local environment agency plan

MEDWAY LEAP

ENVIRONMENTAL OVERVIEW

JANUARY 1999

ENVIRONMENT AGENCY

Medway Area Key Details

General

Area (sq km)	1780.99

Administrative Details

Councils and % of the Kent Area they Administer

Kent CC	67.1
Medway C	9.9
Surrey CC	8.2
East Sussex CC	12.5
West Sussex CC	2.3

Population

Year	Population
1991	734 000
2001 (Estimate)	755 000

Water Resources

Rainfall (mm/yr)

Average	729
Drought Conditions	571

Number of licensed abstractions

Surface Water	265
Groundwater	201
Impoundments	42

Conservation

Sites of Special Scientific Interest	49
Water Dependant SSSIs	30
Special Areas of Conservation	0
Special Protection Areas	0
Ramsar Sites	3
National Nature Reserves	2
Local Nature Reserves	0
Areas of Outstanding Natural Beauty	0

Fisheries

Length of EC Designated Fisheries (km):

Cyprinid		
Freshwater	87.2	Tidal 0
Salmonid		
Freshwater	Bewl Water	Tidal 0

Water Quality

River ecosystem classification as % of the Medway catchment between 1995-1997

Class	
RE1	8
RE2	30
RE3	12
RE4	15
RE5	1

Chemical GQA as % of sites in each class for the Medway catchment rivers in 1995

Class	
A	9
B	35
C	35
D	14
E	6
F	1

Pollution Prevention & Control

Licensed Waste Sites
96

Process Industry Regulations
21(Plus two proposed)

Radioactive Substance Regulations
Authorised sites to accumulate and dispose of radioactive waste 8.

Flood Defence

	Length (km)
Main River *including tidal lengths*	259.74
Sea Defences *Agency responsibility*	11.66
Tidal Banks	55.33

Length of Inland Navigation 31km

CONTENTS

Maps

Note: Maps have been produced using the best available information at December 1998. It is recognised that there may be some inaccuracies. More detailed information may be available from the original source.

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Appendices

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1.0 INTRODUCTION

This Environmental Overview has been prepared to provide supporting information to the Medway Local Environment Agency Plan (LEAP) Consultation Draft. It is a factual description and analysis of the Medway catchment environment and the associated environmental stresses and strains. From this review a series of issues have emerged which have been carried forward into the LEAP Consultation Draft for consideration by the Agency, its partners and those individuals and organisations generally interested in the local environment.

The framework for measuring the state of the environment has been derived from the Environment Agency publication *Viewpoints on the Environment*. This has identified six viewpoints from which the Agency monitors the environment:

- Land use and environmental resources
- Key biological populations, communities and biodiversity
- Compliance with environmental standards and targets
- The health of the environment
- Long term reference sites
- Aesthetic quality

These are described in Section 2 of this Review. The pressures on this environment have then been examined in terms of categories of stresses and strains centred upon particular aspects relevant to the Agency's direct responsibilities and activities. These are:

- Natural forces
- Societal influences
- Abstractions and removals
- Usage, releases and discharges
- Waste arisings and disposals
- Illegal practices

These pressures are set against the description of how the existing environment is performing in Section 3 and areas have therefore been identified where actions are required to restore or improve the environment to a sustainable condition. These are noted as Issues which are listed in the LEAP Consultation Draft as Environmental Issues and Options for Action.

These issues have been grouped according to the environmental concerns developed in the Agency's publication "An Environmental Strategy for the Millennium and Beyond":

Addressing climate change
Improving air quality
Managing our water resources
Enhancing biodiversity
Managing our freshwater fisheries
Delivering integrated river-basin management
Conserving the land
Managing waste
Regulating major industries

This LEAP follows the Area based LEAP produced for the Kent Area of the Environment Agency. The Kent LEAP focused on strategic issues in the area; this catchment LEAP supplements the information provided in the Kent LEAP and addresses more local issues particular to the Medway catchment.

2.0 MEDWAY CATCHMENT ENVIRONMENT

2.1 LAND USE AND ENVIRONMENTAL RESOURCES

2.1.1 The Medway catchment

The Medway is the largest catchment in the Kent Area covering 1780 km^2, and contains 260 km of main river (Map 1). The River Medway rises as a spring in the Ashdown Forest above East Grinstead in East Sussex where the sands and clays of the High Weald give the river its character with a multitude of deeply incised tributaries. The river flows north-east towards Penshurst where it is joined by the River Eden which rises above Oxted in Surrey. As the Medway flows across the Vale of Kent it collects other tributaries from the High Weald including the Bourne, Teise and Beult. The Beult, which rises in the Hythe Sandstone ridge south of Ashford and receives run-off from the Weald Clay, is the longest tributary of the Medway.

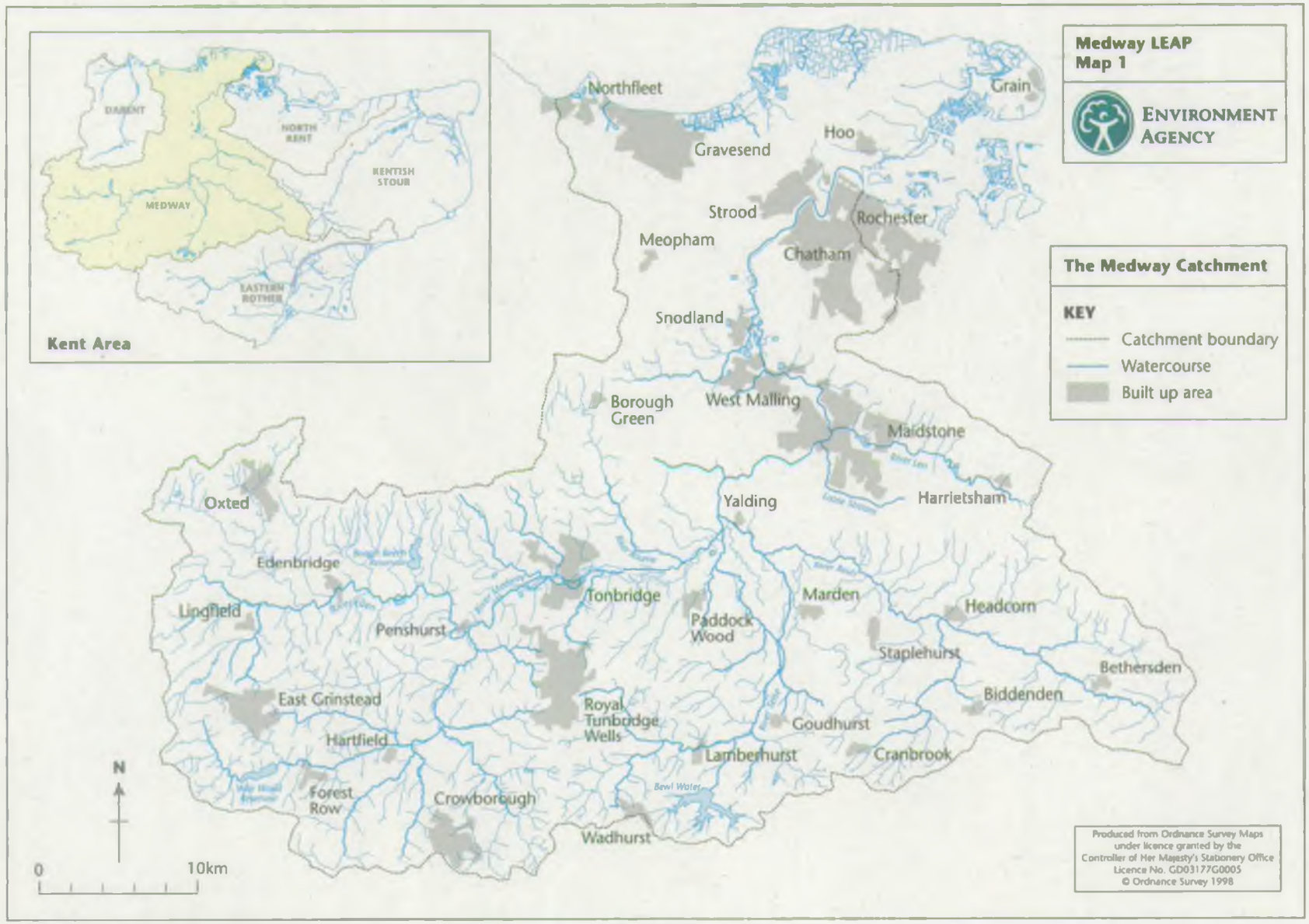
The Medway then cuts through the Greensand Ridge beyond Yalding before reaching its tidal limit at Allington Lock in Maidstone. It then flows north cutting through the Chalk before the estuary widens out at Rochester. The estuary below Gillingham is covered by the North Kent LEAP. The Agency is the Navigation Authority for the River Medway between Maidstone (Allington Lock) and Tonbridge, a total of 31 km of inland navigation. While it is largely an agricultural catchment above Maidstone, downstream the river has a very different character flowing through urban settlements and receiving discharges from industry in its lower reaches.

Administrative areas

Most of the catchment, 1372 km^2, is within the County of Kent. The catchment also includes parts of Surrey, East Sussex and West Sussex encompassing the Agency's operational boundaries which include the headwaters of the rivers Medway, Eden and Teise (Map 2).

Local authorities within the Medway catchment are the district and borough councils of Ashford, Gravesham, Maidstone, Sevenoaks, Tonbridge & Malling and Tunbridge Wells (all in Kent), parts of Wealden and Rother (in East Sussex), Tandridge (in Surrey) and Mid Sussex (in West Sussex). In April 1998 Gillingham Borough and Rochester-upon-Medway City Councils merged to become a Unitary Authority, Medway Council, with responsibility for both strategic and local planning.

The Agency is consulted by Local Planning Authorities (LPAs) in the preparation of development plans and on certain planning applications, since changes in land use and the distribution of the human population influence the work of the Agency.


Medway LEAP
Map 1
Environment Agency
The Medway Catchment
KEY
Catchment boundary
Watercourse
Built up area
Kent Area
DARENT
NORTH KENT
MEDWAY
RENTISH STOUR
EASTERN ROTHER
Northfleet
Grain
Gravesend
Hoo
Strood
Rochester
Meopham
Chatham
Snodland
Borough Green
West Malling
Maidstone
Oxted
Yalding
Harrietsham
Edenbridge
Tonbridge
Marden
Headcorn
Lingfield
Penshurst
Paddock Wood
Staplehurst
Bethersden
East Grinstead
Biddenden
Royal Tunbridge Wells
Goudhurst
Hartfield
Lamberhurst
Cranbrook
Forest Row
Crowborough
Bewl Water
Wadhurst
N
0
10km
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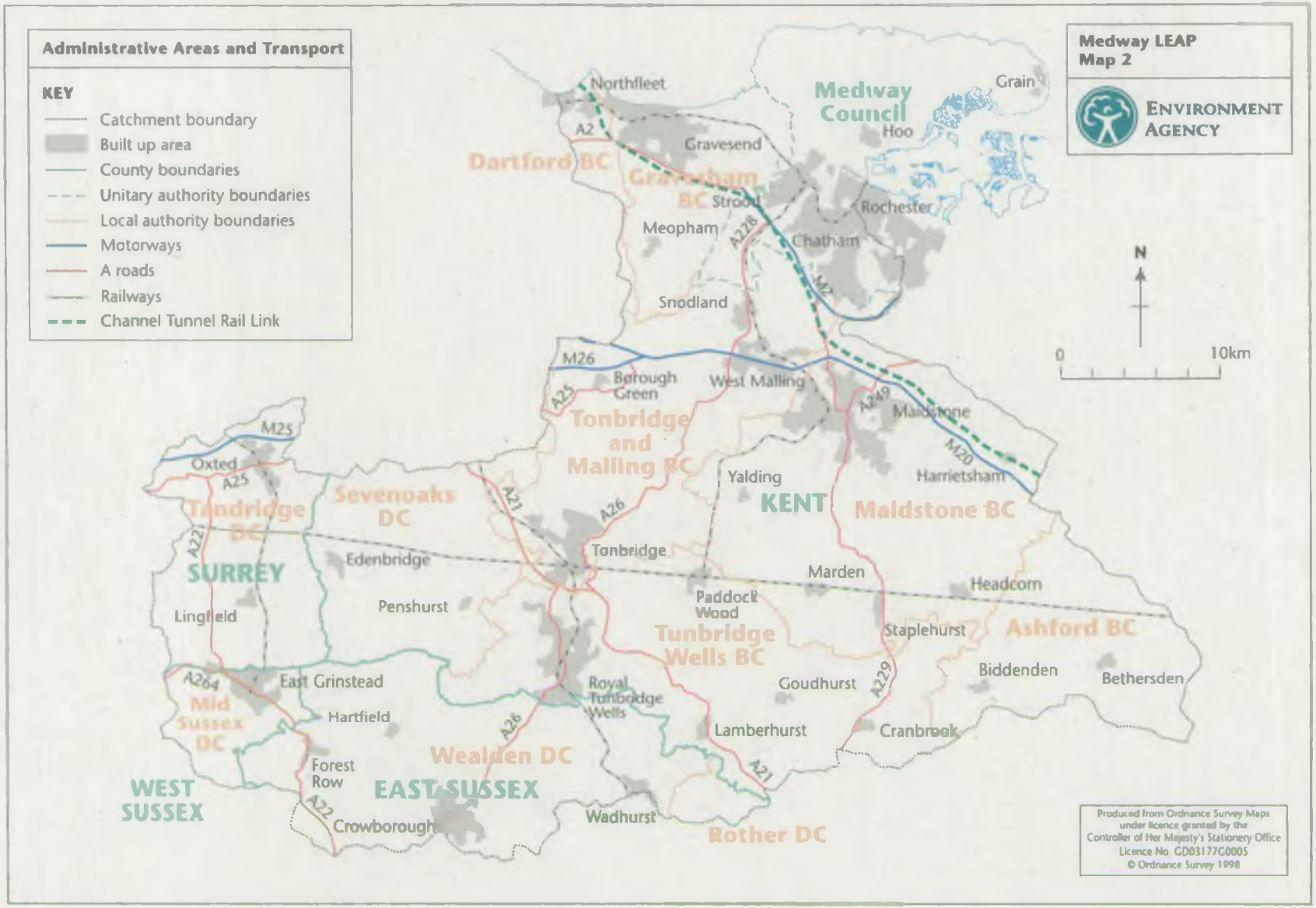
Administrative Areas and Transport
KEY
Catchment boundary
Built up area
County boundaries
Unitary authority boundaries
Local authority boundaries
Motorways
A roads
Railways
Channel Tunnel Rail Link
Medway LEAP
Map 2
Environment Agency
Northfleet
Grain
Medway Council
Hoo
Gravesend
A2
Dartford BC
Gravesham BC
Strood
Rochester
Meopham
A228
Chatham
M2
Snodland
N
0
10km
M26
Borough Green
West Malling
A25
A249
Maidstone
Tonbridge and Malling BC
M25
M20
Oxted
A25
Yalding
Harrietsham
Tandridge DC
Sevenoaks DC
A21
A26
KENT
Maldstone BC
A22
SURREY
Edenbridge
Tonbridge
Marden
Headcorn
Penshurst
Paddock Wood
Lingfield
Tunbridge Wells BC
Staplehurst
Ashford BC
A264
East Grinstead
Royal Tunbridge Wells
Goudhurst
A229
Biddenden
Bethersden
Mid Sussex DC
Hartfield
Lamberhurst
Cranbrook
A26
Wealden DC
Forest Row
EAST SUSSEX
A21
WEST SUSSEX
A22
Crowborough
Wadhurst
Rother DC
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The north of the catchment, including the towns of Gravesend, Rochester, and Chatham, as well as the Hoo Peninsula have been designated under the Thames Gateway area to promote economic development. The Kent Structure Plan (1996) encourages commercial development in this area.

Constraints upon development exist in the form of the metropolitan green belt, which encompasses most of the catchment east of the Medway Gap, including the towns of Sevenoaks, Tonbridge, Royal Tunbridge Wells and Gravesend. Other constraints upon development include the Kent Downs and the High Weald Areas of Outstanding Natural Beauty (AONBs), which preserve the character of the landscape.

2.1.2 Geology and topography

The geology and topography of the Medway catchment controls the hydrology of the area, and therefore influences the available water resources. The allocation of the effective rainfall (essentially the total available water resource for the area) between surface and groundwater is reflected in the surface drainage. Clay and silt areas with low permeability have a high run-off component, whilst chalk and sand allow a greater proportion of the effective rainfall to recharge the groundwater.

The geology in the Medway catchment is dominated by a succession of cretaceous and tertiary rocks. Within the catchment there are seven main geological areas (Map 3):

(i) High Weald

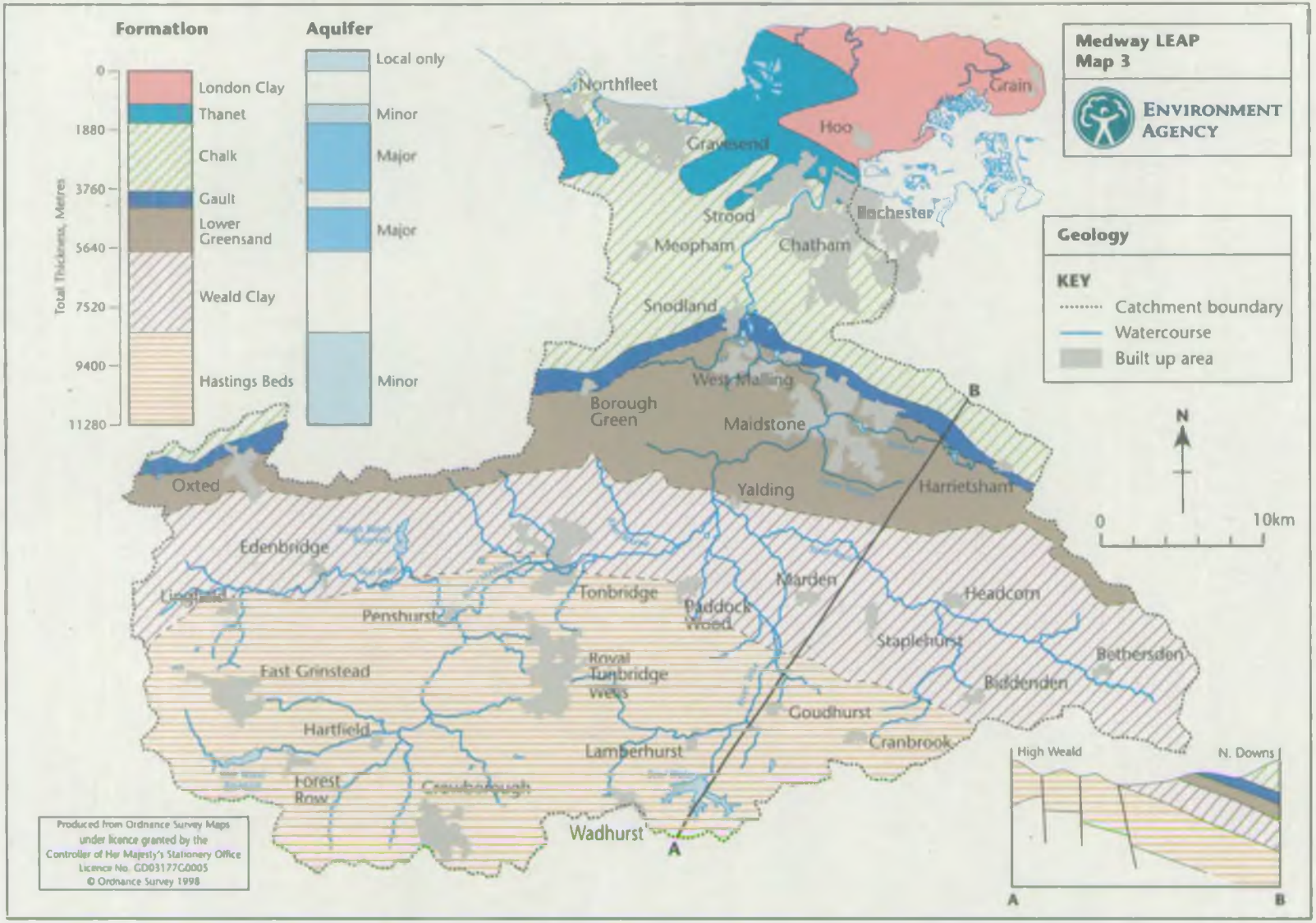
This area comprises the Hastings Beds, composed of sandstones, siltstones and clays. The more permeable components are locally important aquifers feeding the numerous springs which provide the baseflow for the headwater tributaries of the Medway and Teise.

(ii) Vale of Kent

North of the High Weald the Vale of Kent consists of lowlands of weald clay. Both the River Eden and River Beult arise in the Vale of Kent, largely fed by surface run-off from the clay. The source of the River Eden also receives spring flow from the Lower Greensand north of the Vale of Kent.

(iii) Ragstone Ridge

A prominent feature lying immediately north of the Vale of Kent and rising to 120 mAOD south of Maidstone. This area marks the outcrop of the Lower Greensand, a sequence of water-bearing limestones and sandstones feeding the River Len and the source of the River Eden.


Formation
Aquifer
Total Thickness, Metres
0
1880
3760
5640
7520
9400
11280
London Clay
Thanet
Chalk
Gault
Lower Greensand
Weald Clay
Hastings Beds
Local only
Minor
Major
Major
Minor
Medway LEAP
Map 3
Environment Agency
Geology
KEY
Catchment boundary
Watercourse
Built up area
Northfleet
Grain
Hoo
Gravesend
Rochester
Strood
Meopham
Chatham
Snodland
West Malling
Borough Green
Maidstone
Oxted
Yalding
Harrietsham
Edenbridge
Tonbridge
Paddock Wood
Marden
Headcorn
Penshurst
Staplehurst
Bethersden
East Grinstead
Royal Tunbridge Wells
Biddenden
Goudhurst
Hartfield
Cranbrook
Lamberhurst
Forest Row
Crowborough
Wadhurst
A
B
N
0
10km
High Weald
N. Downs
A
B
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(iv) Vale of Holmesdale

This is a narrow tract of lowland formed by the softer sandier levels of the Lower Greensand and the overlying Gault Clay, the sequence dipping north-east beneath the chalk of the North Downs.

(v) North Downs

The Chalk of the North Downs forms the major topographical feature of the area, rising from east to west, to a height of 180 m AoD north of Maidstone and reaching a maximum of 275 mAOD. The North Kent coastal chalk aquifer feeds the River Medway in its lower reaches north of Holborough.

(vi) Lower London Tertiaries

The Thanet beds form an area of fertile sandy soils between the Medway towns and Gravesend.

(vii) London Clay

This underlies the area between the Isle of Grain and Gravesend. It is a region of heavy, poorly drained soils supporting expanses of marsh and wetland fed by springs discharging from the Chalk and Lower London Tertiary aquifers.

Topographically the catchment area comprises approximately 1400 km^2 above, and 400 km^2 below the tidal limit (Map 4). The maximum height in the catchment is 277 m AOD. Features such as the North Downs and the Ragstone Ridge feed the tributaries to the Medway, whilst the flood plains of the river corridor support arable agriculture and urban areas such as Tonbridge and Maidstone.

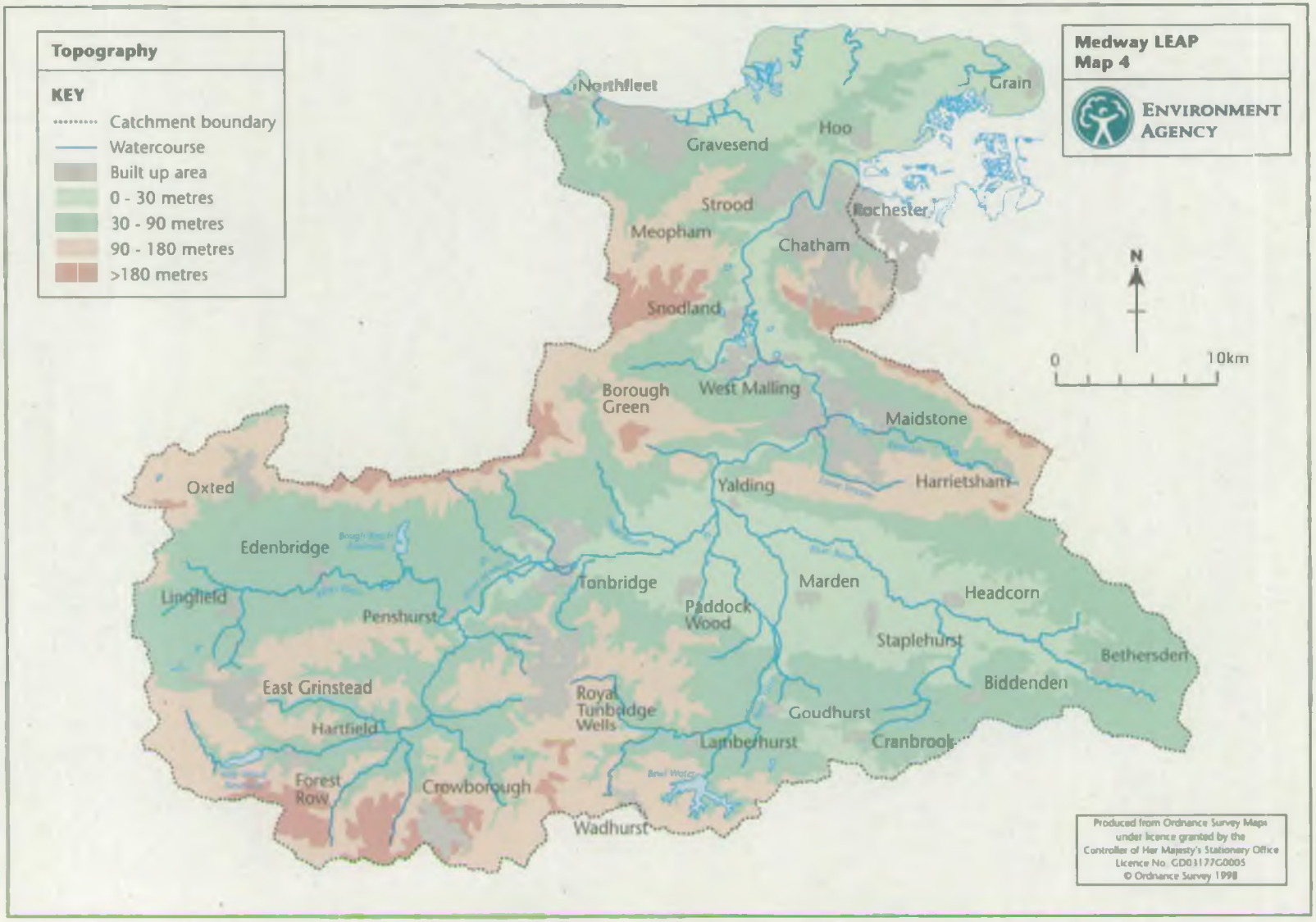
2.1.3 Climate and air quality

Rainfall

Average annual rainfall varies across the Medway catchment. The average annual rainfall for the catchment is 729 mm, which decreases during a 1 in 10 yr drought to 571 mm.

Air Quality

In terms of air quality, there is considerable local variation between urban and rural areas, and between residential, commercial and industrial areas. Pollutant emissions in the Medway catchment are characterised by large industrial sources, typically oil and coal power stations, cement works and an extensive road network. (Maps 2 and 5).


