SITE SYNOPSIS

SITE NAME: RIVER BARROW AND RIVER NORE

SITE CODE: 002162

This site consists of the freshwater stretches of the Barrow/Nore River catchments as far upstream as the Slieve Bloom Mountains and it also includes the tidal elements and estuary as far downstream as Creadun Head in Waterford. The site passes through eight counties – Offaly, Kildare, Laois, Carlow, Kilkenny, Tipperary, Wexford and Waterford. Major towns along the edge of the site include Mountmellick, Portarlington, Monasterevin, Stradbally, Athy, Carlow, Leighlinbridge, Graiguenamanagh, New Ross, Inistioge, Thomastown, Callan, Bennettsbridge, Kilkenny and Durrow. The larger of the many tributaries include the Lerr, Fushoge, Mountain, Aughavaud, Owenass, Boherbaun and Stradbally Rivers of the Barrow and the Delour, Dinin, Erkina, Owveg, Munster, Arrigle and King's Rivers on the Nore. Both rivers rise in the Old Red Sandstone of the Slieve Bloom Mountains before passing through a band of Carboniferous shales and sandstones. The Nore, for a large part of its course, traverses limestone plains and then Old Red Sandstone for a short stretch below Thomastown. Before joining the Barrow it runs over intrusive rocks poor in silica. The upper reaches of the Barrow also runs through limestone. The middle reaches and many of the eastern tributaries, sourced in the Blackstairs Mountains, run through Leinster Granite. The southern end, like the Nore runs over intrusive rocks poor in silica. Waterford Harbour is a deep valley excavated by glacial floodwaters when the sea level was lower than today. The coast shelves quite rapidly along much of the shore.

The site is a candidate SAC selected for alluvial wet woodlands and petrifying springs, priority habitats on Annex I of the E.U. Habitats Directive. The site is also selected as a candidate SAC for old oak woodlands, floating river vegetation, estuary, tidal mudflats, *Salicornia* mudflats, Atlantic salt meadows, Mediterranean salt meadows, dry heath and eutrophic tall herbs, all habitats listed on Annex I of the E.U. Habitats Directive. The site is also selected for the following species listed on Annex II of the same directive - Sea Lamprey, River Lamprey, Brook Lamprey, Freshwater Pearl Mussel, Nore Freshwater Pearl Mussel, Crayfish, Twaite Shad, Atlantic Salmon, Otter, *Vertigo moulinsiana* and the plant Killarney Fern.

Good examples of Alluvial Forest are seen at Rathsnagadan, Murphy's of the River, in Abbeyleix estate and along other shorter stretches of both the tidal and freshwater elements of the site. Typical species seen include Almond Willow (*Salix triandra*), White Willow (*S. alba*), Grey Willow (*S. cinerea*), Crack Willow (*S. fragilis*), Osier (*S. viminalis*), with Iris (*Iris pseudacorus*), Hemlock Water-dropwort (*Oenanthe crocata*), Angelica (*Angelica sylvestris*), Thin-spiked Wood-sedge (*Carex strigosa*), Pendulous Sedge (*C. pendula*), Meadowsweet (*Filipendula ulmaria*), Valerian (*Valeriana officinalis*) and the Red Data Book species Nettle-leaved Bellflower (*Campanula trachelium*). Three rare invertebrates have been recorded in this habitat at Murphy's of the River. These are: *Neoascia obliqua* (Diptera: Syrphidae), *Tetanocera freyi* (Diptera: Sciomyzidae) and *Dictya umbrarum* (Diptera: Sciomyzidae).

A good example of petrifying springs with tufa formations occurs at Dysart Wood along the Nore. This is a rare habitat in Ireland and one listed with priority status on Annex I of the EU Habitats Directive. These hard water springs are characterised by lime encrustations, often associated with small waterfalls. A rich bryophyte flora is typical of the habitat and two diagnostic species, *Cratoneuron commutatum* var. *commutatum* and *Eucladium verticillatum*, have been recorded.

The best examples of old Oak woodlands are seen in the ancient Park Hill woodland in the estate at Abbeyleix; at Kyleadohir, on the Delour, Forest Wood House, Kylecorragh and Brownstown Woods on the Nore; and at Cloghristic Wood, Drummond Wood and Borris Demesne on the Barrow, though other patches occur throughout the site. Abbeyleix Woods is a large tract of mixed deciduous woodland which is one of the only remaining true ancient woodlands in Ireland. Historical records show that Park Hill has been continuously wooded since the sixteenth century and has the most complete written record of any woodland in the country. It supports a variety of woodland habitats and an exceptional diversity of species including 22 native trees, 44 bryophytes and 92 lichens. It also contains eight indicator species of ancient woodlands. Park Hill is also the site of two rare plants, Nettle-leaved Bellflower and the moss *Leucodon sciuroides.* It has a typical bird fauna including Jay, Long-eared Owl and Raven. A rare invertebrate, *Mitostoma chrysomelas,* occurs in Abbeyleix and only two other sites in the country. Two flies *Chrysogaster virescens* and *Hybomitra muhlfeldi* also occur. The rare Myxomycete fungus, *Licea minima* has been recorded from woodland at Abbeyleix.

