protection afforded to early running fish.	Objections of fishermen to loss of part of existing season.

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

APPENDIX 3: THE STANDARDS OF NRA FLOOD PROTECTION

1. This refers to the maintenance and improvement of floodbanks, main rivers, 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 Dee are as follows:
 - 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. Main river watercourses and outfall sluices will be maintained to allow for the evaluation 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 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.

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 Dee catchment is the area of land which drains to the Dee river and estuary as far as the headlands of Point of Ayr on the Welsh side and Hoylake on the English side.

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.

MI/d

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

PARAMETER

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

PARR

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

PERMISSIVE POWER

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

POOL

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

REACH

A length of a river.

REDD

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

RIFFLE

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

RIVER CORRIDOR

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

SALMONID FISH

Game fish, e.g. trout and salmon.

SMOLT

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

SPRING RUN

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

SSSI

Abbreviation for 'Site of Special Scientific Interest'.

SURFACE WATERS

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

TELEMETRY

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

WETLAND

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

95-PERCENTILE FLOW

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