Topography
KEY
Catchment boundary
Watercourse
Built up area
0 - 30 metres
30 - 90 metres
90 - 180 metres
>180 metres
Medway LEAP
Map 4
Environment Agency
N
0
10km
Northfleet
Grain
Hoo
Gravesend
Strood
Rochester
Meopham
Chatham
Snodland
Borough Green
West Malling
Maidstone
Oxted
Yalding
Harrietsham
Edenbridge
Tonbridge
Marden
Headcorn
Lingfield
Penshurst
Paddock Wood
Staplehurst
Bethersden
East Grinstead
Biddenden
Royal Tunbridge Wells
Goudhurst
Hartfield
Lamberhurst
Cranbrook
Forest Row
Crowborough
Wadhurst
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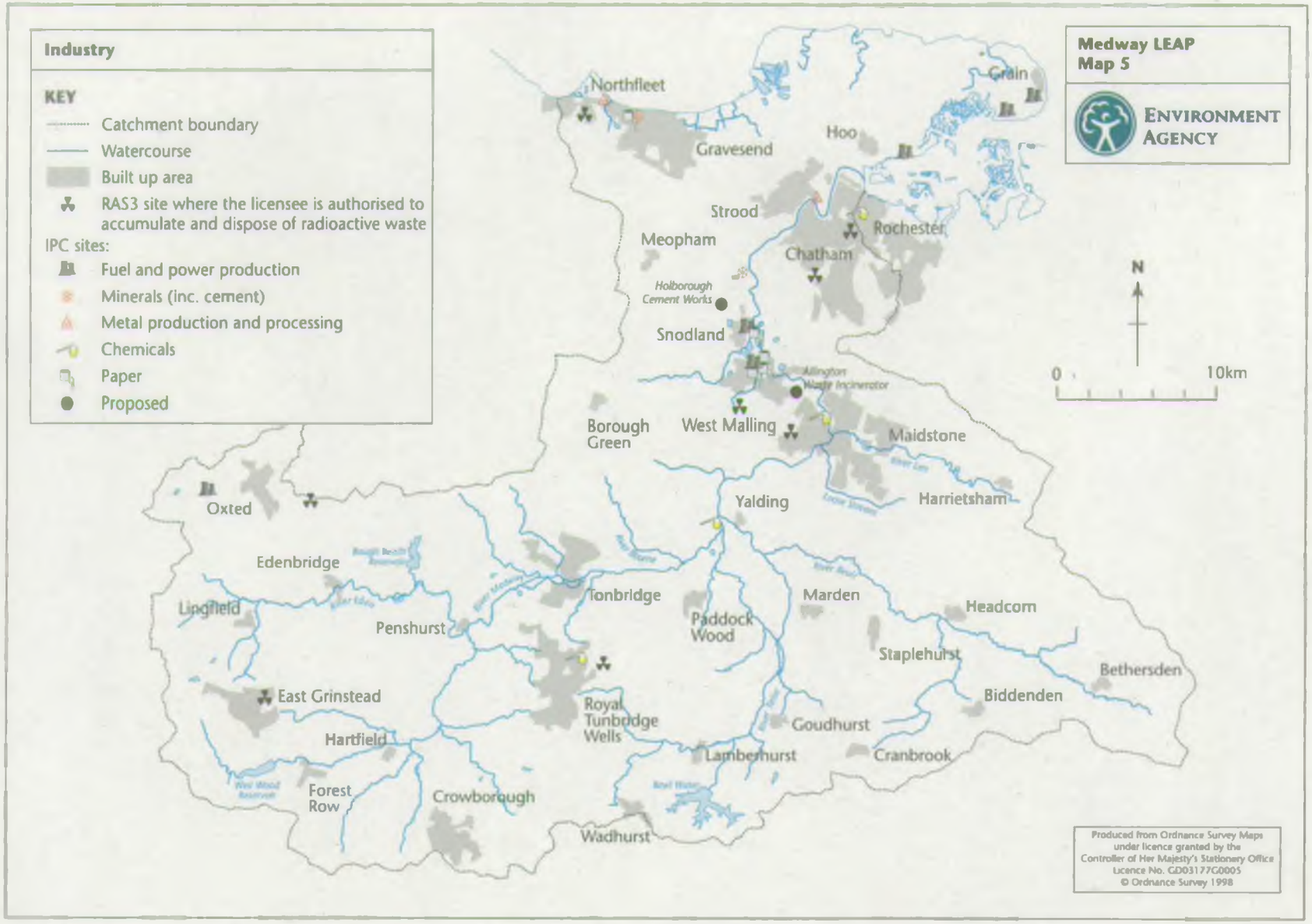
Industry
KEY
Catchment boundary
Watercourse
Built up area
RAS3 site where the licensee is authorised to accumulate and dispose of radioactive waste
IPC sites:
Fuel and power production
Minerals (inc. cement)
Metal production and processing
Chemicals
Paper
Proposed
Medway LEAP
Map 5
Environment Agency
N
0
10km
Northfleet
Grain
Gravesend
Hoo
Strood
Rochester
Meopham
Chatham
Holborough Cement Works
Snodland
Allington Waste Incinerator
Borough Green
West Malling
Maidstone
Oxted
Yalding
Harrietsham
Edenbridge
Lingfield
Penshurst
Tonbridge
Paddock Wood
Marden
Headcorn
Staplehurst
Bethersden
East Grinstead
Royal Tunbridge Wells
Biddenden
Goudhurst
Hartfield
Lamberhurst
Cranbrook
Forest Row
Crowborough
Wadhurst
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2.1.4 Land use, agriculture, industry and minerals

Land use and agriculture

The Medway catchment contains the greatest urban development in the Kent area outside south-east London. The towns of the Medway include Gravesend, Maidstone, Tonbridge, Royal Tunbridge Wells, Chatham and Rochester in Kent, as well as East Grinstead in West Sussex and Crowborough in East Sussex. There has been considerable urban development in the last thirty years, mainly of former agricultural land. Land use changes in the Medway area resemble those across the county as a whole. Changes in the use of agricultural land involve the conversion of former grassland and orchards to arable cultivation. There remains a concentration of orchards and hops in the lowlands between Maidstone, Sevenoaks and Royal Tunbridge Wells. Large areas of freshwater grazing marshes are found along the North Kent coast, with fragments of the habitat inland, particularly above Maidstone. The area of this habitat, which supports internationally important populations of wildfowl and migratory birds, has significantly declined, virtually all due to improved land drainage and conversion to arable cultivation and grassland (KCC 1995).

Industry

The area has an extensive history of heavy manufacturing industry which has now left a legacy of derelict land. The Medway catchment north of Maidstone is still characterised by industry with chemical, pharmaceutical and major cement works, and 5 paper mills (Map 5).

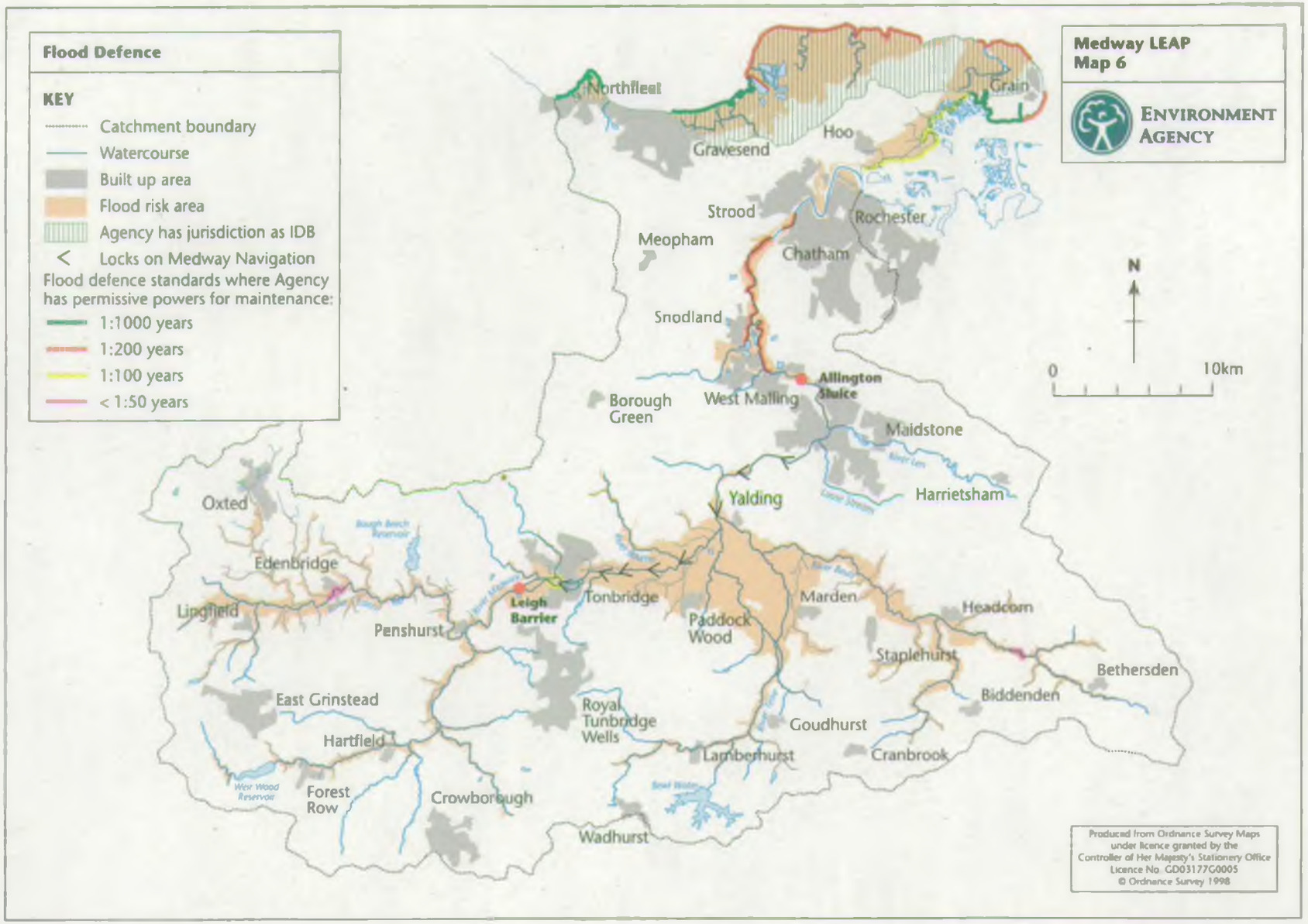
Minerals

The minerals within the Medway catchment comprise sand, gravel and chalk. Material from marine sources is also landed at wharves within the area.

2.1.5 Contaminated land

The extent and nature of land contamination in any area is a legacy of its industrial and urban development. Industrial development has been particularly substantial in the north of the catchment. There are many areas of contaminated land in the Medway catchment, including closed landfill sites, old gas works, and former and current industrial sites, including some in sensitive locations such as land adjacent to rivers or above vulnerable aquifers or within source protection zones of potable abstractions. The disused oil refinery on the Isle of Grain, suitable for redevelopment, covers approximately 1500 hectares.

A few contaminated sites are known where pollution of groundwaters is likely to be a problem in the Medway catchment. This is likely to be only a small percentage of the total figure of potential 'at risk' sites as at present they are picked up through planning applications and specific incidents rather than


Flood Defence
KEY
Catchment boundary
Watercourse
Built up area
Flood risk area
Agency has jurisdiction as IDB
< Locks on Medway Navigation
Flood defence standards where Agency has permissive powers for maintenance:
1:1000 years
1:200 years
1:100 years
< 1:50 years
Medway LEAP Map 6
ENVIRONMENT AGENCY
N
0
10km
Northfleet
Grain
Gravesend
Hoo
Strood
Rochester
Meopham
Chatham
Snodland
Allington Sluice
Borough Green
West Malling
Maidstone
Harrietsham
Yalding
Oxted
Edenbridge
Lingfield
Penshurst
Leigh Barrier
Tonbridge
Paddock Wood
Marden
Headcorn
Staplehurst
Bethersden
Biddenden
East Grinstead
Royal Tunbridge Wells
Goudhurst
Hartfield
Lamberhurst
Cranbrook
Forest Row
Crowborough
Wadhurst
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from monitoring and active searching which would require many resources than are available. Known severe groundwater pollution has been reported and investigated at several sites and active groundwater rehabilitation (such as vapour extraction) is proposed or currently underway. A number of closed landfill sites in the catchment are known to be sited over aquifers, and are thought to be a potential risk to the pollution of groundwater. Some local problems are caused by the migration of landfill gas generated by landfill sites mainly constructed in the 1970s and 1980s close to housing and other built development.

2.1.6 Flood defence

A key aim of the Environment Agency is to "*provide effective defence and warning systems to protect people and property against flooding from rivers and the sea*".

The Environment Agency has statutory responsibilities in flood defence and warning. It exercises a general supervision over all matters relating to flood defence, but has special responsibility for the management of 'designated main rivers', of which there are 260 km in the Medway catchment. The Agency is also responsible for 7.14 km of sea defences in the Medway catchment, on the north Kent coast.

In flood risk areas it is preferable to avoid increased risk from flooding through control of development rather than to have to carry out works to alleviate problems once they occur. The relevant authority for controlling development in the floodplain is not the Agency but the local planning authority which the Agency advises on flood defence matters.

Flooding has historically been a problem in the Medway, Beult and Eden valleys, for towns within the flood plains along the river. Following the flood of September 1968 which caused massive damage to the town of Tonbridge, the flows in the River Medway are now controlled by sluice gates and a flood storage area at Leigh. The flow through the gates is restricted at times of heavy rainfall to retain the flood water on agricultural land upstream. Once the flows have dropped the storage reservoir is drained at a controlled rate. Typically the barrier is required twice a year. Flood defence systems and flood risk areas are shown on Map 6.

Flood defence planning

Strategic planning for flood defence occurs throughout the production of Shoreline Management Plans (SMPs), Strategy Plans and Water Level Management Plans (WLMPs).

A Shoreline Management Plan (SMP) sets out a strategy for coastal defence for a specified length of coast taking account of natural coastal processes, environmental influences and human and other needs. The Agency, in partnership with local authorities, has prepared a consultation draft of the SMP for the North Kent Coast (sub-cells 4a & 4b), of which Process Unit 1 refers to the coastline of the Isle of Grain.

Strategy Plans are long term (usually 50 years or more) plans for coastal and tidal management, defining all necessary work to meet the defence objectives derived for a particular coastline/tidal river stretch. A plan will typically cover a length of coastline along which the coastal processes are self contained and which includes all the defences protecting a given area - thereby accounting for all, and avoiding double counting of, economic benefit contained within an area. It is designed to provide the high level basis for decision making and action related to the provision and management of coastal and tidal defences. Strategies are evolving documents which once approved by the Ministry of Agriculture, Fisheries and Food (MAFF) will enter a programme of five yearly review. Strategy plans bridge the gap between the policy role of the SMPs and operational decision making. The strategies for the Medway and Thames estuaries will be produced by the year 2001.

A Water Level Management Plan (WLMP) is a means by which the water level requirements for a range of activities in a particular area, including agriculture, flood defence and conservation can be balanced and integrated, particularly for Sites of Special Scientific Interest (SSSI) or other areas of high ecological or landscape importance. The Agency is the operating authority for much of Kent and is co-ordinating the production of these documents. Priority is given to SSSIs, particularly those which are also of European/international status. Within the Medway catchment WLMPs have been prepared for the South Thames Estuary and Marshes SSSI and the River Beult SSSI.

Flood defences

Within the Medway Catchment there are effectively three categories of flood defence:

(a) Inland Flood Defences - flood defence systems, such as banks, structural walls, and impounding reservoirs, which protect land and property within the inland flood plain of the Medway and its tributaries.

(b) Tidal Flood Defences - flood defence systems, such as earth embankments, structural walls, and sluice gates, which protect low lying land alongside the tidal reaches of the Medway.

(c) Sea Defences - flood defence systems, such as banks, structural walls, wave walls, shingle beaches, and timber groynes, which protect low lying land along the coastal fringes of the catchment from inundation by the sea.

There are some areas of high ground fronting the estuary that would not be at risk from inundation, although they could be subject to erosion. Maintenance of these frontages and management of the erosion process is defined as "Coastal Protection", as opposed to "Tidal Flood Defences" or "Sea Defences", and usually comes under the jurisdiction of the local councils. The flood defences referred to above (categories (a), (b) and (c)), however, are generally the responsibility of the Environment Agency.

Inland flood defences. This category of flood defences occurs, by definition, upstream of the tidal limit of the river, which, on the Medway, is effectively at Allington Lock, nominally 3 kilometres downstream of Maidstone.

The development of inland flood defences in the Medway Catchment has been carried out over several decades in response to need. At the present time there are six principal locations at which inland flood defences exist, generally to reduce the risk of flooding to densely populated areas:

- Edenbridge - Low earth embankments and structural walls exist along the edges of the River Eden flood plain as it passes through Edenbridge. The scheme was completed in 1981 to reduce the risk of flooding to a 3% chance in any one year.

- Leigh/Tonbridge - The Leigh Barrier was built across the flood plain of the Medway nominally 3 kilometres upstream of Tonbridge. The barrier was completed in 1982 and consists of a concrete sluice structure with 3 electrically-operated radial gates and earth embankments across the flood plain linking the sluice with higher ground at the valley edges, a pumping station at Leigh Village and various culverts and other minor structures. The barrier is operated at times of severe flooding to impound excess floodwater over agricultural land upstream of the sluice thereby reducing the risk of flooding to Tonbridge. Once flows have dropped the river channel is drained at a controlled rate. Typically the barrier is required twice a year. The Leigh Barrier was designed to provide a standard of protection of 1 in 100 years (i.e. a 1% chance of flooding in any year).

- Tonbridge - Low brick flood walls and earth embankments were built in 1957 along the right bank of the Medway as it passes through Tonbridge upstream of Town Lock. These defences were at that time the only protection to the High Street and other properties across a relatively narrow section of the flood plain. They would have originally provided a relatively low standard of protection, but with the commissioning of the Leigh Barrier in 1982, the standard of protection was increased to the Tonbridge area to nominally 1 in 100 years. The flood wall adjacent to River Walk in the town centre was strengthened in 1998 by means of bank stabilisation works consisting of steel sheet piling and concrete/stone revetment. The detailed hydraulic study carried out at the time concluded that the current standard of protection provided to the town centre area was in excess of 1 in 150 years; the increase being at least partly explained by the replacement of the tumbler sluice gates at Town Lock in 1985 by a more efficient automatic radial sluice gate structure.

- Moors Sluice, Collier Street - An automatic radial sluice gated structure and low earth embankments on the River Teise protect a few low lying properties.

- Brook Farm, Marden - Minor earth embankments protect a few low lying properties adjacent to the Lesser Teise. Reconstructed/refurbished in 1997. The standard of protection is undefined.

- Smarden - A recently completed flood defence scheme protects low lying property alongside the River Beult in Smarden. The scheme includes low earth embankments and structural walls with ragstone facing, and provides a standard of protection of 1 in 50 years.

In addition to the above which provide the current standards of protection, the Environment Agency has permissive powers to undertake works on main river watercourses for flood defence purposes. On the navigable sections of the River Medway, river maintenance is assisted by the annual drawing down of reaches of the river between Hampstead Lock and the Leigh Barrier, generally in early spring after the last of the winter storms. During these drawdown periods, inspections are made of the condition of the channel and essential works can be carried out or programmed for a later date. Regular work also undertaken by the Agency and other drainage authorities includes weed and debris clearance, shoal removal and bank vegetation cutting.

Tidal flood defences. This category of flood defence exists on the Medway between the tidal limit at Allington Lock and the relatively high ground on the Isle of Grain.

Tidal defences extend along virtually the whole length of the left (west) bank of the river and estuary and principally come under the jurisdiction of the Environment Agency. The exception to this is through the urbanised area of the Medway towns where the defences are the responsibility of the new Medway Council or private landowners. In general, the defences comprise earth banks, but at particular locations such as Aylesford Village, New Hythe, the Medway towns and Kingsnorth Power Station, hard defences in the form of concrete, steel sheet piled and gabion walls exist.

On the right (east) bank of the Medway, the tidal defences between Allington Lock and the M2 motorway crossing come under the jurisdiction of the Environment Agency, whilst the tidal defences through the Medway towns are again the responsibility of the Medway Council. As on the opposite bank, the defences are generally in the form of earth banks with hard defences at Aylesford Village and the Medway towns.

In general, the Medway tidal defences were constructed many years ago but have been frequently upgraded, particularly after the severe flooding in 1953. In certain areas, such as the Isle of Grain and Kingsnorth Power Station, the tidal defences have been improved relatively recently (a particular example has been improvements at Aylesford Priory completed in 1998). The standard of protection provided varies from nominally 1 in 10 years to 1 in 1000 years depending upon the category of land being protected. The Isle of Grain and Kingsnorth Power Station are both protected to the higher standard. Also,

particularly in these two locations, systems of counterwalls exist to compartmentalise the areas at risk of inundation and to provide a second line of defence.

Tidal flood defences also extend along most of the full length of the south bank of the Thames Estuary between Greenhithe, at the western limit of the Medway LEAP area, and the Isle of Grain. Again, the defences generally consist of earth embankments, but through the urban areas of Gravesend and Northfleet the defences are principally structural walls with moveable steel flood gates at access points. The Thames Tidal Flood Defences were originally constructed in the 1970s with a standard of protection of 1 in 1000 years to tie in with the Thames Barrier and the defences for London.

Sea defences. A relatively short length of the northern coastline on the Isle of Grain, between Yantlet Creek and Grain Village, is designated as sea defences, being outside the Schedule 4 boundaries for the tidal areas of the Medway Estuary and the Thames Estuary. These defences are generally earth embankments with hard revetment on the seaward faces. They were upgraded about 10 years ago to achieve a standard of protection of nominally 1 in 1000 years.

Flood warning

The Environment Agency operates colour-coded flood warning systems for the North Kent Coast and most of the River Medway area. The colour advises of the likely severity of imminent flooding, as detailed below:

- Yellow Warning - Risk of flooding to some low lying farmland and roads near rivers or the sea.
- Amber Warning - Risk of flooding to isolated properties, roads and large areas of farmland near rivers or the sea.
- Red Warning - Risk of serious flooding affecting many properties, roads and large areas of farmland.

To assist with the flood warning procedure, the areas of the catchment at risk from flooding have been divided into a number of "Flood Warning Zones" within which the colour coded warnings are circulated. In inland areas, the local flood defence officers monitor conditions in their areas and generate warnings for zones at risk of flooding. These warnings are then transferred to the Regional Control Centre at Worthing which then issues taped flood warning messages to the public, local authorities, emergency services and members of the public. For coastal areas, the Regional Control Centre (RCC) receives advice on weather conditions from the Meteorological Office and surge tide conditions from the Storm Tide Service. By reference to these forecasts, the local flood defence officers generate warnings which are issued, as before, by the RCC.

2.1.7 Navigation

The Environment Agency is responsible for the management of the Medway Navigation which enables river craft to navigate the river between the tidal limit at Allington Lock and the upstream limit of navigation below the Leigh Barrier, west of Tonbridge, a total distance of nominally 31 kilometres (see Maps 6 and 12).

The navigable part of the river contains ten separate reaches within which water levels are retained at relatively high levels sufficient to permit the passage of boats. At the downstream end of each reach is a lock complex which comprises a boat lock and sluice/weir structures to pass river flows. The reaches of the navigation from downstream to upstream are:

Name of Reach	**Length**
Allington Lock	7.2 kms
East Farleigh Lock	3.2 kms
Teston Lock	4.8 kms
Hampstead Lock	3.6 kms
Sluice Weir Lock	2.0 kms
Oak Weir Lock	1.2 kms
East Lock	2.0 kms
Porters Lock	1.6 kms
Eldridges Lock	2.4 kms
Town Lock	3.0 kms

Most of the existing lock structures are of relatively old construction, although Allington Lock is currently undergoing major refurbishment. Many of the sluice/weir structures at the locks were modernised during the 1980s with the construction of automatic radial sluice gate structures at Oak Weir, East Lock, Porters Lock and Town Lock. On the Hampstead Lock Reach, a pair of automatic radial sluice gate structures was constructed at Anchor sluices in 1964 and these have recently undergone refurbishment. The original automatic radial sluice gates at Sluice Weir (*circa* 1933) are currently being replaced by a single radial gate and fixed weir structure with fish and canoe passes. The sluice/weir structures at the remaining sites are relatively old, although operational.

The difference in water level at each lock complex under normal conditions varies between 1.3 metres and 2.8 metres with a total fall between Allington Lock and Tonbridge of some 17 metres. In canal navigation terms, the locks on the Medway can be described as "wide" capable of accommodating river boats with widths up to 5.6 metres and length 24.5 metres. The Environment Agency maintains depths in the river to enable boats with draughts to navigate the river as follows:

Length of River	Draught
Allington Lock to Maidstone	2.0 metres
Maidstone to Yalding	1.7 metres
Yalding to Tonbridge	1.2 metres

2.1.8 Water resources

The processes involved in the planning and management of the Medway catchment's water resources are based on boundaries which, in many instances, correspond to the watersheds separating the major rivers. Table 2.1 lists the water resource areas in the catchment and the current balance for the areas in terms of authorised abstraction under average year conditions.

Table 2.1: Water resource areas in the Medway catchment

Water Resource Areas	Number	Area (km^2)	% Commitment
Medway Estuary	1	458	99
Medway (middle)	2	385	22
Eden	3	223	77
Medway (upper)	4	252	15
Teise	5	224	38
Beult	6	293	1
West Swale (part)	7	67	> 100

Surface water

Each river system displays a pattern of seasonal flow variations which reflects the geological, topographic and land-use characteristics of its catchment area. For example, the Beult, a clay catchment, has very little natural storage and the high winter:summer run off ratio reflects a very "flashy" runoff characteristic.

By contrast, spring-fed streams such as the Loose and Len which drain the permeable limestones and sandstones of the Lower Greensand show much less seasonal variation in flow. Taken overall therefore the Medway catchment displays a fairly complex flow regime reflecting the varied geology and also, the high degree of artificial regulation associated with flood control operations and pumped abstraction for public supply.

The Medway is reputedly one of the most heavily regulated rivers for its size in England and this is due in large part to the impact of the Medway Scheme, a strategic pumped storage and river transfer facility based on Bewl Water Reservoir located in the headwaters near Lamberhurst.

The Medway Scheme is the largest surface water public supply scheme in the Southern Region and has been in operation since 1977, serving a total

population of more than 500,000 in the Medway towns and West Kent. It was promoted by the Medway Water (Bewl Bridge Reservoir) Act 1968 and is owned and operated by Southern Water Services Ltd (see Map 7).

In its natural, unregulated state the Medway displays large short-period fluctuations in flows and even at its tidal limit at Allington near Maidstone, the summer flows would normally be insufficient to sustain a major public water supply operation without, at the same time, bringing about substantial reductions in downstream flow and consequent risk to estuary quality. The scheme was therefore devised primarily to create higher summer flows at the Maidstone (Springfield) public supply intake and by this means, sustain greater rates of daily abstraction with an overall improvement in yield.

Water abstracted during the winter at intakes on the River Medway at Yalding and the River Teise at Smallbridge is pumped to Bewl Water Reservoir and stored for subsequent release back to the river to support abstraction to supply from Springfield pumping station at times of low flow in the Medway. The releases are made at rates sufficient to meet the maximum authorised daily abstraction rate and also satisfy the Agency's requirements with respect to Minimum Residual Flow (MRF) to the estuary.

The MRF is set at 275 Ml/d as determined at Teston gauging station and this is the minimum flow necessary to satisfy all demands on the river including water quality and environmental requirements for the estuary. The abstraction by Southern Water Services at Springfield represents the most important single demand below Teston, amounting to a maximum authorised average daily rate of 136 Ml/d. There are five additional authorised abstractions between Teston and Allington sluice totalling the equivalent of approximately 10 Ml/d and giving an aggregate rate, together with Springfield, of 146 Ml/d.

A special condition in the Medway Scheme Licence requires that at such times when the flow in the Medway as measured at Teston gauging station is below the MRF, Southern Water Services must make releases from Bewl Water Reservoir at rates 20% above the margin by which the abstraction at Springfield exceeds the MRF. This produces an enhanced freshwater flow into the estuary at times of low natural discharge through Allington tidal sluice.

At an MRF at Teston of 275 Ml/d, there is normally sufficient freshwater flow into the estuary to satisfy the specified Environmental Quality Standards and dissolved oxygen levels. A minimum of freshwater flow is also required to provide a "window" of suitable quality water for abstraction by Aylesford Newsprint and Townsend Hook (Snodland) paper mills, both of whom have intakes sited near the head of the estuary some 5 km below Allington tidal sluice. Water quality modelling work carried out by the Agency indicates that a Q95 flow of 220 Ml/d at Allington would be required to provide sufficient freshwater flow into the estuary to achieve the specified RQO. The principal terms of the Medway Scheme licence are summarised in Table 2.2.

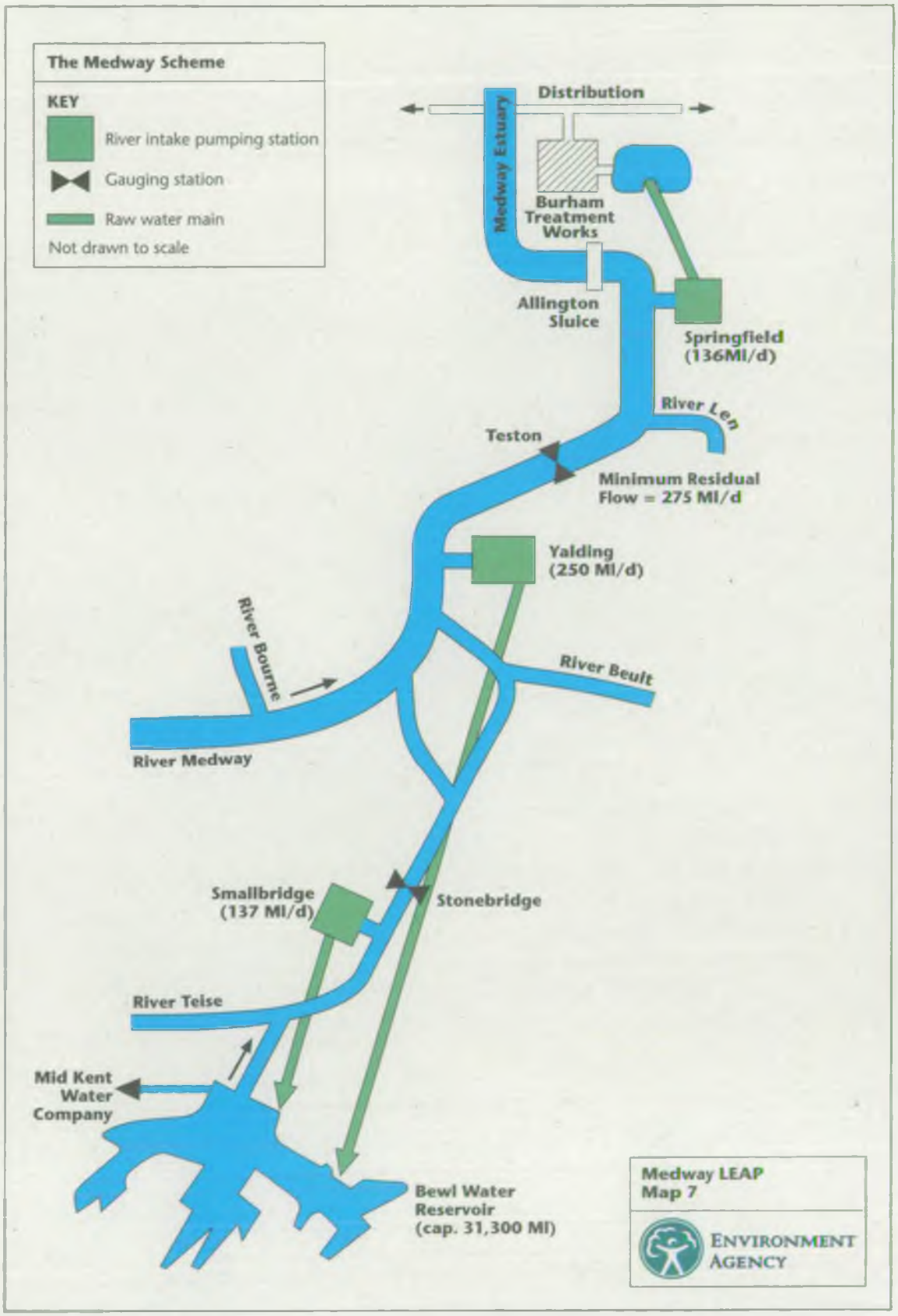

The Medway Scheme
KEY
River intake pumping station
Gauging station
Raw water main
Not drawn to scale
Distribution
Medway Estuary
Burham Treatment Works
Allington Sluice
Springfield (136Ml/d)
River Len
Teston
Minimum Residual Flow = 275 Ml/d
Yalding (250 Ml/d)
River Bourne
River Beult
River Medway
Smallbridge (137 Ml/d)
Stonebridge
River Teise
Mid Kent Water Company
Bewl Water Reservoir (cap. 31,300 Ml)
Medway LEAP Map 7
Environment Agency

Table 2.2: Medway Scheme abstractions

Abstraction	Annual Ml	Daily Ml
From Yalding for transfer to Bewl Water	25,000	250
From Smallbridge for transfer to Bewl Water	11,364 (average)	137
From Springfield PWS intake	37,700	136
From Bewl Water (in aggregate with Springfield)	4,750	20

With the exception of the special category of 'Licences of Right', every licence granted for abstraction from a source of supply in the Upper Medway catchment is made subject to the 'Medway Condition' and this is in turn derived from the Teston MRF. The aggregated daily authorised quantity of all 'tied' licences currently stands at 539 Ml/day giving a Medway Condition of 890 Ml/day. This is the prescribed flow that would have to be specified for the next licence to be granted for any abstraction in the Upper Medway.

The combined effect of the Medway Scheme operation and the control conditions imposed by the Agency is such that the non-tidal river displays a less flashy characteristic than would have obtained 20 years ago.

There are three strategic public supply reservoirs in the Medway catchment: Bewl Water in the upper Medway, Bough Beech which stores water from the River Eden and Weir Wood near East Grinstead which stores water from the headwaters of the Medway (see Table 2.3).

Table 2.3: Reservoirs in the Medway catchment

Reservoir	Area (hectares)	Volume Mm^3	Yield Ml/d	Catchment	Operating Company
Bewl Water	312	31300	75	Medway	Mid Kent/ Southern Water Services
Bough Beech*	130	10100	27	Medway	Sutton and East Surrey Water
Weir Wood	113	5623	14	Medway	Southern Water Services

* Bough Beech reservoir also supplies water to Surrey and South London.

Groundwater

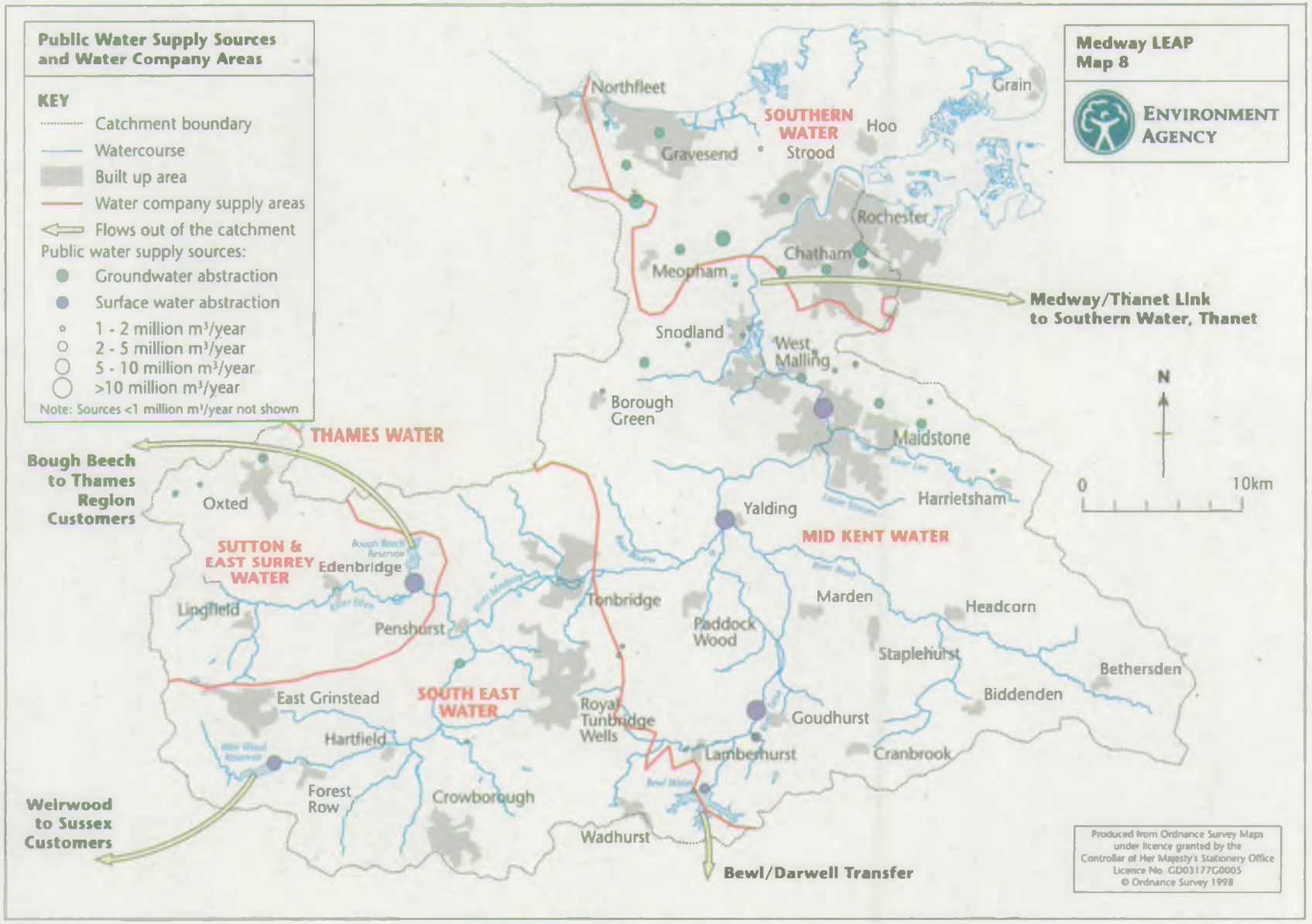
Approximately 50% of the water abstracted each year in the Medway catchment for public supply is drawn from wells and boreholes tapping the Chalk and other water-bearing strata. This in turn represents about 10% of the total effective rainfall on the catchment. Part of this provides the annual 'recharge' to the Chalk aquifer of the North Downs, the most important groundwater unit in Kent, accounting for over 70% of the groundwater abstracted. The Lower Greensand and Hastings Beds aquifers make up less than 10% and 20% respectively.

Water use and demand

Table 2.4 provides a summary of the abstraction totals currently authorised for each of the principal categories of use. Public water supply represents the greatest proportion taken from both surface (non tidal) and groundwater sources, and in the latter case, accounts for more than 70% of the authorised total. Map 8 shows the locations of the public supply sources.

Table 2.4: Summary of water resource abstractions, groundwater and surface water

	Authorised Abstraction Mm^3/year	**Actual Abstraction Mm^3/year (last 3 years)** average for 3 year period 94/95 to 96/97
Surface Water		
Public Water Supply	132.4	43.0
Industry	64.8	17.4
Irrigation	2.3	0.5
Agriculture	7.0	2.6
Other	3.0	0.2
TOTAL	209.5	63.7
Groundwater		
Public Water Supply	86.2	44.8
Industry	32.5	18.2
Irrigation	1.0	0.6
Agriculture	0.5	0.1
Other	0.2	0.2
TOTAL	120.4	63.9
Grand Total Ml/Year	**329.9**	**127.6**


Public Water Supply Sources and Water Company Areas
KEY
Catchment boundary
Watercourse
Built up area
Water company supply areas
Flows out of the catchment
Public water supply sources:
Groundwater abstraction
Surface water abstraction
1 - 2 million m³/year
2 - 5 million m³/year
5 - 10 million m³/year
>10 million m³/year
Note: Sources <1 million m³/year not shown
Medway LEAP Map 8
ENVIRONMENT AGENCY
N
0
10km
Northfleet
Grain
Gravesend
SOUTHERN WATER
Hoo
Strood
Rochester
Chatham
Meopham
Medway/Thanet Link to Southern Water, Thanet
Snodland
West Malling
Borough Green
Maidstone
THAMES WATER
Bough Beech to Thames Region Customers
Oxted
Harrietsham
Yalding
MID KENT WATER
SUTTON & EAST SURREY WATER
Edenbridge
Lingfield
Penshurst
Tonbridge
Marden
Headcorn
Paddock Wood
Staplehurst
Bethersden
Biddenden
East Grinstead
SOUTH EAST WATER
Royal Tunbridge Wells
Goudhurst
Hartfield
Lamberhurst
Cranbrook
Forest Row
Crowborough
Wadhurst
Weirwood to Sussex Customers
Bewl/Darwell Transfer
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Public water supply

There are five water companies operating in the Medway catchment (Map 8). Abstractions and output figures for individual undertakings are presented in Table 2.5.

Table 2.5: Summary of public water supply in the Medway catchment

	Authorised Abstraction		Deployable Output	
Water Company	**Surface**	**Groundwater**	**Surface**	**Groundwater**
Southern Water Services (SWS)	90.75	74.97	54.55	62.29
South East Water (SEW)	0.0	36.39	0.0	26.80
Mid Kent Water Co (MK)	30.25	50.76	20.50	48.40
Sutton & East Surrey Water Co (SESW)	27.40	21.60	27.40	15.50
Thames Water	0.0	2.27	0.0	2.27
Total	148.40	185.99	102.45	155.26

Abstractions for industry and agriculture

The largest industrial water users are the two paper mills at New Hythe, north-west of Maidstone, which account for over 80% of the industrial abstraction in the catchment. Water is also abstracted from the Medway for cement production and gravel washing, but these uses are non-consumptive.

Overall the record shows a general and progressive reduction in direct abstraction for industry due, partly, to the closure of the traditional high-use processes and partly to improvements in water recycling and re-use technology.

Approximately 85% of the licences for industrial/agricultural abstraction are agricultural, however in effect these licences represent a very small proportion of the total volume abstracted. Agricultural uses include spray irrigation and private borehole supplies to farms. Small agricultural abstractions, from surface water of less than 20 cu.m/day , are unregulated.

2.1.9 Landscape, nature conservation and heritage

The Agency is required when formulating or considering any proposal relating to any of its activities other than pollution control to further the conservation and enhancement of natural beauty, geological or physiographical features of special interest.

In addition, it is required to take into account any effect which proposals would have on the beauty or amenity of an area and have regard to the

desirability of protecting and conserving buildings, sites and objects of archaeological, architectural, engineering or historic interest.

The Agency also has a duty to promote, to such extent as it considers desirable and resources allow, the conservation and enhancement of the natural beauty of inland and coastal waters and land associated with these waters.

Countryside character and natural areas

A character map of England, produced by the Countryside Commission and English Nature with support from English Heritage, splits the countryside into 181 different 'Character Areas' and 120 different 'Natural Areas', which are identified on the basis of local distinctiveness in geology, landscape character, wildlife habitats, historical influences and natural features. The Medway catchment is covered by six of these areas:

Greater Thames Estuary

Coastal scenery comprising mudflats, tidal saltmarsh and a network of winding shallow creeks. The area is open and predominantly flat, with vast seascape views.

North Kent Plain

A narrow band of low, gently undulating land between the North Downs and the Thames Estuary. The land types include woodland, grassland and fertile agricultural land.

North Downs

The chalk escarpment which stretches below the North Kent Plain, is covered with chalk grassland and open arable land. Where it is unexploited it provides a habitat for a variety of rare orchid and butterfly species.

Wealden Greensand

Where undisturbed by urban development the area is characterised by a patchwork of farmland and woodland linked by hedgerows. Other common features such as wooded commons, ponds and ditches provide a variety of valuable habitats.

Low Weald

An area characterised by semi-natural woodland growing on heavy, damp soils. Traditional human uses, such as hop gardens, orchards and ponds have been replaced by urban development and arable production on the fertile flood plains of the Medway and the Beult.

High Weald

A significant proportion of ancient semi-natural woodland remains on this rolling countryside, into which rivers have cut broad valleys. In the south-west, the Ashdown Forest consists of birch forest and extensive areas of heathland.

Areas of Outstanding Natural Beauty

The Medway catchment is highly valued for its landscape quality, with two AONBs, designated landscape areas of national importance: the Kent Downs and the High Weald (Map 9). The Kent Downs AONB covers the chalk downland of the North Downs within the catchment and significant stretches of the Medway valley. Prominent landscapes include chalk scarp, chalk downland pastures and ancient woodland. The High Weald AONB covers high, well-wooded ground of the Hastings Beds sandstones and clays in the south of the catchment.

The Agency works with AONB officers through countryside management projects where they are relevant to its activities.

Agricultural incentive schemes

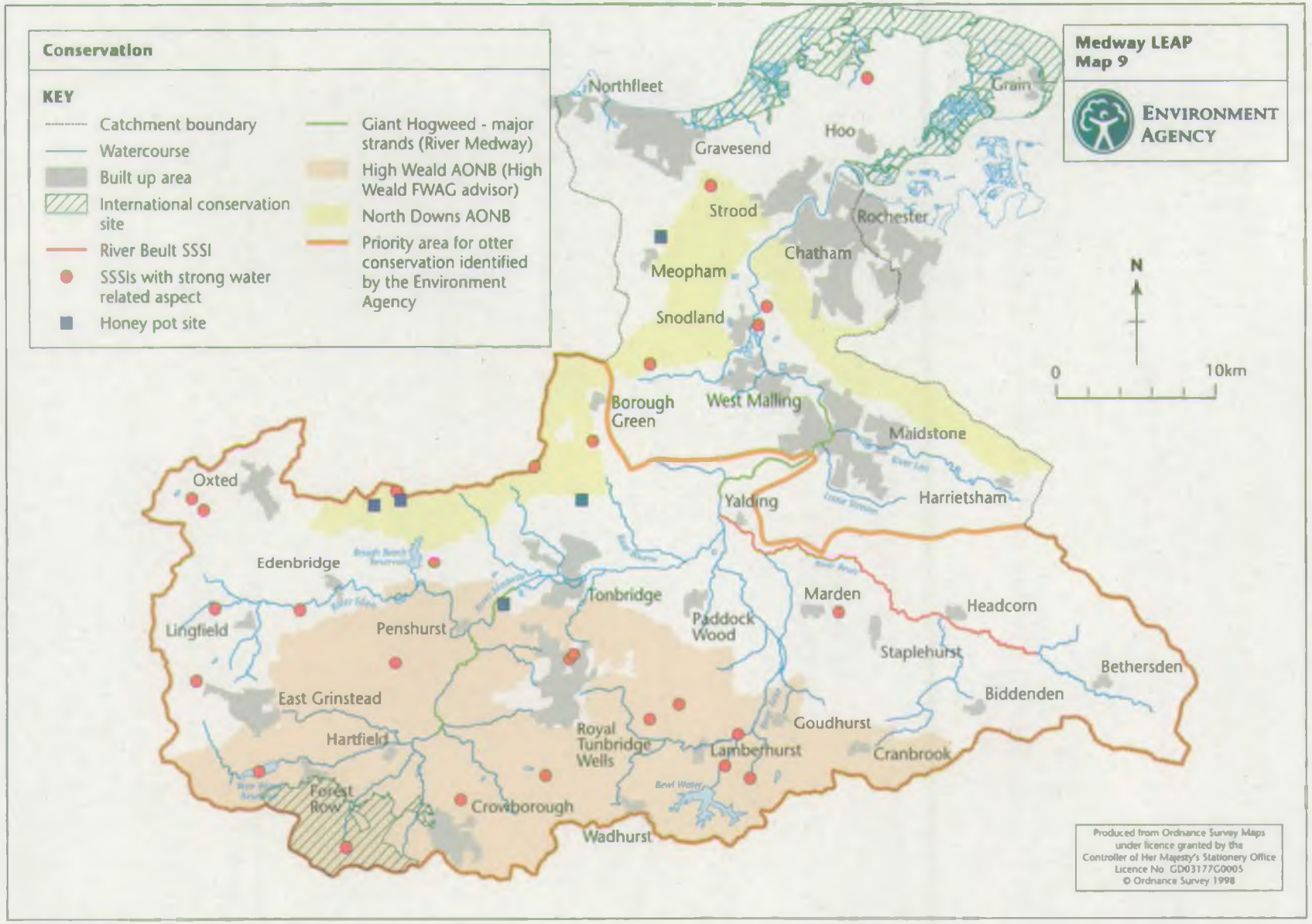
Areas on the Isle of Grain and Cliffe fall within the North Kent Marshes Environmentally Sensitive Area (ESA) designated in 1993 by MAFF to protect and enhance the wildlife, landscape and historic value of the marshes by encouraging traditional grazing agriculture on which this value depends (Map 9).

The marshes provide a habitat of international importance for breeding wading birds and over-wintering birds, and also contain nationally scarce aquatic flora, water voles and invertebrates in the grazing marsh ditches. Areas within the marshland have been designated as SSSI, a part of which is also designated as a Special Protection Area (SPA) for birds. The SSSI is also a Ramsar site.

An environmental monitoring programme suggests that the ESA scheme is leading to the landscape, wildlife and historic value of the area being maintained on land under ESA agreements, but there is only limited evidence of enhancement. Water levels are being raised locally in some areas where appropriate, but there has been a decline in the condition of ditches for rare plants and invertebrates, perhaps due to drier climatic conditions over the survey period (1993-96) (MAFF, 1997).[1]

The Countryside Stewardship scheme also encourages the return to traditional agricultural management practices to conserve landscape, wildlife and historic features in the wider countryside.

[1] Ministry of Agriculture, Fisheries and Food (MAFF), 1997. Environmentally Sensitive Areas Scheme - Environmental Monitoring in the North Kent Marshes ESA 1993-1996. Report to MAFF. MAFF Publications, London.


Conservation
KEY
Catchment boundary
Watercourse
Built up area
International conservation site
River Beult SSSI
SSSIs with strong water related aspect
Honey pot site
Giant Hogweed - major strands (River Medway)
High Weald AONB (High Weald FWAG advisor)
North Downs AONB
Priority area for otter conservation identified by the Environment Agency
Medway LEAP
Map 9
Environment Agency
N
0
10km
Northfleet
Gravesend
Grain
Hoo
Strood
Rochester
Chatham
Meopham
Snodland
Borough Green
West Malling
Maidstone
Harrietsham
Yalding
Oxted
Edenbridge
Tonbridge
Paddock Wood
Marden
Headcorn
Staplehurst
Bethersden
Biddenden
Goudhurst
Cranbrook
Lamberhurst
Royal Tunbridge Wells
Penshurst
Lingfield
East Grinstead
Hartfield
Forest Row
Crowborough
Wadhurst
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Nature conservation sites

Various nature conservation designations apply to the Medway LEAP area (Map 9). Proposals for the designation of sites of national or international status are the responsibility of English Nature. Local Authorities are responsible for the designation of sites of local status.

International designations

Ramsar Sites are listed under the Convention on Wetlands of International Importance and Special Protection Areas (SPAs) are designated under EC Council Directive on the Conservation of Wild Birds (the Birds Directive; 79/409/EEC). South Thames Marshes and Medway Estuary have been designated as Ramsar Sites and as SPAs. Ashdown Forest in the Upper Medway catchment is proposed as a SPA.

National designations

Northward Hill (High Halstow) and Swanscombe Skull Site are the only National Nature Reserves (NNRs) in the catchment, as declared under section 35 of the Wildlife and Countryside Act 1981. The former is managed by the RSPB, being the most important heronry in the catchment (the RSPB also manage a reserve at Tudeley Woods near Tonbridge). 49 Sites of Special Scientific Interest (SSSI) occur within the catchment, as designated under Section 28 of the Wildlife and Countryside Act 1981.

Outside of the international areas which are also SSSIs, there are 40 SSSIs which are water dependent within the catchment including the River Beult, 25 km of which have been designated as a SSSI since it is one of the few clay rivers in the country which retains its characteristic flora and fauna. The Holborough to Burham marshes on an industrial stretch of the River Medway contain a variety of habitats such as reedbeds, grassland, fen and woodland, and support a number of scarce wetland plants and three rare bee species as well as a variety of breeding birds. The Bourne Alder Carr on the River Bourne is an example of an alderwood characteristic of the Wealden valley.

The Agency is required by MAFF to prepare Water Level Management Plans (WLMPs) for SSSIs or for other sites of nature conservation interests where the Agency is the operating authority. In the Medway catchment, WLMPs have been prepared for the South Thames Estuary and Marshes and the River Beult SSSIs in order to manage competing demands and conserve the wildlife interest. The Agency continues to work with English Nature and other bodies to conserve and enhance the conservation value of all designated sites as well as non-statutory sites in the wider countryside with a wetland interest.

Local designations

There are numerous Local Nature Reserves (LNRs) and Sites of Nature Conservation Interest (SNCIs) in the Medway LEAP area. LNRs are

designated by Local Authorities under Section 21 of the National Parks and Access to the Countryside Act 1949 whereas SNCIs are identified by Kent Wildlife Trust and incorporated into local plans by Local Authorities. Principal SNCIs include East Peckham Ponds and Pastures, Tonbridge to Tunbridge Wells SNCIs and the River Eden, River Medway, Bough Beech reservoir and lakes at New Hythe and Leybourne.

Archaeology and cultural heritage

There are over 200 Scheduled Ancient Monuments (SAMs) in the Medway catchment, defined and protected by English Heritage as monuments of national importance. There are over 30 medieval sites where moats form a significant part of the heritage interest, some with adjacent fishponds. Other SAMs where there is significant wetland interest include a large number at Chatham Dockyard, fortifications and ports, bridges, mills, Wealden iron industry sites in the Low Weald which used water power and prehistoric ditches. Several hundred more archaeological sites, including those considered to be of national importance, are recorded under the National Monuments Record, and Sites and Monuments Records maintained by local authorities. The Agency has a duty to protect, conserve and enhance features of archaeological or heritage interest.

An example of co-operation between the Agency and English Heritage on specific sites is Aylesford Priory, where works to reduce flood risks and facilitate archaeological recording were constructed in 1998. The Agency co-operates with English Heritage and local authorities in the protection and management of other significant historic features and sites with a wetland interest, and in the enhancement of their historic interest.

As well as known built features of importance, the Kent Area contains substantial areas where potentially significant features from the prehistoric, Roman, early Medieval and later periods are likely to be buried. Areas of high archaeological potential along the coast have been identified by English Heritage[2] particularly along the Thames Estuary and north Kent coast. These areas may contain extensive prehistoric landscapes and environmental evidence, archaeological evidence of coastal human settlements, sea defences and other developments, and wrecks. They include sites which have been submerged by rising sea levels since the last ice age or buried in the inter-tidal zone. Wetlands can contain important archaeological and palaeoenvironmental evidence within the alluvium of the marshes, and their preservation is dependent on the anaerobic conditions maintained by high groundwater levels. There is therefore a heritage interest in maintaining these water levels. The Agency will continue to take full account of this in the preparation of the WLMPs.

Proposals relating to sea defence schemes and managed retreat in response to rising sea levels have implications for the archaeological resource of these areas. In the Greater Thames Estuary the implications for archaeology of

[2] English Heritage (EH) and the Royal Commission for Historic Monuments in England, 1996. England's coastal heritage. A statement on the management of coastal archaeology. EH, London.

coastal defence proposals are being assessed by English Heritage and county councils. The Agency will continue to work in partnership with these bodies to ensure that the implications of sea defence proposals on coastal archaeology are taken into account through Shoreline Management Plans, Strategy Plans, the Thames Estuary Management Plan, and the Medway and Swale Estuary Management Plan.

2.2 THE STATUS OF KEY BIOLOGICAL POPULATIONS, COMMUNITIES AND DIVERSITY

2.2.1 Habitats and species: Biodiversity Action Plans

The Kent Biodiversity Action Plan (BAP) was produced in November 1997 by the BAP Steering Group for Kent (which includes the Environment Agency) as part of the United Kingdom's commitment to the 1992 Convention on Biological Diversity which was signed at the Earth Summit in Rio (*see the Kent Area LEAP for background information*). Similarly, the Sussex BAP, produced by the Sussex Biodiversity Partnership, was published in July 1998. A Surrey BAP is in preparation. These BAPs contain costed targets and action plans for both habitats and species in the Kent; Sussex and Surrey areas, and are relevant to the Medway LEAP. The Agency is identified as having an involvement in a number of the habitat and species plans (*see the Kent Area LEAP*), the following of which are relevant to the Medway catchment:

Habitats:

Rivers and streams

Rivers and streams "in their natural state are dynamic systems which are continually modifying their form" (Kent BAP Steering Group, 1997). Both of these flowing surface water systems contain a variety of in-stream habitats (e.g. riffles, pools, margins, sandbars) and bankside habitats (e.g. shingle banks, meadows, woodland, marshland), which support a diverse range of flora and fauna. The rivers and streams of the Medway catchment also link fragmented habitats throughout the area and are also highly valued as a fisheries resource and as an important landscape and historic feature (see section 2.1.9).

There is a total main river length of 259.74km in the Medway catchment but this figure is greatly increased when all the smaller tributaries are taken into account. All rivers and streams in the Medway are under increasing threat from a variety of pressures, such as abstraction, river channel modification and management, decreases in water quality, development, agriculture and climate change, all of which have been identified in the Habitat Action Plan in the Kent BAP. Many key areas of main river in the Medway catchment are designated as Sites of Special Scientific Interest (SSSI) or Sites of Nature Conservation Importance (SNCIs).

Grazing marsh

Grazing Marsh is defined as "periodically inundated pasture or meadow with ditches, containing standing brackish or fresh water. It has demonstrable affinity to earlier saltmarsh, often with rills. In Kent, it includes areas of unimproved, semi-improved and improved neutral grassland" (Kent BAP Steering Group, 1997). Grazing marsh supports a number of rare and specialised plant species such as divided sedge, sea barley and small goosefoot. Bird species such as snipe, redshank and lapwing breed are found in grazing marsh habitats, which are also used by large numbers of wintering wildfowl and waders such as dunlin, knot, wigeon and teal. The ditches also contain a diverse community of invertebrates.

A large proportion of grazing marsh in the Medway is designated under SSSI designations which, in some cases, are also designated under the SPA/Ramsar sites which exist in the lower catchment. Large areas of grazing marsh are also included in the North Kent ESA. Grazing marsh habitats have been greatly reduced in size since World War II, largely due to the intensification of agriculture. The Habitat Action Plan for Grazing Marsh in the Kent BAP discusses these impacts in greater detail, as well as the effects of other societal pressures.

Reedbeds

"Reedbeds are wetlands dominated by stands of common reed (*Phragmites australis*). This habitat includes "reed swamp", which retains some water throughout the year and "reed fen" which become dry in the summer. Reedbeds generally incorporate areas of open water and ditches and occasionally, small areas of carr and wet grassland" (Kent BAP Steering Group, 1997). Reedbeds are a nationally scarce habitat and one of the most important habitats for birds. In the LEAP area, reedbed habitats are generally located within the South Thames Estuary and Marshes and the Medway Estuary and Marshes, both of which are SPAs and SSSIs. However, other areas include Holborough Marshes SSSI, Wouldham SNCI and in areas associated with flooded gravel working of the Leybourne Lakes SNCI.

The area of reedbed habitat has declined since World War II, due to a variety of pressures such as inappropriate management, intensification of agriculture, commercial and residential development, water resource management and climate change.

Standing water

"Standing open waters include natural systems such as saline lagoons, lakes and pools as well as man-made waters such as ditches and dykes, ponds, reservoirs and gravel pits, ranging from very large water bodies to small features (usually ponds) a few metres across. Nutrient status and salinity determines the range of fauna and flora" (Kent BAP Steering Group, 1997).

In the Medway catchment, the largest single group of saline lagoons is the old clay workings at Cliffe Pools, which form part of the South Thames Estuary and Marshes SSSI/SPA/Ramsar site. There are also a number of lagoons on the Isle of Grain. Saline lagoons and lagoon-like habitats are listed under the EU Habitats Directive as Priority Habitats and those at Cliffe Pools form 10% of the British Resource. These areas generally support a distinct flora and invertebrate fauna, and are also important sites for breeding, roosting and over-wintering bird populations. A survey of the habitat, flora and fauna of Cliffe Pools is currently being undertaken, funded by the Agency and in collaboration with English Nature. This will provide accurate information on the wildlife present and make recommendations for the future management of the site.

There are numerous lakes concentrated along the valleys of the Medway catchment, mainly as a result of mineral exploitation. Reservoirs are generally small farm reservoirs but do however include large bodies of water such as Bewl, Bough Beech and, albeit to a lesser extent, Weir Wood, which are used for potable supply. Ponds occur throughout the Medway catchment but are generally characteristic and frequent in the High Weald and Central Low Weald (Kent BAP Steering Group, 1997).

Although the area of standing freshwater in the Medway catchment has risen over the last 30 years, this has been largely due to the construction of large reservoirs such as Bewl. These figures have concealed the general decline in the number of ponds and ditches, the cause of which is due to a number of threats and issues identified in the Habitat Action Plan (Kent BAP Steering Group, 1997).

Intertidal mud and sandflats

"Intertidal soft sediments are predominantly mixtures of mud, sand and gravel. The majority of this habitat is found within the county's bays and estuaries where a large proportion of the sediment consists of mud and muddy sand. Areas of more mobile, cleaner sands are common around the open coast" (Kent BAP Steering Group, 1997).

Intertidal mud and sandflat habitats are found in the lower tidal section of the main river and extensively along the margins of the Isle of Grain. These habitats, often precursors to the development of saltmarsh (KWT, 1995), support communities of green and brown algae, eel grass and a diverse range of fauna, such as polychaete worms, bivalve molluscs, crustaceans and wildfowl such as the avocet, black-tailed godwit, dunlin, wigeon and brent goose. These areas are also important breeding areas for fish species such as bass (Kent BAP Steering Group, 1997). However, the area of these habitats is decreasing due to the effects of sea-level rise, land reclamation and physical disturbance, pollution, sea defences, and fisheries and recreation.

Saltmarsh

"Saltmarsh is a highly productive habitat which develops along sheltered coasts with soft, shallow shores, which provide protection from strong wave action. It represents a transition from sand and mudflats on the lower marsh, where vegetation is frequently flooded by the tide, through to the upper saltmarsh where the plant communities are less frequently inundated. The intimate relationship between saltmarsh and other coastal habitats (shingle structures, sand dunes, intertidal flats) means that their management cannot be divorced from actions to conserve these" (Kent BAP Steering Group, 1997).

Saltmarsh is an important component of the South Thames Estuary and Marshes SSSI/SPA/Ramsar site (approximately 78 ha of saltmarsh) and the Medway Estuary and Marshes SSSI/SPA/Ramsar site (approximately 754 ha of saltmarsh). There is also a limited area at Dartford Marshes SNCI.

A comparison of 78 ha with the total area of the South Thames Estuary and Marshes SSSI site of 5450 ha clearly demonstrates that saltmarsh is a rare and valuable resource, essentially forming a narrow ribbon along the coastline.

Nationally scarce plants found at the South Thames Estuary and Medway Estuary sites include: Borrier's saltmarsh-grass, golden samphire, perennial glasswort and one-flowered glasswort. The Medway Estuary is noted as one of the best places in Britain for the study of glassworts (NB species regarded as nationally scarce are recorded from 16-100 of the 10 x 10 km squares in Britain).

In addition, interesting invertebrate fauna live in saltmarsh and large numbers of birds use the habitat for roosting, feeding and nesting.

Species:

Water vole (*Arvicola terrestris*)

The Agency is the lead organisation for water vole conservation in Kent, a species which has recently gained protection under the Wildlife and Countryside Act 1981 (Schedule 5). The South East of England is identified as a stronghold for water voles and Kent is in the top third of counties within mainland Britain. Populations in the county therefore have a very high conservation value.

A comprehensive water vole survey programme is underway in Kent, co-ordinated by the Agency. An extensive survey of Cliffe and Cooling Marshes was carried out in summer 1998. The results showed a patchy distribution of populations, with many of the key sites located outside of the designated areas.

Otter (*Lutra lutra*)

The otter is listed on Annexes 2 and 4 of the EC Habitats Directive 92/43/EEC and the European species is listed as globally threatened on the IUCN/SCMC Red data List. It is one of the largest land mammals still occurring in the UK and relies on clean rivers and streams to supply its food (mainly fish), with well developed bankside habitat to provide cover during the day.

The otter is present on the main River Medway and recent surveys by the Agency and the South East Otters and Rivers Project (which has been established for ten years) have also confirmed its presence in the Eden and Upper Medway. Further assessment of otter habitats will be undertaken in conjunction with River Corridor Surveys: A South East Otters and Rivers Project officer for Kent has been established as a collaborative venture between the Agency and Kent Wildlife Trust. The Agency has carried out bridge surveys to assess the potential of road crossing for causing road kills.

White-clawed crayfish (*Austropotamobius pallipes*)

The white-clawed crayfish is the only species of freshwater crayfish which is native to the UK. Populations have declined markedly in recent years due to the presence of the alien signal crayfish which competes directly for food and spreads a disease which affects the native species. The white-clawed crayfish is listed in Appendix III of the Bern Convention and Annexes II and V of the EC Habitats Directive 92/43/EEC. It is also protected nationally under Schedule 5 of the Wildlife and Countryside Act (WCA, 1981) in respect of taking from the wild for sale.

The white-clawed crayfish is present in the Eden catchment within the Medway LEAP area and the Agency is examining the potential of increasing awareness over the need to safeguard sites where the species is present and to improve the quality of such habitats.

Allis and twaite shad (*Alosa alosa* and *Alosa fallax fallax*)

Shad are members of the herring family Clupeidae and are termed as anadromous (they reproduce in freshwater and mature in the sea). Both species are listed on Annexes II and V of the EC Habitats Directive 92/43/EEC. Allis shad are listed on Appendix II of the Bern Convention and twaite shad are listed on Appendix III. Allis and twaite shad have been found in the Medway up to its tidal limit at Allington.

2.2.2 River habitats and wetlands

The Medway is a classic lowland river. The main river and its tributaries, together with their banks and marginal vegetation act as both key habitats and corridors for a variety of wildlife in an area of high agricultural productivity. The catchment is fairly intensively developed for mixed agriculture with large areas of land used for dairy, beef, arable and orchard farming. Beef and dairy

farming occurs mainly in the High Weald; arable farming is mainly found on the flat land of the flood plains with smaller expanses along the upper reaches of the Teise, Medway and Eden; and orchard farming is generally found in the middle reaches of the main Medway river between Tunbridge Wells and Maidstone. The Tonbridge to Yalding stretch of the river is perhaps the most intensively developed stretch for agriculture in the whole catchment. More extensive pastures along the upper reaches of the Eden are grazed by sheep.

Woodland habitat within river corridors is small and fragmented, being confined mainly to tributaries in the steeper valleys of the Hastings Beds and Lower Greensand. There are few unimproved pastures outside the scheduled sites (section 2.3.10), with the more extensive pastures, most semi-improved, being found along the River Eden near Penshurst, upstream of Edenbridge and along the River Medway upstream of Leigh, near Tonbridge.

Six natural areas occur within the Medway catchment (section 2.1.9) which further characterise the landscape, geology and wildlife of the riverine and wetland habitats. Distinct habitat types found within the catchment have already been identified in section 2.2.1. In general terms, the upper catchment is more rural, wooded and less developed whereas the mid-catchment is an area of high agricultural productivity and urbanisation. In the lower catchment, the tidal section is ringed by the North Downs where there is a legacy of old chalk quarries. After cutting through this area, the Medway is characterised by industrial areas on the west bank whilst the east bank is still very rural - mostly grazing marsh which extends back to the foot of the north Downs. The Medway reaches its estuary at Rochester where it widens into an area of extensive mudflats and salt marshes, and is bounded by the Isle of Grain to the north and west, the town of Gillingham to the south and Isle of Sheppey to the east.

On a species level, internationally important fish species are now found in the Medway (such as recently the Atlantic salmon). The otter is also present in localised areas within the catchment (section 2.2.1). The rivers and wetlands of the Medway catchment are also an important area for several bird species - for example, there is an important heronry on the Isle of Grain. For invertebrates, the River Eden is important, particularly for dragonflies. A variety of plant species occur along the banks of the Medway, including the native black poplar but there is no information on its distribution.

The water quality of the Medway is generally satisfactory but does range from very good to poor. Reductions in quality are largely due to the impact of sewage effluents on small streams but also to sewage inputs on the main river, such as at Tunbridge Wells. Pesticide inputs also decrease the wildlife value of the Medway, a problem which is especially prevalent in the middle reaches of the main Medway river where orchard farming occurs.

2.2.3 Fisheries

EU Freshwater Fish Directive

Under the EU Freshwater Fisheries Directive, stretches of rivers in the catchment are designated as suitable for supporting salmonid or cyprinid (coarse) fish in terms of water quality. These stretches are monitored for compliance with defined water quality criteria (see Section 2.3.6 and Map 11).

Cyprinid fisheries in the Medway are extensive and stretches designated under the Directive are the River Medway (Yalding to Allington), River Beult (Hadmans Bridge to Yalding), River Teise (Bartley Mill to Yalding) and River Eden (Edenbridge to the confluence with the Medway at Penshurst); a total river length designation of 87.2km. Although salmonids are present in the Medway catchment, the only designated site under the Directive is Bewl Water. This is a reservoir sport fishery and is supported by rainbow trout which are grown in cages in the reservoir before release.

Coarse fisheries

23 species of coarse fish, excluding eels and native crayfish, have been found in the Medway catchment and a further 21 species have been found in the estuary. The distribution of each species is documented in the Agency's Medway Fisheries Strategy. The principal coarse fishing areas are the full length of the River Medway, the River Beult and River Eden. The lower reaches of the River Len have some of the best stocks of coarse fish in the Kent area.

Game fisheries

Game fisheries can be divided into migratory fish (e.g. salmon, sea trout) and non-migratory fish (e.g. brown trout).

Migratory salmonids

In the late 1980s and early 1990s, migratory salmonids did not regularly occur in the Medway catchment because of poor estuarine water quality, inadequate flows in dry years and a difficult passage at Allington Lock. Although numbers of sea trout are still very low and only two salmon have been recorded of late, a return to more normal weather conditions and improvements in water quality has lead to a small increase in migratory fish activity in the catchment. Allington Lock, however, still remains a major obstacle to migratory fish and no work is scheduled to take place on the lock until 2002.

Recognising the effect of barriers upon fish migration, the Agency is focusing upon the installation of more fish passes in the Medway catchment. Fish passes exist at Oak Weir and Sluice Weir, East Peckham and one is planned for Eldridges Lock near Tonbridge. There are a further eight navigational locks on the main river and migratory fish can only pass through them when they are open or during periods of flood.

Brown trout

Brown trout are the eighth most frequently occurring species in the Medway catchment, found in the River Len, River Teise (including Bewl Water and its feeder streams), River Eden, Eridge Stream and other Ashdown Forest and Sevenoaks Weald streams. However, the species tend to dominate the upper Medway catchment in the Hartfield area.

Brown trout stocking and management occurs on the River Teise and Bewl Water (similar practices with respect to rainbow trout occur at Bewl and Weir Wood Reservoirs) and every effort has been made to stock with fish of local strain.

Work has been carried out in the upper Medway catchment to improve brown trout habitats. Spawning areas in the Withyham area and Len catchment have been improved and several small fisheries weirs have been built in other areas to reinstate desirable "pool/riffle" sequences.

Monitoring

Under the Salmon and Freshwater Fisheries Act 1975 and the Water Resources Act 1991, the Environment Agency has a duty to maintain and improve fisheries. So that this may be achieved, the Agency must know the presence and quality of fish stocks in the Medway catchment. The Agency must identify deficient stocks and look for causative factors and remediation measures.

Fisheries surveys are undertaken at 57 sites in the Medway LEAP. In terms of stock quality, 35% of fish stocks surveyed are above target for the catchment, 35% are average, 14% are below average and 16% are poor. Several reasons have been proposed for the paucity of fish stocks at some sites, ranging from sampling differences, depth and size of stream, changes in fish stock management, low flows and siltation.

The Agency is set to begin a five-year rolling programme of quantitative electrofishing at all sites throughout the Medway catchment. There will also be a number of ad hoc "strip" surveys carried out annually which relate to specific works, such as flood defence proposals or potential drought applications. Hydrocoustic (sonar) surveys will also be carried out on larger sections of the river and on some lakes, and micromesh seine netting surveys will be undertaken in the Medway Estuary. The new National Fisheries Classification system will also be used, which will provide GIS accessed data.

Fishing/rod licences

One of the responsibilities of the Agency is to regulate recreational angling through a rod licensing system. Table 2.6 shows the number of rod licences (both coarse and salmonid) sold in 1997 in the Medway LEAP area, together with total revenue.

Table 2.6: Number of rod licences sold in 1997 in the Medway catchment

Licence category	Licence type						Total licences
	Annual	Annual Concession	8-day	1-day	Annual upgrade	Concession upgrade	
Coarse	15254	4856	711	7986	*	*	28807
Salmonid	47	31	28	30	3	0	139
					Total licences		28946
					Total revenue		£307,274.50

Furthermore, it is also the responsibility of the Agency to issue commercial fisheries licences in areas under Agency control. In the 1998/99 season, there were eight licences issued by the Agency for commercial eel and elver fishing, compared to six licences which were issued in 1997/98.

2.2.4 Indicator and invasive species

Indicator species

Indicator species are those which are indicative of a particular type or state of the environment, such as a chalk stream or high quality water respectively.

Both the otter and kingfisher are indicator species, their presence indicative of a high quality riverine environment. Both are located at the top of the food chain and are thus reliant upon a quality environment for the existence of lower levels of the chain (section 2.2.1 and 2.2.2).

Barn owls are also thought to be indicative of a quality environment and the Agency, in conjunction with the Medway River Project and FWAG, has undertaken a scheme of placing nesting boxes in grassland adjacent to streams and rivers in the Medway catchment to encourage growth in the population. Where these boxes are placed, the Agency explains to the landowner the importance of sympathetic management of the grassland for small mammals, which both increases the wildlife value of the habitat and provides a food source for the owls.

Native black poplar trees are thought to be some of the last remaining tree species of the ancient "Wild Wood". Although there are a variety of hybrids of the black poplar growing which are very similar to the native, few of these trees are now left in Britain. However, native black poplar trees do occur in the upper Medway catchment but their exact distribution is unknown and there is no management strategy at present to ensure their protection and propagation.

Invasive species

Invasive species are generally introduced, foreign species which cause a variety of problems for native species. There are four invasive plants in the

Medway catchment - Japanese knotweed, Himalayan balsam, giant hogweed and Australian stonecrop. The control of these species is the responsibility of the landowner, as documented in the Agency's "Guidance for the control of invasive plants near watercourses". A significant length of bank of the Medway between Tonbridge and Maidstone is covered by giant hogweed; a meeting of relevant parties is proposed. There is one alien animal species in the Medway LEAP area, the mink. This poses a threat to a variety of native wildlife, including the water vole. Mink are known to occur in several places in the catchment and as yet, the Agency does not have a policy for their control.

Further introduced species occur within the Medway catchment, such as the Chinese mitten crab, signal crayfish, terrapin, Canadian beaver, pumpkinseed and catfish.

2.3 COMPLIANCE WITH ENVIRONMENTAL QUALITY STANDARDS, TARGETS AND POLICIES/STRATEGIES

2.3.1 Air quality standards

The Environment Act 1995 (EA95) Part IV, places responsibility for local air quality management on the local authorities. They are required to carry out a three stage review and assessment of air quality within their boundaries, taking into account factors from neighbouring areas. The Agency is a consultee to this process. The review must assess whether it is likely that air quality objectives laid down in the Air Quality Regulations (SI 1997 No 3043) will be complied with by 31 December 2005. If it is likely that one or more of the objectives will be breached, the local authority is required to designate that area where the breach is likely to occur as an air quality management area. An action plan must be prepared which sets out the measures required to achieve the objectives.

The Agency's role is one of liaison, support, technical consultation and provision of data relating to Part A IPC processes. The Agency's contribution to the achievement of air quality objectives is limited to its regulation of Part A IPC processes. Part B IPC processes (those with lower potential to pollute) are already regulated by local authorities under the Local Authority Air Pollution Control (LAAPC) provisions of the Environmental Protection Act 1990 (EPA 90) Part I.

The Kent Air Quality Partnership is an existing forum which promotes co-operation and co-ordinated action on air quality issues. It is the custodian of an emissions inventory and air quality model which is now being used to facilitate member Local Authorities' Air Quality Reviews. The Agency is a full member of the Partnership and KCC provides secretariat facilities. The air quality model is also used by KCC to assist with planning decisions by evaluating the impact of proposed developments.

2.3.2 Process Industries Regulation (PIR)

The Environmental Protection Act (EPA 90) as amended by the Environment Act (EA 95) introduced the systems of IPC and Local Authority Air Pollution Control (LAAPC). IPC is concerned with the prevention and control of emissions to all three media of the environment: air, land and water. The industrial processes regulated under this system are the Part A prescribed processes, defined in regulations made under EPA 90 and they are the most technically complex and potentially most polluting industrial processes:

- fuel production, combustion and associated processes
- metal production and processing
- mineral industries
- chemical industry
- waste disposal and recycling
- other industries e.g. paper making

Operation of a prescribed process requires an IPC authorisation and the Environment Agency is responsible for implementing IPC and regulating these processes. Less polluting processes (Part B processes) are authorised and regulated by the Environmental Health departments of local authorities under LAAPC for releases to air only.

One of the basic principles of IPC is continuous improvement. The operator of a Part A prescribed process requires an IPC authorisation, which is subject to statutory review every 4 years. The IPC authorisation includes:

- release limits
- reporting requirements
- operating conditions
- improvement programmes

Non-compliance with the conditions of an authorisation can result in enforcement action. Map 5 shows the location of the 20 IPC authorised processes in the Medway catchment and the site of 2 proposed processes. The following table summarises IPC authorisations by industry sector.

Table 2.7: IPC authorisations by industry sector

Industry Sector	No. IPC Authorisations
Fuel and Power production	7
Metal production & processing	2
Minerals (incl. cement)	2
Chemicals	4
Waste disposal and recycling	-
Paper	5

Details of IPC authorisations are held on the Public Register at the Agency's regional office at Worthing and on Public Registers held by the local authorities.

2.3.3 Radioactive Substances Regulation (RSR)

The Agency is responsible for the regulation of the storage and disposal of radioactive substances. While there are no nuclear power stations in the Medway catchment the Agency is responsible for the regulation of accumulation and disposal of radioactive wastes associated with hospitals, universities and research facilities. The Agency carries out a programme of inspections of such premises.

2.3.4 Waste management and regulation

The Agency has a key role in implementing the Government's proposed national statutory waste strategy, which is required under the EA 95. Currently, the strategy is based on three key objectives:

- to reduce the amount of waste that society produces
- to make best use of the waste produced
- to minimise risks of harm to human health and environmental pollution

Government guidance indicates that the principles of BPEO should be used by local authorities when assessing proposals and the Agency is developing a number of tools including Life Cycle Analysis (LCA) to assist. A draft strategy is expected to be prepared by the Government in early 1999, following consultation. In order to prepare this strategy, the Agency and DETR are working to produce accurate statistics which will be required on the amounts of different types of waste arisings.

Before the formation of the Agency, the former Waste Regulation Authorities had the duty of preparing Waste Management Plans setting out the waste management needs of their areas. A Waste Management Plan was produced by Kent County Council in 1993, before responsibility for waste regulation passed to the Agency in 1996.

The potential for increasing the proportion of municipal waste recycled or composted by the Districts will depend on a number of factors including finding suitable sites for collection banks, suitable markets for the materials collected, instigating kerbside recycling collection schemes and increasing public participation. Increasing the proportion of municipal waste used for energy recovery by incineration is being promoted in part of the LEAP area by Kent County Council through the Waste Local Plan process.

Statistics on industrial and commercial waste arisings are not routinely collected for the area covered by this LEAP. Details of household waste arisings may be obtained from Kent County Council or from Medway Council but would not be specific to the LEAP area. The Agency will be collecting

data of waste arisings in the Medway area from industrial and commercial waste producers as part of the National Waste Survey so as to build a picture of waste produced for England and Wales.

The Agency licences and monitors waste management facilities and takes into account guidance from Government such as the Waste Management Paper No. 4, Licensing of Waste Management Facilities. In addition, the Agency has developed a standard licensing policy in order to achieve consistency in the standards of operation required at sites. The Agency also registers and monitors activities which are exempt from the requirement to obtain a waste management licence. It also authorises and regulates emissions from incinerators under IPC in line with EU emissions standards.

The Special Waste Regulations 1996 control the movement of special wastes - the most harmful wastes - which the Agency regulates by enforcing "cradle to grave" controls. Prior to the movement of special waste, notification must be given to the Agency and an appropriate contract must exist.

The Producer Responsibility Obligations (Packaging Waste) Regulations 1997 set targets for packaging waste that the UK must meet by 2001 and the Agency's role is to register packaging waste producers and monitor performance against their obligations. The Agency is also involved in the accreditation of reprocessors of packaging waste allowing them to issue packaging recovery notes.

The number of commercial ports in the Medway LEAP area and our proximity to the continent makes the catchment a very important point of entry and exit for numerous shipments under the Transfrontier Shipment of Waste Regulations 1994.

This requires effective monitoring to ensure wastes are destined for genuine recovery operations, rather than disposal which is banned - countries should be responsible for the disposal of their own waste. Imports of waste through Kent ports take the form of shipments of "amber" and "red" listed wastes (both of which are pre-notified to the Environment Agency) and the free movement of "green" listed wastes.

Port and transit inspections of shipments must be undertaken to ensure the following:

- the waste composition matches the waste description for all waste imports;
- the paperwork and financial provisions accompanying any amber and red listed shipments;
- green listed wastes are uncontaminated and destined for genuine recovery operations; and
- the appropriate paperwork is accompanying any green listed waste.

There is an inspection and sampling system currently being implemented in Kent. There are currently no notifications for waste transfer in the Medway catchment although there are 10 for the use of Thamesport as a transit port.

2.3.5 Flood defence

For the locations where inland flood defence systems are currently in existence in the Medway catchment the following standards of protection are provided:

Location	Standard of Protection
Edenbridge	1 in 30 years
Tonbridge (Town Centre)	1 in 150 years
Tonbridge (Environs)	1 in 100 years
Moors Sluice, Collier Street	Not defined
Brook Farm, Marden	Not defined
Smarden	1 in 50 years

Similarly, for the tidal and sea defences downstream of Allington Lock in the Medway Estuary, on the Isle of Grain and on the south bank of the Thames Estuary between Grain and Greenhithe, the following standards of protection are currently provided:

Location	Standard of Protection
Medway Tidal Defences	1 in 10 to 1 in 1000
Isle of Grain	1 in 1000
Thames Tidal Defences	1 in 1000

(The 1 in 1000 standard of protection is applied to some of the defences where they are tied into the London defences and the Thames barrier).

The fact that, on the inland river system, there are relatively few locations at which flood defence schemes are in existence does not mean that flooding is not a problem elsewhere. The risk of flooding is ever present over land to properties that are within the natural flood plain of the River Medway and its tributaries. It can be assumed, however, that for most, if not all other areas, the risk of flooding from inland rivers does not exceed current standards of service.

In recent years, the evaluation of proposed flood defence works has been standardised throughout the United Kingdom by the publication in 1993 by the

Ministry of Agriculture, Fisheries and Food of the "Project Appraisal Guidance Notes" for flood and coastal defences. This document sets out procedures for justification, in benefit/cost terms, of proposed flood defence schemes with recommendations for appropriate standards of protection, as given below:

Table 2.8: Flood defence standards of protection

Current land use	Indicative standard of protection (return period in years)	
	Tidal	Non-Tidal
High density urban containing significant amount of both residential and non-residential property.	200	100
Medium density urban. Lower density than above, may also include some agricultural land.	150	75
Low density or rural communities with limited number of properties at risk. Highly productive agricultural land.	50	25
Generally arable farming with isolated properties. Medium productivity agricultural land.	20	10
Predominantly extensive grass with very few properties at risk. Low productivity agricultural land.	5	1

Comparison of the actual standards for the flood defences in the Medway LEAP area with the indicative standards from the Guidance Notes reveals that a more than adequate standard of protection is being provided on the coastal defences and similarly for the inland defences. Apart from the two flood defence schemes for which the standards of protection have not been defined, the standards provided are generally better than those suggested in the Guidance Notes.

2.3.6 European water quality directives

A number of EU Directives contain standards which have implications for water quality within the Medway LEAP catchment and the Agency has specific responsibilities to ensure that the Directives are implemented appropriately. Both Directives and responsibilities are documented in detail in the Kent Area LEAP. Each Directive that is applicable to the Medway is highlighted below, together with details of compliance.

Surface Water Abstraction Directive (75/440/EEC)

The EU Directive concerning the quality required of surface water intended for the abstraction of drinking water protects the quality of surface water used for public supply. There are 6 abstraction sites in the Medway LEAP area and all of them complied with the standards (using 1996 data) set in the Directive.

Freshwater Fisheries Directive (78/659/EEC)

The EU Directive on the quality of waters needing protection or improvement in order to support fish life ensures that water quality in designated stretches of water is suitable for supporting certain types of fish. There are two sets of water quality standards in the Directive, one set for cyprinids and a more stringent set for salmonids (see section 2.2.3).

In 1996 (the latest figures available), there were three failures occurring at the same location in the Medway catchment - Stile Bridge on the River Beult. These were due to low oxygen levels attributed to low flows. There was full compliance at the only salmonid designated site in the catchment, Bewl Water.

Dangerous Substances Directive (76/464/EEC)

The EU Directive on pollution caused by certain substances discharged in the aquatic environment of the community protects the water environment by controlling discharges to rivers, estuaries and coastal waters. There are two lists of compounds. List I contains substances regarded as particularly dangerous because they are toxic, they persist in the environment and they bioaccumulate. List II contains substances which are considered to be less dangerous but which still can have a harmful effect on the water environment. Both are measured against respective Environmental Quality Standards (EQSs).

During 1996, EQSs were exceeded twice for List I substances in the Medway LEAP area. The same sites failed during 1995. All the exceedances are associated with a contaminated land site where polluted groundwater is entering the River Medway. Remediation work has begun, which includes treatment of the surface water as well as groundwater.

Urban Waste Water Treatment Directive (91/271/EEC)

The EU Directive concerning urban waste water treatment specifies certain treatment standards for sewage treatment and sewage collection systems. The Directive also requires more stringent treatment for discharges to Sensitive Areas, and/or less stringent treatment for discharges to Less Sensitive Areas (High Natural Dispersion Areas (HNDAs)) for estuarine and coastal waters, provided that schemes can be justified. Such areas are determined by the DETR.

The Urban Waste Water Treatment Directive is one of the key legislative drivers behind the Asset Management Plans in the Medway LEAP area (see section 2.3.8, Consented Discharges to Water), which seek a balance between improvements in overall effluent quality and investment capability. Targeted areas for Sensitive Area status in the catchment are as follows:

> Wateringbury, Tonbridge, Tunbridge Wells North, Bidborough, Redgate Mill, Paddock Wood, Tunbridge Wells South, Edenbridge, Oxted, Lingfield, Felbridge

Monitoring is being undertaken at these sites since while they have elevated nutrient levels, there was insufficient biological evidence to support designation in 1997.

Nitrates Directive (92/676/EEC)

This EU Directive concerns the protection of groundwater against pollution caused by nitrates from agricultural sources. Sources with nitrate concentrations exceeding or trending towards the Directive limit and where the nitrate is of agricultural origin have had their catchment zones reviewed. MAFF have converted the catchment zones into geographical zones and have designated them Nitrate Vulnerable Zones (NVZs). Reviews of existing and potential NVZs are carried out on a four-year basis and the first review for the Medway is due in 1998. There are two NVZs in the Medway catchment, at Boxley and Thurnham.

Groundwater Directive (80/68/EEC)

This EU Directive controls the release of certain substances to groundwater. It is intended to prevent the introduction of List I into groundwater and prevent pollution of groundwater by List II substances by controlling activities which may lead to their direct or indirect discharge into groundwater.

There are no statutory standards for the quality of groundwater, and because of the difficulties in obtaining and interpreting information we have only limited data on the impacts of human activity on groundwater quality. To this extent, the Agency is working on a groundwater database in the Southern region, which includes the Medway LEAP area. The data will be used to keep check on background water quality within aquifers and will provide the ability to carry out long-term trend analysis.

2.3.7 UK water quality objectives

The background to the development of UK Water Quality Objectives is detailed in the Kent LEAP and is not repeated here. At present, non-statutory River Quality Objectives exist for rivers in the Medway LEAP. These are based upon River Ecosystem (RE) classification, which set out long-term quality targets and comprise five quality classes (Table 2.9) which reflect the chemical water quality requirement of different types of river ecosystem.

Table 2.9: River Ecosystem classes

Class RE 1	Water of very good quality suitable for all fish species.
Class RE 2	Water of good quality suitable for all fish species.
Class RE 3	Water of fair quality suitable for high class coarse fish populations.
Class RE 4	Water of fair quality suitable for coarse fish populations.
Class RE 5	Water of poor quality which is likely to limit coarse fish populations.
Unclassified	Water of bad quality in which fish are unlikely to be present, or insufficient data available by which to classify water quality.

(Source: The Surface Waters (River Ecosystem Classifications) Regulations, 1994)

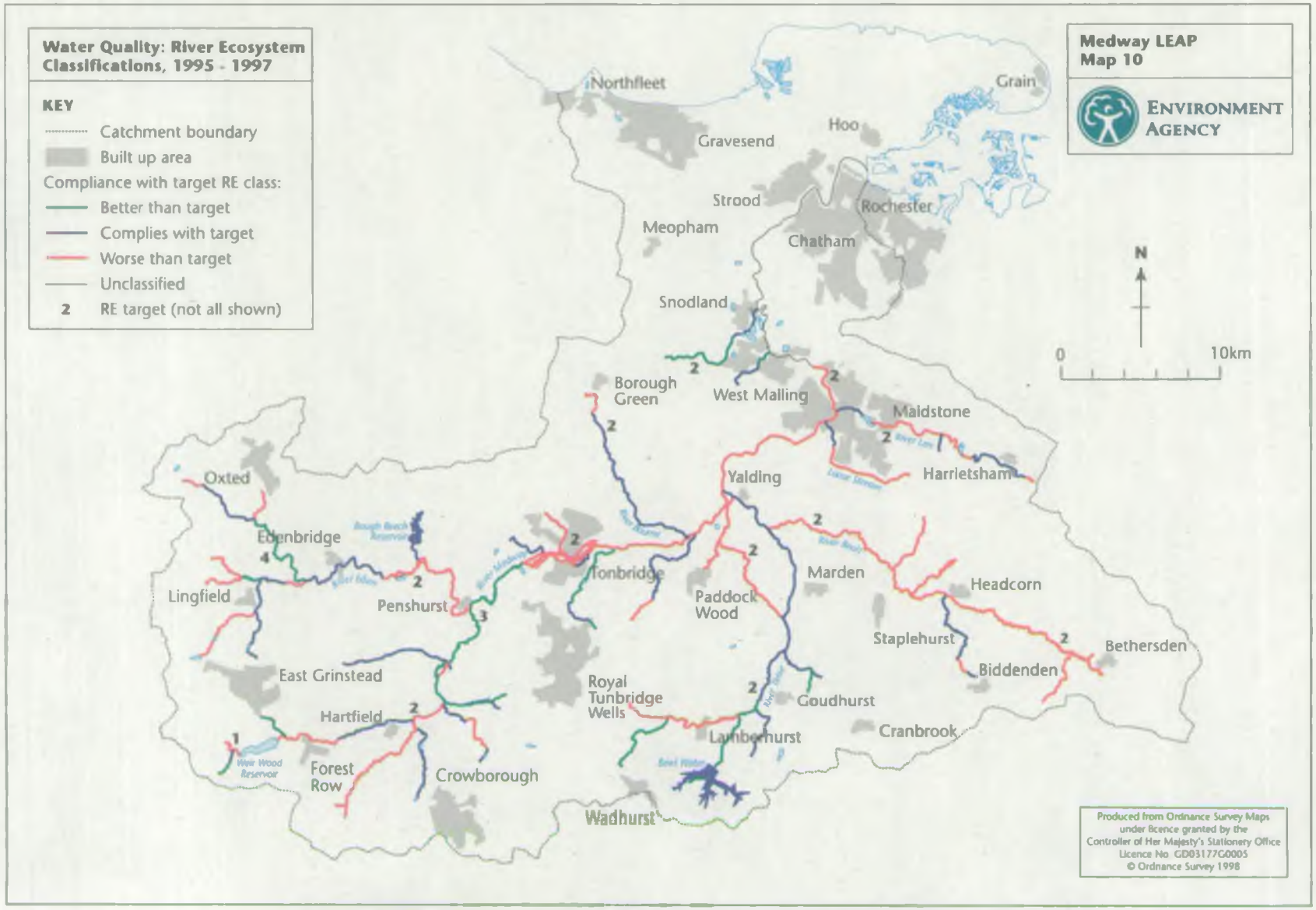
An assessment has been made of the state of the watercourses in the Medway LEAP area based on these objectives using routine water quality sampling data 1995-97. Out of a total of 121 sampling sites 54 failed compliance, representing a failure of 45%. 20 sampling sites (17%) of the sampling sites failed objectives by two or more River Ecosystem categories. Overall, 8% achieved Class RE1, 34% achieved Class RE2, 30% achieved Class RE3, 12% achieved RE4 and 15% achieved RE5. 1% (1 site) was unclassified. (See Map 10).

Periodic assessment is now made by applying the General Quality Assessment (GQA) Scheme of which there are four aspects: Chemistry, Biology, Nutrient and Aesthetics. Each aspect is based upon six water quality grades (Table 2.10).

Table 2.10: GQA Scheme classes

Class A	Water of very good quality
Class B	Water of good quality
Class C	Water of fair quality (suitable for high class coarse fish populations)
Class D	Water of fair quality (suitable for coarse fish populations)
Class E	Water of poor quality
Class F	Water of bad quality

The Nutrient and Aesthetic GQA schemes are still under development. However, both GQA Chemistry and GQA Biology schemes are in use by the Agency.


Water Quality: River Ecosystem Classifications, 1995 - 1997
KEY
Catchment boundary
Built up area
Compliance with target RE class:
Better than target
Complies with target
Worse than target
Unclassified
2 RE target (not all shown)
Medway LEAP Map 10
ENVIRONMENT AGENCY
N
0
10km
Northfleet
Grain
Gravesend
Hoo
Strood
Rochester
Meopham
Chatham
Snodland
Borough Green
West Malling
Maidstone
Harrietsham
Yalding
Oxted
Edenbridge
Lingfield
Penshurst
Tonbridge
Paddock Wood
Marden
Headcorn
Staplehurst
Bethersden
Biddenden
East Grinstead
Royal Tunbridge Wells
Goudhurst
Cranbrook
Hartfield
Forest Row
Crowborough
Lamberhurst
Wadhurst
Weir Wood Reservoir
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The current chemical and biological quality of the Medway LEAP area under the GQA scheme for 1990 and 1995 are shown in Map 11 and summarised in Table 2.11 below.

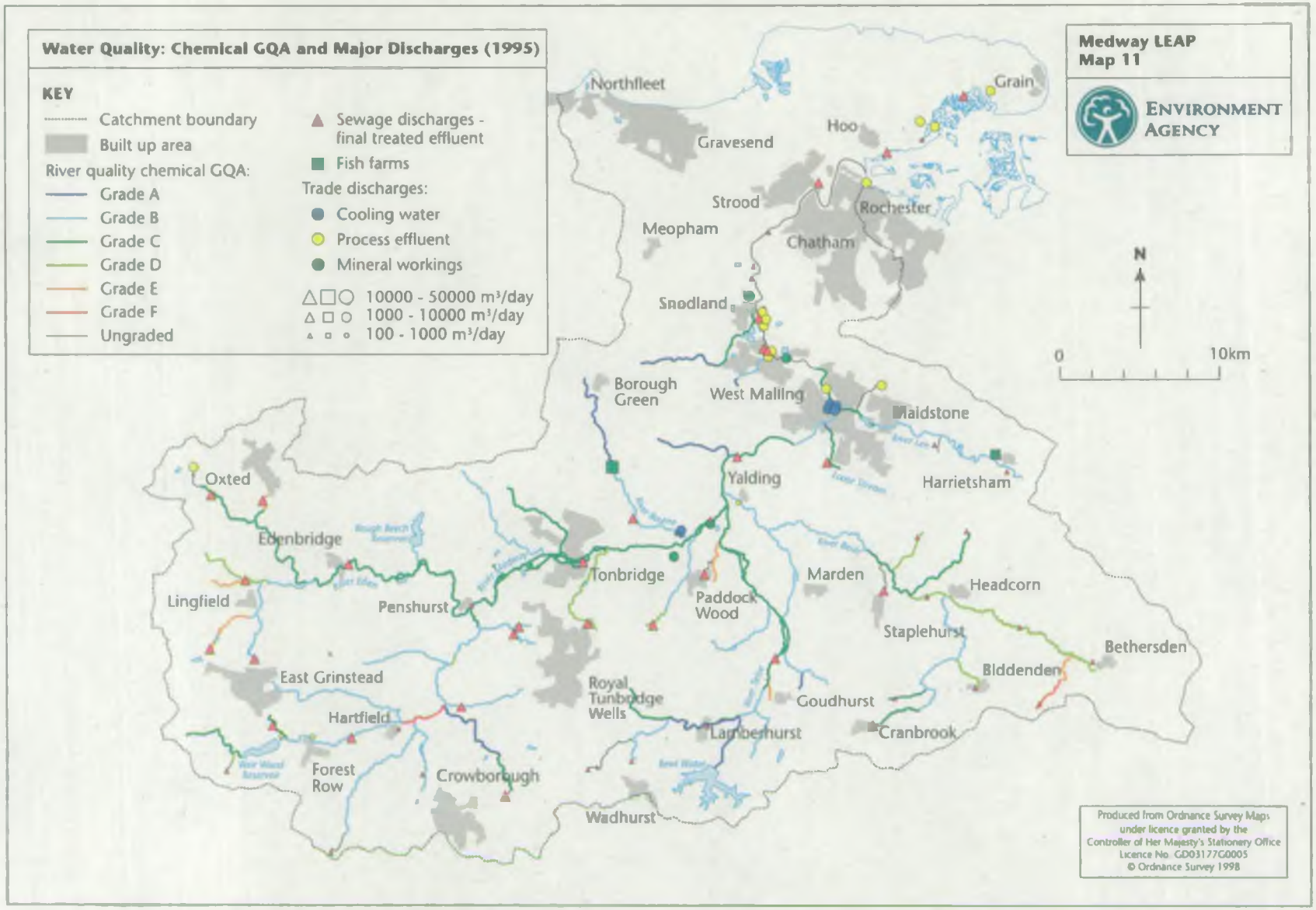
Table 2.11: GQA Chemistry and GQA Biology results 1990-1995

GQA Chemistry	% of sites in each class for:		GQA Biology	% of sites in each class for:	
	1990 Data	1995 Data		1990 Data	1995 Data
A	3	9	A	8	26
B	22	35	B	21	36
C	34	35	C	42	25
D	13	14	D	21	10
E	21	6	E	8	2
F	8	1	F	0	1

For 1995, both GQA sets of results show that water quality is generally satisfactory in the Medway LEAP area, but does range from very good to bad. Where low classifications in quality have been registered, these are most often due to the impact of sewage effluents on small streams which suffer from low flows and offer little dilution. However, the Agency cannot reduce the classification of a particular river stretch just because of a low flow since this may only be a short term situation. Some major sewage treatment works, such as Tunbridge Wells North, also have a serious impact on their receiving waters. However, there have been some significant improvements in recent years following investment in treatment plants, most notably on the Grom (Tunbridge Wells South) and Sunnyside Stream (Luxford's Lane). Overall, there has been a general improvement in water quality from 1990 to 1995, with marked increases in the proportion of sites in classes A and B and decreases in the proportion in the classes E and F - the only exception being the F class GQA Biology result at Dark Mill Farm on the River Bourne, caused by low flows and organic enrichment.

Assessment of estuary quality

The Medway, combined with the Swale, forms one of the three principal estuaries in the Kent area. Focusing on the Medway itself, water quality varies throughout the estuary. Under the National Water Classification water quality scheme, 41% of sites were classified as good quality, 41% classified as fair and 18% classified as poor (Grades A - C respectively). The lower estuary is within the North Kent LEAP and further details are provided in the LEAP Environmental Overview for that catchment.


Water Quality: Chemical GQA and Major Discharges (1995)
KEY
Catchment boundary
Built up area
River quality chemical GQA:
Grade A
Grade B
Grade C
Grade D
Grade E
Grade F
Ungraded
Sewage discharges - final treated effluent
Fish farms
Trade discharges:
Cooling water
Process effluent
Mineral workings
10000 - 50000 m³/day
1000 - 10000 m³/day
100 - 1000 m³/day
Medway LEAP Map 11
Environment Agency
N
0
10km
Northfleet
Grain
Gravesend
Hoo
Strood
Rochester
Meopham
Chatham
Snodland
Borough Green
West Malling
Maidstone
Harrietsham
Yalding
Oxted
Edenbridge
Tonbridge
Paddock Wood
Marden
Headcorn
Staplehurst
Bethersden
Biddenden
Lingfield
Penshurst
East Grinstead
Royal Tunbridge Wells
Goudhurst
Cranbrook
Hartfield
Lamberhurst
Forest Row
Crowborough
Wadhurst
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Groundwater protection

The protection of groundwater is of great importance since once contaminated, the source may be lost for years. The vulnerability of groundwater is prioritised by the Agency in terms of Source Protection Zones I (most vulnerable), II and III and resource protection based upon aquifer type (Major, Minor, Non). The Agency advises on groundwater protection through the document, *The Policy and Practice for the Protection of Groundwater*. Whilst there is no statutory basis for this document at present, the Groundwater Regulations will soon be applied to provide the statutory basis as the implementation of the EU Groundwater Directives.

Furthermore, the Agency's policies are supported by Groundwater Vulnerability Maps which are being produced nationally for England and Wales. Map numbers 40, 46 and 47 apply to the Medway LEAP area.

Work is currently in progress to design and implement the Groundwater Quality Network. When completed the network will provide general groundwater quality information for Kent. Data will be collected from selected Public Water Supplies and some private groundwater abstractions and boreholes.

2.3.8 Consented discharges to water (non PIR)

Sewage treatment works (STWs)

There are over 70 sewage treatment works in the Medway LEAP area, which are consented and monitored by the Agency. These range from private plants serving individual public houses, caravan sites and service areas to those larger works operated by Southern Water which serve large towns and villages. One of the roles of the Agency (in conjunction with the DETR and the Regulator of Water Services, OFWAT) is to negotiate future investment by Southern Water, which is assisted by Asset Management Planning (AMP). The Kent LEAP gives further details of AMP2. AMP2 projects in the Medway catchment agreed with Southern Water and scheduled for completion by March 2000 are: Paddock Wood STW, Harrietsham STW, Pembury STW, Tunbridge Wells North STW, Eden Vale STW, Coxheath STW, Biddenden STW, Bethersden STW.

The Agency is currently reviewing further improvements required under AMP3 in the Medway LEAP area, which will continue from 2000 to 2005.

Industrial discharges

There are numerous surface water discharges in the Medway, originating largely from a number of industrial estates in the Medway towns. There are also discrete consented trade discharges which predominate in the south of the catchment.

2.3.9 Water resources

The Agency has duties and powers to manage water resources under the Water Resources Act 1991 (WRA 91) and the Environment Act 1995 (EA 95). The principal mechanism for managing water resources is through the abstraction licensing system and full details are given in the Kent Area LEAP.

2.3.10 Conservation

The EC Birds and Habitats Directives require the Agency as a 'competent body' to maintain a favourable conservation status of sites afforded statutory protection because of their international importance for nature conservation. Agency consents and authorisations potentially affecting sites protected under the Habitats Directive have now been identified for review. Those sites falling within the Medway catchment are the Medway Estuary and Marshes (number of consents to be reviewed is in the order of 60), Ashdown Forest (number of consents to be reviewed is in the order of 10) and Thames Estuary and Marshes (number of consents to be reviewed is in the order of 30).

Under the Biodiversity Convention signed by the UK Government in 1992 the Agency is the contact point for delivering Action Plans for twelve species of nature conservation concern and one habitat. (See Section 2.2.1). The Agency is the lead organisation for white-clawed crayfish, water vole, allis shad, twaite shad and is also the joint lead for the otter.

Targets relevant to the Medway catchment from the Kent BAP are:

- to manage and maintain the Medway catchment in a condition which supports the full potential range of flora and fauna, through improved water quantity and quality, and physically respecting and conserving the dynamic nature of rivers, their micro-habitats and their associated floodplains.
- protection and maintenance of minimum residual flows even in drought environments to ensure biodiversity safeguards.
- to retain and enhance the management of the present extent of semi-natural grazing marsh.
- to create new grazing marsh habitat, especially from degraded improved grazing marsh and arable conversion.
- encourage a return to near-natural coastal processes where appropriate.
- increase the number of ponds and ditches with open water.
- maintain groundwater supplies and increase to historic levels.
- prepare and implement water level management plans for all marsh areas.

- to contribute to the creation of 100 km of buffer strips adjacent to ditches and dykes throughout Kent in 10 years.
- reduce agricultural pollution, especially entering waterways.
- improve water quality through tighter controls on discharges.

Water voles in the Medway catchment

The Agency considers this catchment, particularly the coastal grazing marshes, to be very important for water voles. As such, there needs to be a high level of conservation effort focused on this species, in this area, including a large contribution to achieving the following Kent-wide BAP targets:

- to carry out 5 specific water vole habitat schemes each year.
- to create 5 km of riparian habitat headland each year.
- to establish and designate 10 key refuges from mink in Kent, for example strongholds within Cliffe and Cooling Marshes.
- to produce a network of good quality water vole habitat, linking key populations.

Otters in the Medway catchment

Contribution to Kent-wide targets:

- survey to assess and monitor populations.
- protect existing populations and encourage natural expansion through good habitat management.
- provide resting sites every 5 km of bank.
- assess and alleviate physical threats.
- maintain and raise the profile of the otter.
- survey all road/rail crossings by the year 2000.

White-clawed crayfish in the Medway catchment

Certain tributaries, for example the River Eden are important for native crayfish:

Contribution to Kent-wide targets:

- to establish the distribution and status of the native crayfish in Kent by the year 2000.

- to generate two media articles each year raising public awareness of the native crayfish and the importance of its conservation.
- to investigate the possibility of identifying and managing two sites in Kent as refuges for the native crayfish.
- to investigate best practice methodology to survey crayfish.

Allis and twaite shad in the Medway catchment

The allis and twaite shad have both been found in the Medway catchment. Kent-wide targets for the species include:

- Establish current status and distribution of shad in Kent waters by 2000.
- Identify and protect any spawning areas.
- Put in place mechanisms for identification and recording of any shad catches.

2.3.11 Flood warning

The operation of the flood warning systems by the Environment Agency within the Medway LEAP area is measured against the National Performance Targets which, for success, stipulates that by 2000/01, 80% of members of the public affected by flooding must have received a flood warning. In addition, it is the Agency's aim to provide a minimum of a two hour warning of commencement of flooding wherever practicable. In order to meet the target, however, it will be necessary to extend the database of those who receive direct warnings to include a significantly higher proportion of people at risk from flooding.

2.3.12 Navigation

The navigational structures at the various lock complexes on the Medway Navigation between Allington and Tonbridge have two principal functions:

- Locks - to enable river craft to navigate safely and efficiently between reaches over a vertical height of up to 3 metres.
- Sluice/Weirs - to retain water levels in the upstream reach at a relatively high level for navigation purposes and to allow river flows to be conveyed downstream without excessive flooding.

The Lock structures, which are currently all manually operated and despite being relatively old structures, can be said to adequately fulfil their intended function.

The same can be said for the sluice/weir structures although it should be noted that some of the older structures, namely at East Farleigh and Eldridges, are giving cause for concern. In addition, due to the altered winter flow regimes

brought about by relatively recent sluice replacements, significant downstream erosion problems are being caused at several locations.

2.3.13 Recreation

The Agency's responsibilities towards recreation are detailed in *"An Action Plan for Recreation"*, published in 1998 and further details are provided in the Kent LEAP.

The Agency has a duty to promote the use of water and associated land for recreational purposes where desirable and where resources allow.

Water-related recreation in the Medway catchment includes activities such as coarse and game fishing; canoeing; power-boating; dinghy and yacht sailing; windsurfing and water skiing. These take place throughout the River Medway and its estuary, and in large water bodies e.g. Bough Beech reservoir, Bewl water and Brooklands lake (Map 12).

2.4 HEALTH OF THE ENVIRONMENT

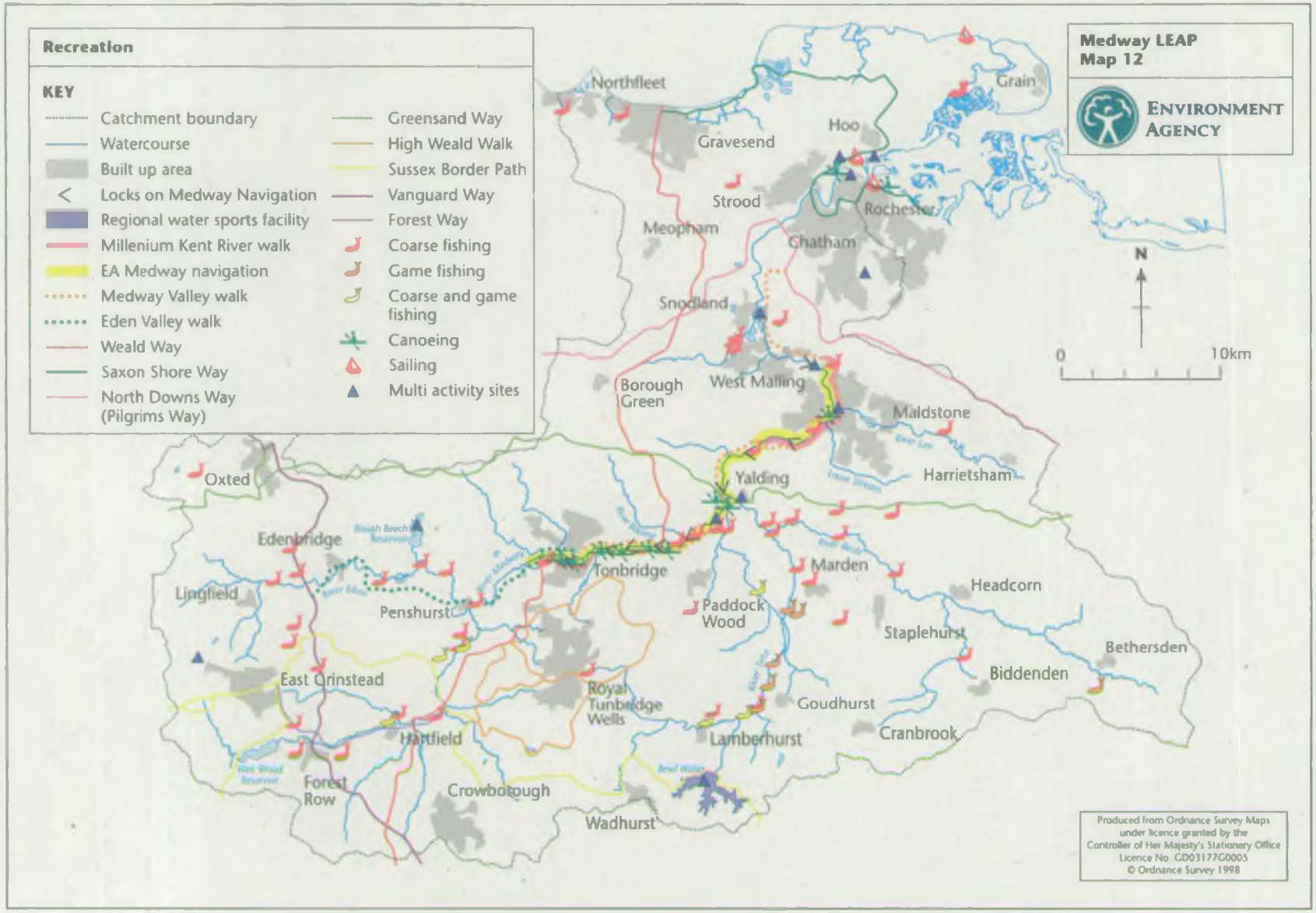
The health of the Kent Area environment has been addressed in the Kent Area LEAP which should be referred to for our current thinking on this issue. Of particular relevance in the Medway are eutrophication and tree health. Eutrophication is characterised by excessive growth of algae and other aquatic plants and is indicative of the presence of fertilisers. The River Beult is an example of a watercourse which is suffering from eutrophication (see 3.2.4).

Although common along the banks of rivers and wetlands, alder trees are at risk in the Medway catchment from alder root disease, otherwise known as *Phytopthera*. Alder trees are monitored in the catchment to assess the spread of the disease.

2.5 LONG TERM REFERENCE SITES

The reasoning for long-term monitoring of the environment has been provided in the Kent Area LEAP: there is a need to take a long-term perspective if sustainable development is to be achieved and if long-term changes are to be detected. In the Medway catchment there is an air quality monitoring site in Rochester High Street and a river flow monitoring site at Teston.

The River Eden at Penshurst is the site in Kent being used for the Environmental Change Network. This covers long-term monitoring for water quality, invertebrates, plants and algae. Upstream of Allington Sluice on the Medway and Clappers Sluice on the River Eden are harmonised monitoring sites within a DETR programme for monitoring river quality based on chemical sampling at the tidal limit of rivers or the downstream end of major tributaries.


Recreation
KEY
Catchment boundary
Watercourse
Built up area
Locks on Medway Navigation
Regional water sports facility
Millenium Kent River walk
EA Medway navigation
Medway Valley walk
Eden Valley walk
Weald Way
Saxon Shore Way
North Downs Way (Pilgrims Way)
Greensand Way
High Weald Walk
Sussex Border Path
Vanguard Way
Forest Way
Coarse fishing
Game fishing
Coarse and game fishing
Canoeing
Sailing
Multi activity sites
Medway LEAP Map 12
Environment Agency
N
0
10km
Northfleet
Grain
Gravesend
Hoo
Strood
Rochester
Meopham
Chatham
Snodland
Borough Green
West Malling
Maidstone
Harrietsham
Yalding
Oxted
Edenbridge
Tonbridge
Marden
Headcorn
Lingfield
Penshurst
Paddock Wood
Staplehurst
Bethersden
Biddenden
East Grinstead
Royal Tunbridge Wells
Goudhurst
Cranbrook
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2.6 AESTHETIC QUALITY OF THE ENVIRONMENT

2.6.1 Introduction

Aesthetics is normally related to the attractiveness of an area, and that would be within the remit either of the local authorities or the Countryside Commission, which is the Government's main advisor on landscape protection. However, it can be related to how an area is perceived by both residents and visitors, and is a major element in determining the quality of life experienced in an area. In that respect, the Environment Agency has a direct role through:

- ensuring that water bodies are as attractive as possible, as well as being conducive to nature conservation and to recreation. This relies on the Agency's powers of management of the areas adjacent to water as well as in ensuring that water is free from litter, films of oil, scum and algae, and in preventing sewage solids in water bodies and in the sea;

- negotiating with Southern Water in respect of screening of combined sewage overflows to prevent the discharge of sewage related debris;

- regulating the appearance of landfill and other waste disposal sites, to ensure litter, wind blow, or bird populations do not detrimentally affect an area; and

- influencing the development plan process and acting as a statutory consultee on planning applications.

The Agency also has an indirect control in that it takes a holistic view of environmental management and maintains strong liaison with the Countryside Commission, local planning authorities and others who are concerned about aesthetic matters.

2.6.2 Landscape

The Medway LEAP area largely falls within that part of Kent which is described as the "Garden of England". It is perceived as a rich agricultural landscape which is safe from urban pressures. That perception may well be retained for the major part of the LEAP catchment, at least because development will be restricted in the two AONBs (Kent Downs and High Weald) and in the Metropolitan Green Belt. Planning policies have been, and continue to be, very successful in dealing with land management issues.

The Agency can influence the management of the Kent Downs AONB by ensuring appropriate excavation and restoration of chalk pits. The High Weald is a more subtle landscape which depends on the mosaic of many types of feature; some heathland and forest, but often an intimate mixture of pasture, hedgerow and wetland. The Agency can play an important role in encouraging or requiring the retention of such features, which are threatened not only by

development, including culverting, but also by agricultural practice. Such action would help to conserve the local landscape character, which is central to the philosophy promoted by the Countryside Commission.

The Green Belt occupies the western half of the LEAP area, including land in both AONBs, and serves an important role in conserving not only the countryside itself, but also ensures that the open spaces in between are kept defensible.

The role of measuring the quality of the landscape is principally that of the local planning authorities, which are recommended to undertake district-wide landscape assessments as part of the local plan process. However, the Agency can make an appropriate input into the assessment. The local plan process leads to the designation of more local landscape designations, such as Special Landscape Areas. If account is taken of these areas, nearly three-quarters of the LEAP area is covered by protective landscape designations, and little major development is allocated for such areas. The proposed density of development in the undesignated areas is consequently high, and the Agency has an important role to ensure that the water and wetland features in the areas to be developed are protected and appropriately managed.

2.6.3 Tranquil Areas

Another measure of the quality of life in the Medway area is the degree of quietness or tranquility which it experiences. Measurements of noise are not assessed on a local authority basis, although Environmental Health Officers have spot records for individual sites. A broad-brush indication of tranquility has been provided through a desk study prepared by the Council for the Protection of Rural England, working in conjunction with the Countryside Commission. They described tranquil areas as places "which are sufficiently far away from visual or noise intrusion of development or traffic to be considered unspoilt by urban influences." This is a somewhat simplistic approach, because there are quiet areas in towns and noisy areas in the countryside, so, in urban areas, account is taken of the presence of power stations, highly trafficked roads, motorways, military bases and civil airfields.

In common with much of the South East of England, there are few areas in the catchment of the Medway that are identified as tranquil. The continued expansion of development in north Kent, the continued use of the motorways and the creation of the Channel Tunnel Rail Link will further reduce these areas. However, it is likely that much of the Isle of Grain, small areas in the North Downs and much of the rural areas south of Maidstone away from major routes will remain tranquil and thus be continued to be treasured for their rurality. Care has to be taken when attempting to provide increased access to the countryside, particularly to rivers, that such tranquil areas are not lost.

2.6.4 Litter

The Agency is concerned with the impact of litter on the environment because:

- a build up of litter can block drainage channels and lead to a danger of flooding;
- accumulated litter can comprise a fire risk, which in turn is detrimental to air quality;
- certain parts of litter can, if left, pose a potential water pollution problem;
- litter is aesthetically unpleasant, and can reduce people's enjoyment of recreation on or adjacent to water features, or even deter them from visiting such sites;
- litter can pose a health and safety risk.

Litter generally relates to the placing, by intent or otherwise, of materials in an illegal or unwarranted location by the public. It does not include discharges of material or tipping on sites of material by industrial concerns. Litter can arise from the following sources:

- sewer outfalls with little screening or macerating, releasing faecal, other organic and inorganic matter into rivers or the sea and hence being deposited on river banks or the sea shore;
- discharge of material at sea;
- flytipping;
- accidental spread of material from licensed sites; and
- incremental collection of material dropped by individuals in the countryside. We are generally concerned only when this litter is deposited close to or at water bodies.

The Medway River Project, which is co-funded by the Agency, has performed a number of litter clearance operations and is helping to educate local residents to reduce litter and to reuse and recycle materials. The work of the Project may provide a model for successful partnerships between the Agency and other organisations. It should be noted that responsibility for removal of litter lies with riparian owners, district councils or unitary authorities rather than the Agency.

3.0 STRESSES AND STRAINS UPON THE LOCAL ENVIRONMENT

3.1 NATURAL FORCES

3.1.1 Climate variations and potential sea level rise

The effects of "global warming" are likely to affect the Medway LEAP area in two significant ways:-

- Rising sea levels - Predicted sea level rise due to climate change will result in the gradual reduction in standards of protection provided by coastal defences. Scientists have identified that the UK is rotating about an axis generally from the Bristol Channel to the Wash with the result that the South East is sinking. The combined effect of climate change and settlement is that sea levels in the South East of England are predicted to rise, relative to the sea defences, at a rate of 6 mm per year.

- Extreme weather conditions - More frequent, more extreme weather conditions have been predicted to accompany "global warming". With respect to inland flood defences, intense rainfall over relatively short periods could result in flash flooding in previously unprotected areas adjacent to smaller watercourses. The converse of this also applies in that prolonged dry periods could lead to the reduction of frequency of flooding on the larger watercourses.

The predicted rise in sea level, coupled with the effects of the settlement of the South East of England are expected to bring increasing pressure on the coastal defences in both the Medway and Thames estuaries. Furthermore, intensely severe weather conditions inland will require inland flood defence resources to be redirected to new, almost certainly more numerous, areas.

Guidelines for the design of flood defences to take account of the predicted rise in sea levels are set out in the "Project Appraisal Guidance Notes" for flood and coastal defences as published by MAFF.

3.1.2 Erosion

Erosion is generally a natural process, with moving water being the most important agent of erosion, whether from the sea, tidal waters or rivers. In many areas, generally in remote or rural locations, these natural erosion processes go unnoticed as they cause little or no impact on man's activities. Where, however, coastal or riparian land has either been developed or is used, e.g. for recreational purposes, then problems can arise.

The effects of natural erosion can be observed in most parts of the Medway LEAP area, whether on the coast or along river banks. With respect to sea and tidal defences the erosion occurs initially in the form of loss of foreshore, whether sand beaches, shingle banks or saltings. If left unchecked, such

processes lead to the defences becoming more exposed to wave attack with the consequent risk of increased overtopping, storm damage and, eventually, breaching. These processes are in evidence in the North Kent coast and lead to the increased use of revetment, wave walls and groynes in order to maintain standards of protection at their present levels.

On inland waterways the adverse effects of natural erosion are bank collapse and "shoaling" or deposition downstream. Again, these effects are noticeable to a greater or lesser degree on all of the watercourses in the Medway LEAP area, except perhaps where effective bank protection systems exist. On the River Medway, in particular, bank erosion is causing significant concern to the Agency. Erosion generally occurs in one of two ways.

- Severe localised erosion at normal retained level leading to undercutting of the upperbank and eventual collapse.

- Bed and lower bank erosion resulting in total bank collapses and generally high vertical faces.

The first of these erosion processes is thought to be caused by boatwash or surface water currents, or both. The second is either caused by natural erosion on the outside of meanders, (with subsequent deposition on the inside of meanders), or excessive or extended high volume flows in a channel that has insufficient capacity. Several examples of the latter can be seen as a result of the series of automatic sluice gated structures that were installed between East Peckham and Tonbridge in the 1980s. Each of these structures has, in some way, changed the flow regime through the lock complex, with the result, in several cases, that increased erosion or erosion in areas not previously affected occurs. Examples of these are:

- Porters Lock and East Lock - Severe erosion in the relatively narrow flood channel for some distance below the sluice.

- Oak Weir Lock - Malfunctioning of the sluice, now corrected, led to erosion of the river banks immediately upstream and downstream of the structure. Bank repair works upstream of the sluice were subsequently carried out in 1994 making extensive use of chestnut faggotting.

Another example of increased or varied erosion due to changes in flow regime is downstream of the Leigh Barrier which was built in 1982. There is a supposition, as yet unproven, that the operation of the Barrier at times of peak flow, with the impounding of excess water upstream and the controlled release of water through Tonbridge, could cause changes to erosion rates during the extended period of bankful conditions. However, it is not known how this would compare with the effect of the full flood flow passing through Tonbridge.

Other areas on the navigable section of the Medway at which bank erosion is currently giving cause for concern are:

- Upstream of Tonbridge - Localised areas of erosion, mainly on the northern branch of the river through the Sports Grounds, are threatening public footpaths.

- Tonbridge Town Centre - General erosion on the right bank is threatening to undermine the low brick flood wall adjacent to the Garden of Remembrance (bank stabilisation works have recently been completed in front of the flood wall at River Walk).

- Anchor Sluice Moorings - Severe erosion on the right bank is threatening the integrity of the Agency's public moorings as well as the towpath.

- East Farleigh Moorings - Localised erosion upstream of East Farleigh bridge, perhaps due to turbulence caused by boat movements, is threatening the moorings and towpath.

The main difficulty with all erosion problems is that of identifying, with any degree of certainty, the actual cause or causes, whether natural or man-made. Other factors which will also affect rates of erosion are as follows:-

- Poor Ground Conditions - Weak natural soils or disturbed soils adjacent to river banks.

- Vegetation Loss on Banks - Caused either by over-grazing by farm animals, clearance by anglers, informal moorings for river craft, or erosion processes.

- Bank Damage by Recreation Activities - Removal of bankside vegetation and cutting of access steps by anglers, informal moorings, general trampling of bank edge.

3.1.3 Flood warnings

The expected outcome of the effects of relative sea level rise would be for the numbers of flood warnings being issued to be on the increase. In practice, however, the reverse seems to be the case with relatively few flood warnings in the last 5 years. Whilst weather patterns on a national basis appear to be changing as predicted, the South East has, to a great extent, escaped the very intense rainfall conditions that have been experienced elsewhere.

The main issue facing the Agency's Flood Warning Service is to extend the database of people/properties at risk of flooding who receive direct warnings within the existing Flood Warning Zones (**Issue No. 1**).

3.2 SOCIETAL INFLUENCES

3.2.1 Climate change

Whilst there is a growing public awareness, with recent media coverage, of the likely effects of climate change in the UK, there is perceived to be a growing apathy amongst members of the public and authorities towards the associated flooding risks in the South East of England. Recent years have had lower than average annual rainfall which in turn has resulted in fewer flood events. The consequent complacency and lack of awareness of the risk of flooding is tending to put increased pressure on the development of land within flood plains. (See Kent LEAP).

It has been considered that climate change could be behind the overall trends in the decline of water quality in the Southern Region. Potential reasons for such a trend include a decrease in rainfall and an increase in temperature, leading to lower flows in rivers and streams, decreases in dissolved oxygen and increases in water temperature. However, the overall effects of climate change are confusing and thus it is difficult to make generalisations at a regional level. Therefore, only detailed, catchment level assessments of water quality and flows will help to identify areas of potential concern in terms of further climate change, the results of which may lead to changes in river quality management for the Medway **(Issue No. 2)**.

It is also apparent that in terms of water demand, consumers expect water 'on tap' and without restrictions. In order to inform the suppliers of water and contribute to water resource planning, certain key data are required. Current climate change predictions associated with water resources include changes in rainfall and river flows, increased evaporation and a tendency for the south-east to become drier. Because the effects are likely to be exacerbated in the south-east it is necessary to institute a routine for the analysis of water quality and hydrological data to identify any trends indicative of climate change processes. Special attention will need to be given to the flow regime of principal rivers.

Corresponding periodic amendments will need to be made to the water balance estimates for the constituent resource areas. The significance of any observed changes will be assessed in terms of:

- Possible decrease in average annual resource replenishment rates.
- Consequent decrease in deployable output of public water supply sources.
- Increase in public supply demand
- Impact on river baseflows, water table levels and wetland habitats.

3.2.2 Development Pressures

Regional and national planning guidance

This guides local planning authorities in terms of numbers of houses to be accommodated in their areas and sets targets for the proportion to be built on brownfield land.

Structure plan guidance

Although most of the Medway catchment lies within the county of Kent (1370 km^2) parts also lie in Surrey (147 km^2), West Sussex (40 km^2) and East Sussex (222 km^2). The policy implications of the relevant structure plans are as follows:

Kent

- Promotes the reinvestment in the urban fabric of the Medway towns focusing on the riverside areas.
- Development of the former West Malling airfield.
- Maintenance of strong Green Belt policy over much of West Kent.

Surrey

- Resists urbanisation and seeks to slow the rate of development to conserve the environment, including the Green Belt.
- Does not allocate for strategic development in Tandridge District, other than for 2,600 houses.

East Sussex

- Seeks to conserve and enhance the High Weald Area of Outstanding Natural Beauty and Ashdown Forest.
- Does not allocate for strategic development within the catchment.

West Sussex

- New development to be within or adjoining existing built up areas.
- Limited additional development only in East Grinstead/Crawley Down/ Turners Hill due to environmental constraints.

Local plans

The Medway catchment includes eleven local authorities (including Medway Council unitary authority).

Gravesham Borough Council

Major developments are limited to the Channel Tunnel Rail Link and a section of the Medway Towns Northern Relief Road.

Dartford Borough Council

The Borough is scheduled to receive major development, but most is outside the Medway LEAP area in the short term. From 2003 to 2021, however, major residential development will take place in the Swanscombe and Greenhithe area, including Eastern Quarry, with 14,735 dwellings scheduled in the long term, and over 10,000 by 2021. In addition, major employment development allocations for over 11,000 jobs in the Ebbsfleet area are proposed to be developed from 2003 - 2021.

Mid Sussex District Council

Environmental constraints restrict potential housing development in this area to 149 dwellings up to 2006. Employment provision is similarly modest.

Tandridge District Council

Development in this district is to be largely centred in the Caterham area, outside the catchment. New housing in the catchment is limited by the presence of the Metropolian Green Belt. The Limpsfield/Oxted/Hurst Green area lies outside the Green Belt, and is scheduled to accept only about 250 dwellings on large sites up to 2006.

Maidstone Borough Council

While the area has to make provision for 7400 dwellings up to 2006 most of this allocation will take place in Maidstone itself since the remainder of the Borough is largely rural and protected by Green Belt or Kent Downs AONB policies.

Medway Council

This unitary authority has to balance the need to provide the greatest number of new houses in Kent with the improvement of areas suffering from deprivation. Opportunities are being taken to re-use brownfield sites in town centres, riversides and industrial areas on the Isle of Grain. The Channel Tunnel Rail Link, Medway Towns Northern Relief Road and M2 widening scheme also cross the Council area.

Sevenoaks District Council

The part of the Medway catchment in the district is rural with the exception of Edenbridge. The area is protected by Green Belt and High Weald AONB policies.

Ashford Borough Council

This is one of the major growth points for Kent. However the area around the headwaters of the River Beult are rural with no allocations for development.

Tonbridge and Malling Borough Council

Major development is proposed at Bushey Wood on the eastern bank of the Medway and at Kings Hill (West Malling airfield). There are also proposals for the reuse of wharves downstream of Aylesford to facilitate the movement of materials by river.

Tunbridge Wells Borough Council

The Borough has an allocation of some 2700 houses by 2011 and with little industrial land, greenfield sites adjacent to towns will be required.

Wealden District Council

There are no further housing or industrial land releases within the Medway catchment planned up to 2004. Development will be required for 4400 dwellings up to 2011 but again this will not be focused within the catchment.

Summary of development issues

- Increased impermeability in major development areas, which might lead to flash floods unless flood alleviation measures are introduced. Significant areas for redevelopment which could lead to these problems are redevelopment proposals in the Medway towns and Bushey Wood, on the east bank of the Medway (**Issue No. 1**).

- Redevelopment of older urban areas could lead to disturbance of contaminated land. It is not possible to avoid such areas without compromising protection of greenfield areas in the countryside (**Issue No. 17**).

- Redevelopment of older waterside areas will seek maximisation of use of land, but there is a demand to increase access to the water (**Issue No. 10**).

- It is inevitable that increased pressures for residential and commercial activities will place water resources under greater pressure (see Kent LEAP).

- Avoidance of areas prone to flooding - now mostly recognised by planning authorities.

- Creation of Channel Tunnel Rail Link and generation of subsequent development.

- Poor surface water quality from culverted watercourses in developed areas.

3.2.3 Community involvement

Partnership opportunities exist for the Agency with the various user-groups of the Medway including conservation groups, boaters, canoeists and anglers. The Agency would wish to be more proactive in forging links with the local community to increase the value of the Medway catchment in terms of wildlife and recreation. An example of a successful partnership is The Medway River Project (a partnership with the Agency, Kent County Council, Tonbridge and Malling Borough Council, Maidstone Borough Council, Medway Council and the Countryside Commission) which has the primary aim of enhancing the Medway Valley in the "Navigation" as a green corridor for the benefit of wildlife and the local community, through the promotion of community awareness and action (Map 9). Future partnerships do not necessarily have to be on such a large scale and could operate on a much lower-key basis, such as Agency advice sessions on particular issues.

The Agency funds the South East Otters and Rivers Project hosted by Kent Wildlife Trust. The project is assisting with water vole conservation and taking the lead in otter conservation in Kent. An otter strategy for the catchment is being prepared and this will be followed by targeted action on a river by river basis.

The Medway and Swale Waste Minimisation Project is another example of successful partnerships for which the Environment Agency is the major sponsor. This has attracted eleven organisations throughout Kent (although the majority are in the Medway catchment) and in the last two years savings of £4 million have been identified, emissions have been reduced and water saved. This has lead to the promotion of a new strategic initiative - the Sustainable Business Partnership. This offers local companies further opportunities to participate in action on waste minimisation and environmental improvement.

3.2.4 Surface water management

There is increasing demand in the Medway LEAP area for suitable land for development for both residential and commercial reasons. This requirement for land raises two specific issues with respect to surface water management:

- Development of flood plain - See Section 3.2.1 above.

- Surface water discharges - Many of the areas being developed have or will have surface water discharges direct into tidal waters with the consequence that gravity flows may only be feasible for 12 hours in any day. Developers/planners need to be better informed to enable early recognition of the possible need for surface water storage and/or pumped discharge facilities.

Development of land invariably leads to the increase in the area of impermeable surfacing, with greater, more rapid surface run-off during rainfall. Developers need to take account of this effect when drawing up their proposals for surface water drainage taking account of the possible need for local storage facilities with controlled discharge into watercourses.

The catchment is typified by a number of towns on the headwaters of rivers. At times of low flow the proportion of sewage effluent makes up a high volume of total flow at sites adjacent to Tunbridge Wells, Tonbridge, Crowborough and East Grinstead. In particular, under low flow conditions the River Beult is heavily dependent on the input from a number of local waste water treatment works operated by Southern Water Services. Problems have been experienced in recent years with consequent nutrient enrichment of the river which can lead to eutrophication. Pressure is being placed on Southern Water (via the AMP 3 process) to improve the effluent quality from these works by nutrient removal. The Company is considering aggregating the treatment by transferring the sewage downstream for treatment at one existing site. The closure of smaller existing works could adversely affect the river flow during the summer and the Agency will therefore oppose developments which lead to more housing in the upper catchment or involve closure of such works or changes in the sewerage infrastructure and number of discharge points (**Issue No. 11**).

3.2.5 Water demand and management

The strategic need to manage water demand in the Kent area has been addressed in the Kent LEAP and will be guided by Structure Plan pressures. There is a need to satisfy strategic requirements for growth in population and industry while balancing the needs of the consumer and the environment (**Issue No. 3**). Actions may be selected from a range of options developed by the South East Region Water Resource Strategy Study. The hierarchy of options for the Medway is:

- Demand management/leakage control.
- Bulk transfers between companies.
- Enlargement of strategic reservoirs.
- Aquifer storage and recovery in the Lower Greensand.

Attention has also been given to the general supply potential of the large volumes of water currently discharged to waste from the Swanscombe/Northfleet chalk quarry (**Issue No. 4**).

Water is abstracted from both surface and groundwaters throughout the catchment for public, private, industrial and agricultural purposes as has been described earlier. The effects of this are of a generic nature throughout the

south-east and have been addressed in the Kent Area LEAP. In particular, however, within the Medway, there are specific areas of concern in connection with the Medway scheme. Flows over the sluice at Allington can become severely depleted during drought periods and in the past such low-flow episodes have led to oxygen depletion within the estuary with consequent fish kills. There is a need therefore to understand the flow/quality relationship in the Medway and this is being studied as part of the Medway Estuary Project. This will provide the basis for the setting of discharge consents and will define minimum residual flows.

Similarly, as part of the Medway scheme, the intake at Yalding currently enables rapid filling of Bewl Water. However, there may well be future occasions when, as in some recent years, winter flows have been insufficient to allow full recovery of storage following a dry summer. There will be a need therefore to abstract water earlier in storm events with a potential reduction in the quality of water taken into storage. This may have consequent implications for treatment costs. A Drought Management Plan is needed to guide water companies on the most appropriate and environmentally-beneficial operating regime under such conditions (**Issue No. 3**).

3.2.6 Transport

The Agency has no formal remit regarding the planning or operation of the transport system. However, we do have a role as a consultee in the planning system on proposals for new or expanded transport infrastructure development, as these may affect Agency duties. In addition there is a Memorandum of Understanding between the Agency and the Highways Agency (see Map 2).

Road transport

New road infrastructure, including new bypasses, link roads and improvements to existing primary routes, is proposed by the DETR and Highway Authorities (local authorities) in order to cope with increased traffic demands, keep unsuitable traffic levels away from residential areas and provide new or improved access to areas for redevelopment. Key proposals recently completed or underway include the £180 million Medway Towns Northern Relief Road, which includes the Medway Tunnel. There are also proposals for a Medway Metro, a modern version of the tram, to link Strood, Maidstone, Rochester and Chatham, to provide a more sustainable alternative to road transport within the next decade. The Government's recently published New Deal for Trunk Roads in England concluded that an integrated transport strategy for improved access to and within Kent Thames side and other regeneration areas in North Kent including improvement of the A2 was required. The A2/M2 Cobham to Junction 4 widening is now proceeding to contract and a bypass for Lamberhurst on the A21 is proposed. The A21 Tonbridge - Pembury bypass dualling is to be considered by the South East Regional Planning Conference.

Rail

The principal change to the rail network will be the development of the high-speed Channel Tunnel Rail Link (CTRL) passing through the catchment.

The Agency is a statutory consultee in the applications to be made to LPAs for the construction of the railway under Schedule 6 of the CTRL Act 1996, and as the CTRL crosses a large number of watercourses we are involved directly under Schedule 15 of the Act in approving aspects of the final design in relation to our flood defence, land drainage, water resources and fisheries interests. Extensive consultation has already taken place between the Agency and LPAs to ensure our interests are represented within planning approvals. During construction, the Agency will monitor the works for compliance with these approvals.

Groundwater levels will also rise as a result of Blue Circle's proposals at Swanscombe (**Issue No. 4**).

The valley of the River Ebbsfleet in north Kent will be significantly affected by the CTRL and by the proposed Ebbsfleet international and domestic passenger station. This will probably greatly affect development in Gravesham.

Ports

Major harbours of international importance including Thamesport for handling deep-sea cargo vessels are located in the Medway Estuary, with other cargo ports at Chatham Docks. Various other ports and wharves in the Medway Estuary and at Gravesend are also of local importance. Coal and oil are imported for the power stations at Kingsnorth and Grain. With this presence of ports within the catchment considerable efforts are required by the Agency to carry out inspections under the Transfrontier Shipment of Waste Regulations 1994 (See Section 2.3.4). The Agency will work as a consultee in the planning process to ensure that any proposals for the expansion of ports take sea defences, water quality and nature conservation interests into adequate consideration. Dredgings to maintain the viability of the harbours and approach channels have to be deposited elsewhere and this can be of concern given the proximity of sites of international wildlife interest such as the saltmarsh of the estuaries particularly at Gravesend and the Isle of Grain. The increased shipping along Chatham Reach and the barging of oil to factories is leading to increasing concern with respect to oil pollution and a Medway Emergency Pollution Plan has been prepared in conjunction with the Medway Ports Authority who are responsible for the control of pollution up to Allington Sluice (**Issue No. 16**).

3.2.7 Energy

There are 3 major power stations in the Medway catchment with net declared capacities of power generation well over 50 MW. There are also a number of smaller power stations in operation (see Table 3.1).

Table 3.1: Power stations in the Medway catchment
Source: Electricity Association, 1998.

Power station	Fuel/plant type	Declared net capacity (MW)	Company and year of commission
Grain	Oil/OCGT	2065	PowerGen (1970)
Kingsnorth	Coal/Oil/OCGT	1474	PowerGen (1970)
Isle of Grain	CCGT	675	Medway Power (1995)
Aylesford	CHP	40	Aylesford Newsprint (1994)
Stangate landfill	Landfill gas	4.5	Greenways (1997)
Offham landfill	Landfill gas	1.18	Greenways (1997)

Key: OCGT = Open Cycle Gas Turbine
CCGT = Combined Cycle Gas Turbine
CHP = Combined Heat and Power

The total declared net power generating capacity within the Medway catchment is some 5,090 MW and is set to expand further, with several more power station proposals at various stages of planning and authorisation:

- planning and IPC applications for another proposed CCGT (1200 MW) on the Isle of Grain are expected;
- the proposed Kingsnorth (Damhead Creek) CCGT (700 MW) has received consent from the DTi, and an IPC application has been received;
- new applications for Kent Power's Allington Waste to Energy Plant (capacity 35-40 MW) are expected;
- Scottish Hydro is commissioning a new 40 MW CHP plant at the Smurfit Townsend Hook papermill. IPC authorisation has been issued.

Approval of applications for new gas-fired power stations is presently on hold pending the results of the energy review by the Royal Commission on Environmental Pollution (RCEP). The proposed Allington waste to energy plant could potentially dispose of up to 500,000 tonnes of the county's waste. It is not affected by the energy review and while opposed by some, will be welcomed by others who see it as solution to the lack of landfill opportunities in the Medway catchment, which consequently exports much of its domestic waste (see Section 3.4).

The Agency authorises all power stations with declared net capacities above 50 MW through IPC. It has an important role as a consultee in decisions on

consent (required from the DTi for power stations above 50 MW) or planning permission from LPAs. As potential power station operators can apply for and receive planning permission before applying for IPC authorisation, the Agency needs to ensure that consultation in the planning system is used effectively so that the full environmental impacts of power stations are taken into account at an early stage.

Power stations are often located along the coast, partly due to their need for large volumes of cooling water, and their concentration along the north Kent coast is of some concern for the cumulative effects of thermal pollution. The emissions and air quality impacts of existing and proposed power stations in and around the county of Kent have been able to be predicted, monitored and assessed through the use of the IPC application process and the Kent Air Quality Management System, which was developed in response to the concentration of power stations and incinerators in north Kent.

Coal-fired power stations also produce large quantities of solid waste in the form of pulverised fuel ash and furnace bottom ash, which can both be recycled for use as aggregates in concrete manufacture.

There are Combined Heat and Power (CHP) plants at Aylesford Newsprint and Smurfit Townsend Hook. CHP stations are more energy efficient than conventional power stations, saving some 35% in primary energy usage and 30% savings in CO_2 generation. The Government aims to increase CHP capacity in the UK to 5 GW by 2000 and is considering doubling this by 2010. The Agency encourages industry and others to recognise the benefits to be gained from energy efficiency measures, including CHP and the use of gas generated by landfills such as at Offham landfill. This could also be implemented at Coney Hill.

3.2.8 Recreation

The Agency is principally concerned with water-related recreation, which not only includes active water sports, but also informal recreation adjacent to water bodies, and thus includes those recreation facilities which depend on water or are located by water. Principal recreational facilities are shown on Map 12.

The catchment area is a popular tourist destination, combining attractive countryside within "the Garden of England", and including important parts of the Kent Downs and High Weald Areas of Outstanding Natural Beauty, with historic towns such as Royal Tunbridge Wells, Rochester and Chatham.

Chatham in particular relies to a considerable degree on its waterside attractions - the Historic Dockyard is being managed as a "living museum" and redeveloped with the Dockyard Trust. Other nearby areas are being redeveloped in conjunction with English Partnerships and will include new marinas at Chatham Marine, Basins 1 and 2. These sites were previously occupied by the Ministry of Defence and contain areas of contaminated land **(Issue Nos. 10 & 18)**.

In Maidstone the local authority is seeking to introduce riverside footpaths, similar to those being promoted in the Medway towns and helping to broaden the existing tourism attractions. The Agency has an important role to play in encouraging reasonable levels of access to water in urban areas (**Issue Nos. 10 & 17**).

The Agency can also play a role in maintaining the character of the countryside in controlling the water environment, and working with farmers whose land management is a major determinant of the appearance of the area.

Watersports

The River Medway is an important cruising waterway for tourists and day visitors. In recreation terms, the management of the river should be treated together with the Medway Estuary and Swale, for which an Estuary Management Plan has been prepared. The Agency's role in co-ordinated recreational management of the river from source to mouth is one which warrants further examination. (The LEAP covering the lower estuary is that for North Kent).

There is a right of navigation in the lower parts of the river, as far south as Allington Lock, operated by the Medway Ports Authority. From there to Tonbridge rights are operated by the Agency, and from Tonbridge upstream to Forest Row there is navigation but not controlled under any rights. There is canoeing activity throughout much of the river's length and in some of the tributary rivers. These activities do not take place at such a level that the Agency's interests are jeopardised.

However, the rise in popularity of jet-skis (personal water craft) is, to some degree, based on the fact that they have a small draught and thus can be used in shallow rivers. There is a possibility that their use, especially at high speeds, can cause bank erosion, so it may be appropriate to consider a code of practice. One problem is that jet-skiers tend not to be controlled by a governing body, although the Royal Yachting Association has sought to provide a good practice guide. Siltation also takes place at several of the on-line lakes on the River Eden and so threatens sailing there and at Haysden Lake (**Issue No. 9**).

The single most important site for water recreation is Bewl Water, at the head of the River Teise, but local facilities are also to be found at Bough Beech Reservoir, on a tributary of the River Eden, and at Weir Wood Reservoir, which is close to the source of the River Medway. Bewl Water occupies nearly 500 hectares, has a maximum depth of about 30 metres and has a perimeter of about 13 miles. A considerable range of recreation activities takes place in and around the reservoir, including angling, sailing, windsurfing, canoeing and rowing. These activities are able to take place side by side with a nature reserve, which is set in a discrete part of the reservoir's southern side.

Access to water

The initiatives by urban authorities to increase access to water have been highlighted above. Redevelopment should, if it is conducted in accordance with policy, achieve pedestrian access alongside water and also launching points where vehicles and craft can gain access to water and have adequate social and parking facilities nearby.

It is in the rural parts of the catchment, where developers' contributions will not be forthcoming, that there is a paucity of access for horse riders, cyclists and walkers to bankside areas as well as a lack of launching points. Although the Agency has a general responsibility to promote the use of waters and to make land available, where appropriate, for recreational purposes, it is not generally responsible for the establishment, upkeep and waymarking of rights of way, but it can establish and manage routes on its own land. The major responsibility normally falls to the highways authority, i.e. the county councils and the Medway Council, although it is sometimes vested in the district council. Nationally important or regionally important routes may be funded by the Countryside Commission. Such local authorities may wish to make development near watercourses subject to planning obligations to require the provision of safe access to water (**Issue Nos. 10 & 17**).

Although there is generally good coverage by rights of way within the catchment, there are some areas which have poor access, such as parts of the Teise and Beult. The Agency will seek to work with the highways authority to negotiate either new rights of way or permissive routes subject to their acceptability in wildlife conservation terms.

The most important long distance footpaths in the area include:

- The Weald Way, which runs alongside the Medway between Tonbridge and Maidstone;
- The North Downs Way (although little of this is beside water);
- The Eden Valley Way;
- Forest Way (in the upper Medway Valley); and
- Greensands Way.

As yet, no study has been undertaken of the degree of conflict between users of rights of way and permissive routes, other recreation users and nature conservation. Any such study of the Medway should be set within an integrated review of management for recreation and lead to clear priorities for action. Much of the land immediately adjacent to the River Medway is designated for nature conservation purposes so consideration should be given to disturbance factors (e.g. to otters) in such cases.

Only in a few places does the use of riverside footpaths cause problems in relation to bank stability. The degree to which problems might arise is increased if the routes are to be used by bicycles (which, in law, cannot use public footpaths), horses and (on roads, roads used as public paths and by-ways open to all traffic) motor vehicles. This is happening through unauthorised use and there is pressure to convert footpaths by law to routes taking bicycles, horses or vehicles. While this is laudable in principle, in practice it can prove damaging if banks are not adequately strengthened. Although the Agency seeks to encourage access to water, it is inappropriate for it to bear all the cost of strengthening works in such circumstances. Moreover, the Agency has to make a reasoned decision as to whether the greater activity which would occur on an "upgraded" route would be appropriate in what is presently a tranquil area (**Issue Nos. 9, 10 & 17**).

The maintenance of existing rights of way and creation of new routes is hampered by the undesirable spread of exotic plants along banks of rivers and streams. These include Himalayan balsam, Japanese knotweed and giant hogweed which, because it can cause severe blisters and rashes, is a danger to health. It is recognised that control of these plants is expensive and time-consuming (**Issue No. 6**).

Boating and canoeing

Recreation contributes a number of impacts upon the Medway, especially on the navigation section. There is a need for example to raise the awareness of conservation issues amongst boaters. Boats are known to beach or moor directly into sensitive habitats. The Agency will therefore promote the use of casual moorings to minimise the impacts on the river and bankside habitats.

While the Agency will not promote recreation to the detriment of conservation interests there is a need to promote increased managed access and this might include the designation of different areas for specific activities to avoid conflicts of interest. The Agency will also consider the provision of improved information for recreation, especially for canoeing, walking and rowing (**Issue No. 17**).

The main concentration of boatyards on the Medway lies between Yalding and Bowbridge/Wateringbury. The visual appearance of permanent moorings needs to be enhanced through sympathetic landscape management e.g. through the establishment of bankside vegetation. Such enhancements will also have inherent benefits to the ecology of the river. There is active use of the Medway between Tonbridge and Maidstone by canoeists and the Agency will consider the provision of canoe passes within the Agency's programme of renewing flood defence and navigation structures on the river (**Issue No. 17**).

Management of Agency landholdings

All sites that the Agency owns in the catchment have now had an initial site assessment for conservation and recreation potential and priority sites for

enhancement have been identified. Priority recreation sites include the Medway Flood Relief Scheme at Leigh (due to walking, cycling, horse riding and fishing activities and to the proximity to a country park) and the Thames Tidal Scheme at Shorne Marshes (the Saxon Shore Way (footpath) runs through the site).

Recreational issues

- Siltation in rivers and lakes reducing enjoyment (and potentially threatening safety) of water users. **(Issue No. 9)**.
- Ensuring good policies to encourage urban waterside access through redevelopment can be realised. **(Issue No. 10 & 17)**.
- Ensuring redevelopment of waterside sites for tourism and recreation does not generate pollution problems from contaminated land. **(Issue No. 10 & 18)**.
- Controlling the growth of exotic plants along river banks in order to provide good, safe access. **(Issue No. 6)**.

3.2.9 Navigation

The use of the Medway Navigation by commercial carriers ceased many years ago and nowadays traffic on the river, with very few exceptions, is recreational although oil deliveries by barge to industry are currently being promoted. There are a handful of commercially operated passenger boats which are based in the Tonbridge, Yalding and Maidstone areas. The only scheduled passenger service is between the Archbishops' Palace in Maidstone and Allington Lock.

In recent years, there has been a gradual decline in the number of registered craft on the navigation, although the reasons for this are unclear. There are, however, an increasing number of inhabited houseboats on the river, particularly in commercial boatyards between Yalding and Allington.

3.2.10 Conservation

There is a general need to enhance the Medway catchment, including wetlands, for biodiversity. Although habitats and species in the designated sites of conservation importance and BAPs should be given priority (see below), a holistic approach needs to be undertaken to ensure that conservation is considered throughout the catchment; including all tributaries which are extremely important in terms of conservation e.g. the lower Teise, the Bourne, the Millstream in Tonbridge. Some Internal Drainage Board Ditches also have high conservation value.

Although the Biodiversity Action Plans have been published and Kent County Council have produced the Kent Wildlife Habitat Survey, a Catchment-related Biodiversity Action Plan for water-related species is considered to be a method of achieving this holistic conservation aim. Relationships between landowners,

countryside user-groups and interested organisations will have to be enhanced to assure the success of such a plan and, furthermore, consideration of biodiversity will have to be integrated into all regulatory and advisory activities of the Agency.

Designated sites of nature conservation importance

There is a need for further protection and enhancement of the Ramsar Sites and Special Protection Areas (SPAs) in the Medway LEAP area. A review of Agency consents and authorisations has been carried out and authorisations which have the potential to have a significant adverse impact on these sites of international importance have been identified. The Agency is now awaiting national advice on how to proceed with the next stage of protection, especially on environmental constraint criteria to bridge the gap between consent conditions and the stated conservation objectives for these sites.

It is now a requirement that all new Agency plans and activities which may have a significant adverse impact on the condition of a European-designated site should have an appropriate Environmental Impact Assessment.

A variety of factors pose a threat to the River Beult SSSI, including eutrophication, low flows and sewage effluent. A conservation strategy is being prepared together with a low dissolved oxygen alleviation project (**Issue No. 11**).

Increased protection needs to be afforded to the SNCIs within the catchment. Although SNCIs are given planning protection, they are more often degraded by other factors, such as unsympathetic water management. The Agency has initiated a review of water-related Sites of Nature Conservation Interest within the catchment and considers that increased protection needs to be afforded to key SNCIs.

In general, there is a need to improve links between the Agency and English Nature, which is the Statutory Conservation Body. This is likely to increase the protection afforded water-related sites of nature conservation importance.

Biodiversity Action Plans

The issues relating to the following four species should be considered in conjunction with aims and objectives of Species Action Plans, as detailed in the Kent and Sussex Biodiversity Action Plans. Habitat Action Plans are also detailed in these documents and the conservation, enhancement and creation of these habitats should be promoted across the Medway in order that targets within the BAPs may be achieved (**Issue No. 5**).

White-clawed crayfish

There is a need to raise awareness of this species within the Medway catchment with a particular emphasis on safeguarding areas where individuals

are found. Where populations of native crayfish exist, the Agency must ensure that their habitat requirements are integrated into decisions affecting water quality, flow and management in these relevant areas. Furthermore, a review needs to be carried out to determine the potential for increasing habitat quality for the species. Areas containing non-native crayfish should also be identified and the need for remedial action assessed in line with future plans for dealing with invasive species (see below).

Otters

An "Otter Sanctuary" is required between Maidstone and Tonbridge to establish a stronghold for the species in the catchment. This would be an initial stage of a larger strategy to provide otter refuges throughout the catchment. Before such areas are established, further surveys need to be carried out in the other main catchments, beginning with the Beult and Teise. Otter habitats have been assessed using Phase 1 habitat surveys but it is considered that River Corridor Surveys would be a better assessment method. The Agency should continue to support the work of the Southeast Otters and Rivers Project in improving the Medway catchment for otters.

There is also a need to prioritise road crossings for mitigation and erect "otter-proof" fencing alongside railway lines. Priority areas will only become apparent through monitoring and evaluating the use of rail bridges and roads which cross the Medway and tributaries. Furthermore, mitigation measures should be incorporated into any future road and rail schemes, including upgrades and maintenance.

A biotoxicity study of the concentration of different pollutants in the tissues of eels is being undertaken to show the potential of these pollutants to affect otters through the food-chain. Furthermore, water quality monitoring should be carried out for synthetic pyrethroids in water bodies as these have been found to have an adverse impact on otters.

Water voles

There is a need to carry out water vole surveys throughout the catchment, especially on the main river. Water voles are present in the Medway catchment and areas where they are known to exist (e.g. Cliffe Marshes) should be avoided for development where possible. In particular the loss of/damage to habitat without appropriate mitigation should be opposed and the habitat requirements of the species should be taken into account in Agency operations and regulations. The Agency should liaise with FRCA over water level management in the North Kent Marshes ESA and promote appropriate channel and bankside management, including the establishment of buffer strips.

Mink pose a major threat to water voles but there is currently no policy to control this alien species. (Preliminary results from the SW Region of the Agency demonstrate that as otters move into certain areas, mink are displaced).

Allis shad

If allis shad can be proved to spawn successfully in the tidal Medway there could be greater regulatory control for the Medway estuary due to the high conservation status of this species. The estuary could be proposed as a Special Area of Conservation under the EC Habitats Directive. This would have a benefit for the status of fisheries within the Medway by increasing control upon netting in the area.

Indicator species

It is necessary to increase the understanding of the distribution of the key indicator species (e.g. barn owls, otters (as mentioned above), kingfishers, bats, black poplar) so that their habitats may protected, enhanced and created throughout the Medway catchment.

It has been proposed that certain pill boxes, remnant defensive posts from World War II, which are situated at several locations within the Medway catchment could be used as joint-*hibernacula* for both bats and otters combined. Pipes could be installed at the base of these structures which would allow the passage of otters and bats could enter via existing openings. Potential pill boxes for consideration need to be identified.

Invasive species

There is concern about the spread of exotic weeds in the Medway catchment, namely the giant hogweed, Japanese knotweed, Himalayan balsam and Australian stonecrop. A strategic approach needs to be established that will successfully deal with this increasing problem, both on public land (council-owned), private land and land owned by the Agency. The formation of a partnership to assess the current situation and establish remediation plans is thought to be the most appropriate way of dealing with this issue.

While there are organisations responsible for enforcing the law regarding the introduction of exotic flora and fauna in the UK (e.g. English Nature under the Wildlife & Countryside Act 1981 (as amended)) but there are no obvious organisations established which will actively remove these species from different catchments. Including the exotic flora species discussed above, exotic fauna in the Medway catchment include the Canadian beaver, Chinese mitten crab, catfish and signal crayfish (**Issue No. 6**).

Tidal Medway

Partnership opportunities exist in the tidal Medway which include the Agency, Medway Ports Authority and Kent Wildlife Trust. A collaborative project could be established to further the environmental management of the tidal section, increasing both the ecological value of the area and recreation access.

Increasing development pressures (predominantly commercial) along the river corridor in the tidal section of the Medway are resulting in continued habitat loss. "Coastal squeeze" and the potential loss of habitats is therefore an issue. A network of important habitats exist in this lower tidal section, including the South Thames Marshes and Medway Estuary Ramsar Sites and SPAs (**Issue Nos. 10 and 14**).

Biological information

There is a paucity of biological information on the headwaters and downstream of Allington on the Medway. In the main river section, there are an equal number of biological and chemical monitoring sites (121 in total throughout the catchment).

The harmonisation of biological monitoring (invertebrate, fish, flora, other fauna) would allow for a greater understanding of the ecology within the Medway catchment. This would provide a more accurate basis of biological information upon which more accurate management and planning decisions can be based (**Issue No. 5**).

Water resource management

Over-abstraction and unsympathetic water management in the catchment has lead to the degradation of the riverine and bankside habitats, and surrounding wetland areas. Minimum residual levels for the river and tributaries should be set which allow for natural functioning within habitats and the retention of biodiversity. Water flows should also be maintained which are sufficient for the adequate dilution of agricultural run-off and sewage effluent. Low flows, combined with low dissolved oxygen and high ammonia concentrations have had a major adverse impact of the ecology of some stretches of the Medway and its tributaries. In the upper estuary, cooling water and abstractions exacerbate this problem which result in occasional fish kills.

Several key wetland areas such as the grazing marsh in the lower Medway catchment and North Kent (ESA), Wouldham, Halling and Burham Marshes are not reaching their wildlife potential due to the maintenance of low water levels. Raising the water levels in these areas is desirable for their conservation and targets should be established in order for this to be achieved. Such targets could include raising water to a sufficient level at five of these sites by the year 2005 **(Issue No. 14).**

Flood defence

Due to the effects of flood defence operations in the past, large stretches of the Medway and tributaries exist in a highly artificial state. River and bankside vegetation have been lost due to channelisation, culverting and flood defence maintenance. Desired riffle/pool sequences have been removed and meanders have also been straightened under flood defence strategies. This has lead to a more homogenous environment and a dramatic loss of biodiversity. It has also

had a similar effect upon fisheries (See Section 3.2.11). Where possible, a reversal of these engineering works should take place to re-instate more natural features. Distinct targets should be set, which also include the re-creation of floodplain habitats in areas where they once existed. Such an opportunity for example has been identified around Tonbridge which has extensive flood plains which are drained and not allowed to carry out their natural function as a water storage area. It is considered that the Flood Defence section of the Agency could engage an environmental engineer to raise the profile of conservation in future flood defence operations including the possible removal of flood defence structures (**Issue No. 13**).

Buffer strips of vegetation should be encouraged along all river lengths in the Medway catchment. Such habitats have been lost due to flood defence operations and agricultural practices. Buffer strips are important habitats between surrounding land-uses and the river environment, and also enhance the river ecology and wildlife value within a particular stretch (**Issue No. 14**).

Active tree management should be promoted throughout the Medway catchment. Large, over-mature trees fall into the river, degrading the bankside in the process. Although this can be of benefit to the ecology of the river in some instances, it presents a variety of problems for other Agency concerns, especially for recreation and navigation. A rolling management programme involving coppicing on a cycle of 15-20 years would be an appropriate method of tree management, benefiting wildlife, recreation and navigation. A programme of tree planting in appropriate areas is being carried out (**Issue Nos. 13 and 14**).

At the request of English Nature, trials have been undertaken not to carry out mowing of flood defences in selected locations. Subsequent damage caused by erosion during overtopping of the defences has demonstrated the need for the continuation of periodic mowing to maintain a good cover of vegetation which increases the surface strength.

Industry

A number of gravel pit operations in the flood plain area around Tonbridge represent opportunities for habitat creation. It is no longer commercially viable to extract gravel out of several pits in this area and thus opportunities exist to create freshwater and wetland areas in these redundant areas. Potential habitat should be created which will maximise the ecological benefit to the local area, with a particular emphasis on BAP species such as the otter and water vole. These represent an opportunity within the Medway catchment for the creation of quality freshwater and wetland habitat (**Issue No. 14**).

3.2.11 Fisheries

Flood defence

It is widely accepted that there are a number of barriers to the migration of salmon and sea trout within the Medway catchment **(Issue No. 7)**. The weirs interfere with the ability of fish to reach traditional spawning grounds and limit recruitment and recovery from any drought-induced or water pollution-induced mortalities. A strategy needs to be determined as to how much of the river is to be "opened up" to migratory fish so that resources may be targeted upon key areas, such as Allington Sluice. This is the principal barrier to migration with no work taking place on it until 2002. Consideration should be given to a legal way of removing these structures, either leaving or recreating small fish weirs in their place to retain the desired pool/riffle structure whilst facilitating migration.

Seasonal changes in the operation of flood defence/navigation structures pose a threat to fish stocks in certain areas through changes in water levels and flow. Radial sluices in some areas of the catchment may lead to the "washout" of fish. Sluices are open in winter and closed in summer, potentially leading to the permanent displacement of fish. Once fish have been redistributed downstream, it is difficult for them to return upstream either due to strong flow through the sluice gates when they are open or because the sluice gates are closed.

Water resources

Under Section 14 of the Salmon and Fisheries Act 1975, there is a requirement to install gratings at intakes and outfalls to stop the entry of salmonids - the entry of cyprinids is also of concern. There is a need for more information about the impact of such features in the Medway catchment and their effects upon fish populations, including an examination of the time of year that abstraction takes place relative to abstraction laws and permits **(Issue No. 8)**.

Excessive abstraction and drought induced flow has an adverse impact upon the environment (See Section 3.2.5). It can also affect fisheries, changing the composition of fish communities or leading to fish mortalities in extreme cases. Various land-use practices and developments have also led to increased siltation within areas of the Medway catchment. This can lead to a decrease in overall habitat quality, and impact upon breeding sites for some fish species. The River Len has recently been affected, due to surface run-off from ploughing up to the river edge and also from motorway construction.

Within-catchment introductions

Carp have been increasingly recorded in fisheries surveys in sections of the Medway where they were once absent, gaining entry through either illegal introduction or from adjacent or on-line lakes. These are unsuitable species for flowing riverine habitats, leading to habitat degradation, and can also transfer infectious diseases and parasites to resident fish.

The stocking of brown trout in some stretches of the Medway and tributaries is carried out by local Angling Clubs. Research carried out by the Agency is yet to show whether the interbreeding between stocked and wild native fish has resulted in introgression, a process which has removed native stocks in some areas. Stocking of trout of native genetic composition is thus highly desirable **(Issue No. 8)**.

Angling

There are currently no sea fisheries powers on the tidal stretch of the Medway up to Allington. This situation needs to be reviewed in order to preserve fish stocks in tidal reaches. Fishing also occurs from Agency-owned structures such as weirs and sluices during the closed season and a bye-law is required to stop this practice.

Although the Agency issues rod licences which are compulsory in order to fish with a rod and line in British waters, some areas of rivers are further controlled by angling clubs and membership is compulsory in order to fish that particular area. Different angling clubs on the "Navigation" section of the Medway are involved with various conservation projects on the river, in terms of river and bankside habitat preservation, restoration and conservation. The Agency needs to be more proactive in advising such groups as to the best ways of achieving their aims of maximising the habitat potential of different areas to increase the quality of the fishery. It is thought that Agency bailiffs could act as the point of contact **(Issue No. 8)**.

3.2.12 Minerals

The Medway catchment includes the principal areas of mineral extraction in Kent, as it runs across the full complement of rocks within the Weald.

Chalk and cement production

The main mineral-related industry is cement production, which is based in only two places in Kent, one of which is the Rochester works, at Halling. The cement works is supplied with chalk from the adjoining Halling quarry. The existing area for chalk extraction lies adjacent to the cement works, but supplies are due to run out within about three years, compared with the 15 year landbank required by the Kent Minerals Plan. That plan is content to retain the permission for extraction of a long-term chalk supply at Dean Valley, which is just to the west of the present site, and which also has better quality chalk.

The Halling quarry is partially worked below the water table, so that a large lake has developed. Although there is a landscape scheme for the site, it is 25 years old. There is no prospect of filling of the site with other material, and - in any event - a borehole lies nearby. Therefore, an agreed after-use plan for the lake needs to be prepared, and the Agency should have a significant role to play in its preparation **(Issue No. 19)**. The Dean Valley site will be restored in accordance with conditions and a legal agreement, but it will be a dry working

and, if no landfill is undertaken, the scheme should have minimal strategic implications for the Agency.

The other cement works is at Northfleet, near Gravesend in the Darent catchment. However, the local chalk supplies for that works are running low and are poor quality, so they have to be supplemented by good quality chalk from Holborough, just to the south of the Halling site, which is operated by BCI. The long term plan is for the Northfleet works to close and be replaced by a purpose-built works at Holborough, which would be operating well in advance of the Northfleet closure. A planning application has been submitted by Blue Circle for both a cement works and a large area of chalk quarry, based on the existing Ladd's Lane site. It would result in a large mineral working, part of which would be under water. Clearly, the Agency has a significant role in advising Kent County Council, as mineral planning authority, on issues such as pollution control, impact on aquifers, nature conservation and restoration and after-use. There is unlikely to be any significant reason why recreation uses could not be permitted in parts of the wet pit which would not conflict with ongoing operations. The Agency would also be concerned with air quality issues related to the cement works operation. **(Issue No. 21).**

No other proposals for chalk extraction in the catchment are put forward by the County Council because of the adequacy of supply. There are minor extraction points for agricultural lime, but these are of minimal strategic interest to the Agency.

Clay

Clay is also required for the production of cement. The Northfleet site is currently supplied with clay from Essex, which is piped under the Thames Estuary. No clear indication has been given as to the proposed source of clay for the Holborough works, although it is stated that raw materials other than chalk would be brought in by road. Thus, the viability of the long term supply from Essex may be called into question and there may be need for a local supply. The Halling cement works is served by the clay pit at Park Farm, Wrotham, but its reserves are likely to be used by 2009 and so new clay reserves will need to be sought in the early years of the new century.

There will be continued demand for clay for coastal sea defences, particularly on the North Kent coast. There is an existing site on the Isle of Grain which would serve that purpose and thus no additional land take is anticipated. Moreover, there is likely to be adequate clay for brick and tile making to satisfy demand well into the twenty-first century **(Issue No. 19).**

Aggregates for construction

The considerable amount of development to take place in the Medway catchment will demand an adequate supply of construction aggregates. This has been recognised by the Kent Minerals Local Plan which has proposed that large areas be promoted as Areas of Search. These include the following areas:

• Hoo Peninsula	Gravel and concreting sands (large areas)
• Isle of Grain	Gravel and concreting sands
• Borough Green	Building sand
• Upper Medway Valley	Gravel and concreting sands

It is the last of these proposals, particularly on land to the east of Tonbridge as far as Paddock Wood, which could have a significant impact on the valley of the Medway. It would not only have local impacts, producing large areas of open water during operation, but also have implications for the water quality and geomorphology downstream. The operations may not necessarily prove damaging, but care is needed to ensure the riverine environment and the public perception of the locality is conserved and, if possible, enhanced. **(Issue No. 19).**

Oil and gas

There are no productive or exploratory wells in the catchment area other than that at Rooks Nest, in Surrey, but licences for exploration exist. Therefore, while no imminent issues are likely to arise from exploration, the situation should be closely monitored.

3.3 RELEASES AND DISCHARGES

3.3.1 Industrial Emissions

The Kent Air Quality Management System (AQMS) operated by the Kent Air Quality Partnership of local authorities has identified that air quality in North Kent gives concern particularly with respect to traffic and development. Traffic issues are controlled by local authorities but most of the development issues relate to IPC authorisations which are regulated by the Agency. Power generation is of particular prevalence in the northern part of the Medway catchment and a number of new schemes are proposed (see Section 3.2.7) including waste to energy plants at Allington and Kingsnorth, and power stations at Damhead Creek and the Isle of Grain. The Air Quality Partnership provides a mechanism for considering the cumulative impact of such schemes to ensure that there are no adverse impacts on the environment as a whole even though individual schemes may be within acceptable limits. This has been addressed in the Kent Area LEAP.

The northern part of the catchment is a focus for industry, particularly cement and paper production. The proposed move from Northfleet of Blue Circle to Holborough has been referred to above and the IPC application for this plant is currently being considered by the Agency. It is likely that the planning application will be called in by the Secretary of State for a public inquiry since it is in Green Belt. Rugby Cement's plant at Halling has been the subject of an increasing level of dust complaints and a new electrostatic precipitator is to be installed in 1999 to control such emissions.

At present all paper mills in the Medway catchment comply with their authorisation limits.

It is noted that a number of IPC authorisations in the catchment are due for their four yearly review within the next 3 years in accordance with the Agency's duty under EPA 90.

Within these authorisations there are consents to discharge effluent and cooling waters. At the present time each consent is reviewed individually but, due to their close proximity to each other, the Agency will wish to review the cumulative effect of all the discharges into the tidal Medway. This is being progressed as part of the Medway Estuary Study. (**Issue No. 12**).

3.3.2 AMP3 and the National Environment Programme

The outcome of the Periodic Review undertaken by the Regulator is expected in Spring 1999. Consequently, details of these issues for negotiation between the Agency and the water company are not available at the time of writing. Guidance recently issued by the Government to OFWAT strongly suggests that the safeguarding of wildlife sites will assume a high priority in AMP3.

The Agency has proposed schemes including phosphate stripping at 13 sewage treatment works in the Beult catchment for review by OFWAT and will seek to ensure the flows in the Beult are not compromised by down catchment transfers (**Issue Nos. 11 & 15**).

3.3.3 Water quality: diffuse and intermittent pollution

Control and monitoring of water quality by the Agency is essential not only to fulfil legislative requirements but also to protect intakes for water abstraction.

Main problems for water quality arise from point source discharges such as from sewage treatment works (e.g. Somerhill Stream, a tributary downstream of Fordcombe STW), and from diffuse discharges such as agricultural run-off (e.g. Brenchley Stream, Wateringbury Stream). Discharges from sewage treatment works are subject to Asset Management Planning (see Section 2.3.7). Somerhill Stream, for example is a stream of major water quality concern and is covered by AMP2. The Gas Works Stream enters at the start of the Somerhill stream which brings about problems for water quality. Additional water quality problems arise from storm water flows from Tunbridge Wells North STW.

Agricultural pollution is more difficult to control and represents a major problem for water quality in a catchment of high agricultural productivity. Pesticides and herbicides originating from intensive farming methods within the catchment have been detected in river water samples and can lead to fish kills. Fertiliser run-off can lead to the enrichment of the catchment, causing the growth of extensive algal blooms which can reduce levels of dissolved oxygen in water, especially in summer. The Environment Agency will be more proactive in establishing riparian buffer zones and increasing environmental awareness amongst landowners, including the safe disposal of pesticides and herbicides.

At present, there are no bye-laws to prevent discharges from boats although such a law is scheduled for early 1999. It is important that this law is introduced when scheduled and that boaters are made aware of the consequences (**Issue No. 16**).

3.4 WASTE MANAGEMENT

3.4.1 Waste management planning

The solid waste produced each year in the UK presents significant stresses and strains on the environment in a variety of ways.

The Agency has wide ranging duties, powers and responsibilities for waste management (see Section 2.3.4). The principal aim is to achieve a continuing reduction in the impact of waste on the environment and to prevent pollution of the environment, harm to human health and serious detriment to the amenities of the locality.

Local authorities require information on waste arisings and management to prepare their statutory Waste Local Plans under the EPA 90, which determine the requirement for further waste management developments in their areas. The development of such facilities is determined by local authorities through the land use planning system.

A new Waste Local Plan for Kent was produced by the County Council and was adopted in 1998. It accepts that there is an urgent need for additional waste management facilities and that in the short term that need can only be met by new landfill proposals. Energy recovery from waste through incineration was proposed at 2 sites - Halling and Kingsnorth but no applications have been received for these sites by the Agency. A further incinerator is being proposed, but not allocated in the Waste Local Plan, at Allington Quarry (**Issue No. 21**).

East Sussex County Council produced the 'Waste Disposal Plan 1988-1998' which will be superseded by the Waste Local Plan under preparation. In the meantime East Sussex County Council prepared a non-statutory document 'East Sussex Waste Strategy' in May 1997 (ESCC, 1997) dealing with the waste of East Sussex in the period up to 2011. This provides a framework for more sustainable waste management and has been the subject of extensive consultations. The Waste Local Plan for Surrey County Council is currently under preparation.

3.4.2 Waste arisings

Household waste

Household waste statistics are collected by District Councils based on their administrative boundaries which do not follow the LEAP boundary. Household waste recycling schemes are promoted in several districts covered by the Medway LEAP but the vast majority of household waste still continues to be disposed of at landfill sites. Major proposals for household waste incineration in Kent may change this in the near future.

Commercial and industrial waste

The types and quantities of such wastes arising in any district are a function of the amount and type of industry and commerce in the area. For example, the newsprint and paper recycling industry is substantial in the Medway LEAP area, and gives rise to large quantities of paper sludge and other wastes, as well as the recycling of newspapers and other paper into new product. Of some concern to the Agency is the extent of the practice of spreading paper sludge wastes on agricultural land (**Issue No. 20**). The cement industry is also particularly important in the Medway LEAP area, and gives rise to large quantities of cement kiln wastes. These can be highly alkaline and corrosive, and as such can be classified as Special Wastes under the Special Waste Regulations 1996. Amendments to the EC Hazardous Waste Directive may mean that cement kiln wastes are all classified as Special Wastes under new Regulations. Reused wastes include scrap metal, hardcore, wood, crushed concrete, waste oils and solvents.

Sewage sludge

Sewage sludge wastes arise from more than 50 sewage treatment works in the Medway LEAP area which are operated by Southern Water Services plc. The cessation of disposal at sea and the higher levels of wastewater treatment to be provided will result in high volumes of residential sludge. SWS's sludge strategy involves increased recycling of sludge to land for agricultural use and so there is likely to be an increase of sludge spreading on land (**Issue No. 20**).

The spreading of sewage sludge as a fertiliser on agricultural land is controlled by the Agency with guidelines issued by MAFF. These controls exist to ensure that the potentially harmful substances in sewage sludge, including pathogens and heavy metals, are at levels that do not cause harm to human and animal health, pollute surface or groundwater, or harm soil fertility and crop yields.

3.4.3 Waste management facilities

Waste management facilities include materials recycling facilities, scrapyards, civic amenity sites, waste treatment plants, transfer stations, landfill sites and incinerators. The Agency regulates most waste management facilities through the Waste Management Licensing Regulations 1994 (as amended), which

implement the licensing scheme introduced by EPA 90 and the requirements of various EU Directives on waste. Controlled waste or *directive waste* is defined as any material which the holder intends to (or is required to) discard and includes household, commercial and industrial wastes. There are exemptions, and other solid wastes are covered by separate legislation.

The waste licensing system aims to ensure that facilities do not cause harm to human health, do not pollute the environment nor cause significant detriment to local amenities. Certain facilities with a low risk potential are exempt from licensing. They still need registration from the Agency and include activities such as temporary storage and scrap metal recovery. There are thought to be at least 60 scrap yards in the Medway LEAP area. These will all require registration by the Agency by November 1999.

There are some 96 licensed waste management facilities in the Medway LEAP area, including 38 landfill sites, 14 waste transfer stations as well as 9 civic amenity sites and 4 clinical waste transfer stations. Liquid waste treatment sites include 70 sewage treatment works. There are currently no solvent transfer stations, or licensed incinerators other than clinical waste incinerators, although several new municipal waste incinerators are proposed in the Medway Council area.

Landfill

Landfill remains the most significant waste management option in the Medway LEAP area. There are currently 21 landfill sites licensed to accept domestic and other putrescible wastes, and 17 licensed to accept non-domestic, mainly 'inert' wastes.

Some operational landfill sites in the Medway LEAP area are known to give rise to problems of leachate pollution of aquifers and groundwater, and are known to be causing local odour and landfill gas migration problems. Closed landfill sites of which the Agency has records of 257 in the Medway catchment, have also led to these problems. As the Agency is responsible for regulation of licensed sites, we will continue to work with operators and landowners to reduce environmental problems. Local authorities have duties with regard to air quality and other nuisance problems arising from sites, and we will continue to work with them to reduce such problems. Landfill gas and leachate management is being undertaken at several sites, and required on all new licensed sites. Leachate and groundwater monitoring is undertaken at 9 sites, and this may need to increase as more closed landfill sites are identified and defined as 'contaminated land' under the Environment Act 1995 (see Section 2.1.5; **Issue No. 18**). Landfill gas is being utilised for energy recovery from a number of landfill sites, and the Agency is keen to encourage energy recovery from more landfill sites where gas is currently being flared off.

Incineration

There are currently no municipal waste incinerators in the Medway LEAP area, and only one clinical waste incinerator, which burns 6-7000 tonnes of waste per year. Three new large municipal waste incinerators are proposed in Kent's Waste Local Plan in order to provide an alternative disposal method to landfill, with another site subject to private proposals. (See Sections 3.2.7 and 3.4.1. **Issue No. 21**).

Waste transfer

Waste management in the Medway LEAP area is characterised by large movements of waste both into and out of the Area.

Others

Problems have arisen with the tyre dump at Fort Horsted, which closed in 1988. Up to 1 million waste tyres were disposed of in a moat at the site over a period of 20 - 30 years. The site is now considered to pose a substantial fire risk and the Agency needs to consider the appropriate remediation action (**Issue No. 22**). A fire at a similar site at Marden caused severe pollution problems.

3.4.4 Waste initiatives

Waste minimisation

The Agency supports local initiatives for waste minimisation in the Medway-Swale Waste Minimisation Project. Local Agenda 21 initiatives can also be used to investigate and promote waste minimisation in local areas (see Section 3.2.2).

Recovery

There are some landfill sites in the Medway area where methane gas produced by the landfilled wastes is collected and burned to generate electricity. Landfill gas generation is monitored at 14 sites in the area. At Offham landfill site, this electricity is fed into the national grid (see Section 3.2.7). The Agency is keen to see more energy recovery at landfill sites which are producing landfill gas, including at Coney Hill, where gas is currently collected and flared off.

3.5 ILLEGAL PRACTICES

3.5.1 Pollution incidents

These include breaches of consent conditions and unauthorised discharges. The Agency is committed to the "polluter pays" principle and enforcement of legislation.

Pollution incidents may also occur as a result of accidents e.g. road traffic accidents, resulting in oil or chemical spillage. Incidents may also be caused by vandalism which may be an illegal act in itself. However, in such instances the occupier of the land will also have a duty to ensure that spillages are contained and so may also be liable to prosecution.

As noted above, road, rail or river accidents occur which may not be directly illegal although costs for pollution abatement and clean up may also be recoverable by the Agency. For major new road or rail projects, pollution control is required to be built into the design and the CTRL will have pollution control devices incorporated where appropriate. The Agency must ensure that the operators maintain such systems and implement staff training to avoid pollution in the event of an accident.

For the period 1995 to 1997, approximately 3500 pollution incidents within the catchment were reported to the Agency. From this total, 70 were classified as significant pollution incidents (20 as Category 1 and 50 as Category 2).

Given the sensitive nature of the catchment with surface water abstraction for potable supply and areas where low flows are recorded in the summer this level (approximately 2/months) of serious incidents is of concern. The prevalence of these Category 1 and 2 pollution incidents is due principally to the intensive road and rail network in the catchment and the urban nature of the northern half.

Catchment Protection Plans are in preparation to identify areas where chemicals or other pollutants are stored. The first of these is being undertaken for the River Len which has its confluence with the Medway immediately upstream of the Springfield water supply intake (**Issue No. 16**).

3.5.2 Unlicensed waste sites

Throughout the catchment, excluding scrap metal sites, there are usually several illegal, unlicensed waste sites operating. Once the Agency receives information about such sites they are visited, warned to cease operation and prosecuted if appropriate. Notices can be served on the operators requiring them to remove any waste illegally disposed of at the site. Generally these sites are closed down but they often generate complaints from local residents during the period that they operate. The more serious concerns are often associated with larger-scale illegal sites or sites receiving potentially harmful wastes. In these cases the Agency will prosecute those responsible.

3.5.3 Fly tipping

Fly tipping is the term used to describe the illegal disposal of waste at various locations throughout the Area. Small-scale fly tipping may be seen in lay-bys and by road sides, with larger-scale operations being found in some secluded urban areas. The illegal disposal of waste in such sites can cause immediate public concern and, in the worst cases, danger to the public. The Agency has

to use its resources effectively and cannot investigate every case of fly tipping. A draft operational protocol has been developed with the Local Government Association, which sets out the proposed roles and responsibilities of the Agency and the local authorities. The protocol proposes that the primary responsibility for small-scale, non-hazardous fly tipping should rest with the local authority while larger-scale, hazardous fly tipping would be dealt with by the Environment Agency.

Tipping of materials by the roadside or on other land without an appropriate licence falls into this category. Discharge of oil from shipping or into watercourses, culverts or drains could equally be categorised as fly tipping. While it was predicted that the incidence of fly tipping particularly of solid waste materials would increase with the introduction of the landfill tax a recent report[3] is not conclusive in this respect. However fly tipping remains a problem particularly in "hot spots" such as lay-bys or country lanes. The Agency is supporting a current (April 1998) study to establish the extent of the problem and the long term effect of the Landfill Tax.

If it can be demonstrated that such incidents are increasing or are a problem then again a campaign of education may be an appropriate action. Generally, litter is perceived to be a problem in the Medway catchment. The Agency will support and develop litter campaigns directly with user groups e.g. boating, angling. The Medway River Project wardens collect high returns of litter especially in "open" fishing areas and thus anglers need to be educated on the effects of discarding materials.

3.5.4 Fish kills

In August 1995 a sewage treatment works failure on the Eridge Stream in the Medway catchment resulted in over 8,000 fish deaths. This was the sole incident of major fish mortalities in the non-tidal catchment between 1995 and 1997 and resulted in prosecution. There were two major fish kills in the upper estuary in 1996 and 1997. The occasional large scale mortality is always a possibility particularly during times of drought when pollutants are ineffectively diluted.

3.5.5 Transfrontier imports

Given Kent's location relative to mainland of Europe, the illegal import of fish species, e.g. large carp, catfish and sturgeon is reported to be occurring. This may have considerable environmental implications where unsuitable species are released into the wild and can also result in disease epidemics. To assist in combating this there is currently a fisheries review that it is hoped will provide more cohesive legislation between the Agency and CEFAS.

[3] Effects of the Landfill Tax on Fly-tipping 1996-97
Tidy Britain Group April 1998

3.5.6 Fish netting/poaching

There is a measure of sea trout, brown trout, eel and elver poaching in the Medway catchment which is being addressed by intelligence gathering and targeted operations **(Issue No. 8)**. Brown trout are taken from mainly private fisheries using lamp and snatches/gaffs and set lines. Theft of valuable coarse fish (large specimen carp) is also a problem in the Medway catchment. Offences under the Theft Act 1968 are addressable by the Police and under the Salmon & Freshwater Fisheries Act 1975 by the Agency Fisheries Officers. Despite an authoritative handout, landowners wrongly ascribe the policing of theft to the Agency Fisheries Officers.

Eel fyke nets are frequently inspected by the Agency to ensure they meet the legal specification and are licensed. This regulates the eel fishery and helps to protect coarse fish stocks that may be illegally exploited using similar methods.

There is extensive rod and line fishing in the Medway rivers and lakes for coarse fish and trout - the latter predominantly in the Upper Medway and tributaries. However, some anglers do not have a licence, despite continuous checks by part-time bailiffs. This is an illegal act under the Salmon & Freshwater Fisheries Act 1975, addressable by Agency Fisheries Officers **(Issue No. 8)**.

3.5.7 Contravention of land drainage consents and bylaws

In general, most developers follow the procedures for new works adjacent to "Main Rivers" by obtaining the necessary consent from the Agency for any works within 8 metres of the bank for non-tidal reaches and fifteen metres of the bank for tidal reaches.

Occasionally developers or individuals, who may be unaware of the bylaws, will carry out works without consent. In such cases, the Agency can either grant retrospective consent or may require the works to be altered or removed. Failure to put this right would be a criminal offence. In extreme circumstances the Agency may remove the un-consented works and recover the cost from the transgressor although it seldom resorts to this drastic measure, preferring to negotiate an amicable settlement for all parties.

Another area in which land drainage legislation is often infringed relates to the infilling, diverting or culverting of watercourses, including ditches and streams. In such cases, the Agency and local councils will often work together to remedy the situation.

The Agency is particularly vigilant with respect to either intentional or unintentional reduction in the standards of protection provided by its flood defences, whether caused by wilful vandalism or lack of care. Under such circumstances, the Agency has appropriate powers, under the terms of the Land Drainage Act 1991, to remedy matters.

Within the Medway area the Agency has certain obligations with respect to sea defences. The Agency controls works and activities which may affect sea defences through the provisions of the Land Drainage and Sea Defence Bylaws 1981.

The particular problems that the Medway poses in terms of policing land drainage legislation is one of logistics (the sheer length of 'main' river, much of which is inaccessible) and the many ordinary watercourses in the area, means that it is difficult to spot activities which require land drainage consent. The Agency relies on a partnership with local councils, the Internal Drainage Boards and the public to ensure that possible contraventions of land drainage legislation are investigated.

4.0 CONCLUSIONS

The following list of issues which have been identified in this Environmental Overview together with proposals for action are detailed in the associated document the Medway LEAP Consultation Draft.

ISSUES SUMMARY

Environment Agency Concern*		Issue
Addressing Climate Change	1	Flood defence provision and operation in the Medway catchment needs to be reviewed to address the increased flood risk due to the predicted effects of climate change
	2	Impact of predicted climate change effects on water management
Improving Air Quality		No issues identified (but see Issue 21 and involvement with local Air Quality Partnerships)
Managing Water Resources	3	Implications of the water resource supply and demand management strategy in the South-East Region
	4	Effect on water resources of Blue Circle Industries moving cement works from Northfleet
Enhancing Biodiversity	5	How to enhance biodiversity in the Medway catchment
	6	Spread of invasive species and diseases
Managing Freshwater Fisheries	7	There are barriers to the movement of fish on the Medway
	8	Sustainable fisheries management
Delivering Integrated River-Basin Management	9	Increased incidence of coastal and river bank erosion and associated siltation
	10	Redevelopment of older waterside areas seeks to maximise the use of the land
	11	Protection of river flows in River Beult
	12	Need to improve our understanding of flow and water quality in the Medway estuary
	13	Impacts of flood defence operations on Medway tributaries on habitats and fisheries

Environment Agency Concern*		Issue
	14	Protection and enhancement of wetland and riverine habitats
	15	Non-compliance with EU standards and Agency objectives for water Quality
	16	Intermittent pollution of watercourses
	17	How to manage the access to water for recreation in the Medway catchment
Conserving the Land	18	Redevelopment of industrial areas needs to ensure that any contaminated land is appropriately remediated
	19	Extraction of minerals may create environmental impacts within the catchment
Managing Waste	20	Spreading of paper sludge wastes on agricultural land
	21	Waste management options for the Medway catchment
	22	Pollution risks from Fort Horsted tyre dump
Regulating Major Industries	No issues identified (but see Issue 4)	

* From: An Environmental Strategy for the Millennium and Beyond (Environment Agency 1997)

APPENDIX 1: CONSULTATIONS

The following organisations were consulted during the preparation of this Consultation Draft.

C.B.I. - South East Region
Council for the Protection of Rural England
Country Landowners Association
Dartford Borough Council
East Sussex County Council
English Heritage
English Nature
English Sports Council, South East Region
Gravesham Borough Council
Kent County Council
Kent Wildlife Trust
Lower & Upper Medway Internal Drainage Boards
Medway River Users Association
Medway River Project
Mid Kent Water plc
Mid-Sussex District Council
Ministry of Agriculture, Fisheries & Food
National Farmers Union
Royal Society for the Protection of Birds.
Southern Water plc
Surrey County Council
Sutton & East Surrey Water plc
Tandridge District Council
Thames Water plc
The Farming & Rural Conservation Agency
Wealden District Council
West Sussex County Council

Supported by data and information supplied by Area staff.

Meetings were held with the following local authorities:

Maidstone Borough Council
Tonbridge and Malling Borough Council
Tunbridge Wells Borough Council
Medway Council
Sevenoaks District Council

APPENDIX 2: GLOSSARY

Abstraction	Removal of water from surface water or groundwater, usually by pumping.
Abstraction Licence	Licence issued by the Environment Agency under Section 38 of the Water Resources Act 1991 to permit water to be abstracted.
Anadromous	Fish with a life history which involves reproducing in fresh water and growing in the Sea.
Asset Management Plan	Asset Management Plans can be considered as the means by which the water undertakers plan the work required and the capital expenditure necessary, for improvements and maintenance of the water supply, sewage treatment works and sewerage systems. These are drawn up through consultations with the Agency and other bodies to cover a five year period. Asset Management Plans must be agreed by the Department of the Environment Transport and Regions, and OFWAT.
Aquifer	A layer of underground porous rock which contains water and allows water to flow through it.
Catchment	The total area of land which contributes surface water to a specified watercourse or water body.
Coastal protection	Natural or man made features protecting land over 5 m AOD contour.
Combined sewer overflow	An overflow structure which allows discharge from the sewerage system to a watercourse during wet weather conditions.
Controlled water	Defined by the Water Resources Act 1991 Section 104. They included groundwaters, inland waters and estuaries.
Cretaceous	A geological era lasting from approximately 140 to 170 million years ago.
Cyprinid	Coarse fish of the carp family ie roach, dace, bream etc.

Discharge consent	A statutory consent issued by the Environment Agency under Schedule 10 of the Water Resources Act 1991 to indicate any limits and conditions on the discharge of an effluent to a controlled water.
Dissolved oxygen	The amount of oxygen dissolved in water. Oxygen is vital for life so this measurement is an important, but highly variable, indicator of the "health" of a water. It is used to classify waters.
Effective rainfall	The rain remaining as runoff after all losses by evaporation, interception and infiltration have been allowed for.
Environmentally Sensitive Area	An area defined by MAFF for which grant aid is available for appropriate agricultural and water/land management.
Eutrophication	Presence of nutrients e.g. fertilisers in aquatic systems leading to excessive growth of algae and other aquatic plants.
Floodplain	This includes all land adjacent to a watercourse over which water flows or would flow, but for flood defences, in times of flood.
Flytipping	The unregulated and, hence, illegal, dumping of waste.
Green Belt	A zone of designated countryside immediately adjacent to a town or city, defined in development plans for the purpose of restricting outward expansion of the urban areas, and preventing the coalescence of settlements.
Groundwater	Water which is contained in underground rocks (aquifers).
Internal Drainage Boards	Autonomous public bodies under the control of board members (including those elected by agricultural ratepayers and those nominated by local authorities), with responsibilities and powers for flood defence on ordinary watercourses (non-Main Rivers) under the Land Drainage Acts.

Landfill Tax	A levy per tonne or cubic metre of waste sent to landfill, used to encourage the use of recycling and waste minimisation.
Main river	All watercourses are designated as either 'Main River' (defined in maps held by the Environment Agency and MAFF) or 'ordinary watercourses' ('non-Main River'). Main Rivers include all watercourses which contribute significantly to a catchment's drainage, although ordinary watercourses may be significant locally. The Agency has powers to carry out works to protect land and property from flooding by improving drainage of Main Rivers only, under the Water Resources Act 1991. Local authorities (and in some areas Internal Drainage Boards) have powers for flood defences on ordinary watercourses, and the Agency has a supervisory role.
National Nature Reserve	An area of land designated by English Nature under Section 35 of the Wildlife and Countryside Act 1981. They are managed by, or on behalf of, English Nature specifically for nature conservation purposes.
Q95	The flow or quality which occurs 95% of the time.
Ramsar Sites	Internationally important wetland sites adopted from the Ramsar Convention on Wetlands of International Importance especially as waterfowl habitats (1971) and ratified by the UK government in 1976.
Return Period	The return period of a flood. Flood events are described in terms of the frequency at which, on average, a certain severity of flood is exceeded. This is usually expressed as a return period in years, e.g. 1 in 100 years.
Riparian owner	A person or organisation with property rights on a river bank.
River corridor	Land which has visual, physical or ecological links to a watercourse and which is dependent on the quality or level of the water within the channel.

River Quality Objective	The level of water quality that a river should achieve in order to be suitable for its agreed uses.
Salmonid	Game fish of the salmon family, e.g. salmon, trout and sea trout.
Sea Defences	Natural or man-made features protecting land below 5 m AOD contour.
Special Protection Areas	Internationally important nature conservation sites designated under the EU Wild Birds Directive. All SPAs are also SSSIs.
Strata	Layers of rock, including unconsolidated materials such as sands and gravel.
Sustainable development	'Development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs' (definition from World Commission on Environment and Development, 1987. Our Common Future - The Brundtland Report).
Tertiary	A geological era lasting from approximately 65 to 2 million years ago.

APPENDIX 3: ABBREVIATIONS

AMP	Asset Management Plan
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
AQMS	Air Quality Management Strategy
BAP	Biodiversity Action Plan
BPEO	Best Practicable Environmental Option
CCGT	Combined cycle gas turbines
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CFC	Chlorofluorocarbons
CHP	Combined Heat and Power
CO_2	Carbon dioxide
CTRL	Channel Tunnel Rail Link
DETR	Department of the Environment, Transport and Regions
EA95	Environment Act (1995)
EH	English Heritage
EPA 90	Environmental Protection Act (1990)
EQS	Environmental Quality Standard
ESA	Environmentally Sensitive Area
FRCA	Farming and Rural Conservation Agency
FWAG	Farming and Wildlife Advisory Group
GQA	General Quality Assessment
HNDA	High Natural Dispersion Area
IPC	Integrated Pollution Control
IUCN	International Union for the Conservation of Nature
KCC	Kent County Council
KWT	Kent Wildlife Trust
LAAPC	Local Authority Air Pollution Control
LCA	Life Cycle Analysis
LEAP	Local Environment Agency Plan
LNR	Local Nature Reserve
LPA	Local Planning Authority
MAFF	Ministry of Agriculture, Fisheries and Food
MRF	Minimum Residual Flow
MW (e)	Megawatts
NNR	National Nature Reserve
NVZ	Nitrate Vulnerable Zone
OFWAT	Office of Water Services
PIR	Process Industry Regulation (the Agency department formerly known as IPC)
PWS	Public Water Supply
RCEP	Royal Commission on Environmental Pollution
RE	River Ecosystem
RQO	River Quality Objective
RSPB	Royal Society for the Protection of Birds
SAM	Scheduled Ancient Monument
SMP	Shoreline Management Plans
SPA	Special Protection Area

SSSI	Site of Special Scientific Interest
STW	Sewage Treatment Works
TSP	Total suspended particulates
WCA 81	Wildlife and Countryside Act 1981
WLMP	Water Level Management Plans
WRA 91	Water Resources Act 1991

APPENDIX 4: FURTHER INFORMATION

Further information may be obtained from the following publications which have been produced by the Environment Agency:

Sustaining Our Resources. Southern Region, Worthing. 1997

An Environmental Strategy for the Millennium and Beyond. Bristol. 1997

Policy and Practice for the Protection of Floodplains. Bristol. 1997

Viewpoints on the Environment. Bristol. 1997

Waste Minimisation and Waste Management, Bristol. 1997

The Agency's Contribution to Sustainable Development, Bristol. 1997

Water Related Recreation Strategy for the Southern Region. Consultation Draft. Southern Region/English Sports Council, Worthing. 1997

Environment Agency Corporate Plan 1998-99. Bristol. 1998

Saving Water: Taking Action. Bristol. 1998

Saving Water: On the Right Track. Bristol. 1998

Fishing in the South. Southern Region, Worthing.

Policy and Practice for the Protection of Groundwater. Bristol. 1998

Guidance for the Control of Invasive Plants near Watercourses, Bristol. 1996

Action Plan for Land Quality, Bristol 1998.

An Action Plan for Recreation, Bristol 1998.

Money for nothing - your waste tips for free, Bristol 1998.

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