Oak woodland covers parts of the valley side south of Woodstock and is well developed at Brownsford where the Nore takes several sharp bends. The steep valley side is covered by Oak (*Quercus* spp.), Holly (*Ilex aquifolium*), Hazel (*Corylus avellana*) and Birch (*Betula pubescens*) with some Beech (*Fagus sylvatica*) and Ash (*Fraxinus excelsior*). All the trees are regenerating through a cover of Bramble (*Rubus fruticosus* agg.), Foxglove (*Digitalis purpurea*) Wood Rush (*Luzula sylvatica*) and Broad Buckler-fern (*Dryopteris dilatata*).

On the steeply sloping banks of the River Nore about 5 km west of New Ross, in County Kilkenny, Kylecorragh Woods form a prominent feature in the landscape. This is an excellent example of a relatively undisturbed, relict Oak woodland with a very good tree canopy. The wood is quite damp and there is a rich and varied ground flora. At Brownstown a small, mature Oak-dominant woodland occurs on a steep slope. There is younger woodland to the north and east of it. Regeneration throughout is evident. The understorey is similar to the woods at Brownsford. The ground flora of this woodland is developed on acidic, brown earth type soil and comprises a thick carpet of Bilberry (*Vaccinium myrtillus*), Heather (*Calluna vulgaris*), Hard Fern (*Blechnum spicant*), Cow-wheat (*Melampyrum* spp.) and Bracken (*Pteridium aquilinum*).

Borris Demesne contains a very good example of a semi-natural broad-leaved woodland in very good condition. There is quite a high degree of natural re-generation of Oak and Ash through the woodland. At the northern end of the estate Oak species predominate. Drummond Wood, also on the Barrow, consists of three blocks of deciduous woods situated on steep slopes above the river. The deciduous trees are mostly Oak species. The woods have a well established understorey of Holly (*Ilex aquifolium*), and the herb layer is

varied, with Brambles abundant. Whitebeam (*Sorbus devoniensis*) has also been recorded.

Eutrophic tall herb vegetation occurs in association with the various areas of alluvial forest and elsewhere where the flood-plain of the river is intact. Characteristic species of the habitat include Meadowsweet (*Filipendula ulmaria*), Purple Loosestrife (*Lythrum salicaria*), Marsh Ragwort (*Senecio aquaticus*), Ground Ivy (*Glechoma hederacea*) and Hedge Bindweed (*Calystegia sepium*). Indian Balsam (*Impatiens glandulifera*), an introduced and invasive species, is abundant in places.

Floating River Vegetation is well represented in the Barrow and in the many tributaries of the site. In the Barrow the species found include Water Starworts (*Callitriche* spp.), Canadian Pondweed (*Elodea canadensis*), Bulbous Rush (*Juncus bulbosus*), Milfoil (*Myriophyllum* spp.), *Potamogeton* x *nitens*, Broad-leaved Pondweed (*P. natans*), Fennel Pondweed (*P. pectinatus*), Perfoliated Pondweed (*P. perfoliatus*) and Crowfoots (*Ranunculus* spp.). The water quality of the Barrow has improved since the vegetation survey was carried out (EPA, 1996).

Dry Heath at the site occurs in pockets along the steep valley sides of the rivers especially in the Barrow Valley and along the Barrow tributaries where they occur in the foothills of the Blackstairs Mountains. The dry heath vegetation along the slopes of the river bank consists of Bracken (*Pteridium aquilinum*) and Gorse (*Ulex europaeus*) species with patches of acidic grassland vegetation. Additional typical species include Heath Bedstraw (*Galium saxatile*), Foxglove (*Digitalis purpurea*), Common Sorrel (*Rumex acetosa*) and Bent Grass (*Agrostis stolonifera*). On the steep slopes above New Ross the Red Data Book species Greater Broomrape (*Orobanche rapum-genistae*) has been recorded. Where rocky outcrops are shown on the maps Bilberry (*Vaccinium myrtillus*) and Wood Rush (*Luzula sylvatica*) are present. At Ballyhack a small area of dry heath is interspersed with patches of lowland dry grassland. These support a number of Clover species including the legally protected Clustered Clover (*Trifolium glomeratum*) - a species known from only one other site in Ireland. This grassland community is especially well developed on the west side of the mud-capped walls by the road. On the east of the cliffs a group of rock-dwelling species occur, i.e. English Stonecrop (*Sedum anglicum*), Sheep's-bit (*Jasione montana*) and Wild Madder (*Rubia peregrina*). These rocks also support good lichen and moss assemblages with *Ramalina subfarinacea* and *Hedwigia ciliata*.

Dry Heath at the site generally grades into wet woodland or wet swamp vegetation lower down the slopes on the river bank. Close to the Blackstairs Mountains, in the foothills associated with the Aughnabrisky, Aughavaud and Mountain Rivers there are small patches of wet heath dominated by Purple Moor-grass (*Molinia caerulea*) with Heather (*Calluna vulgaris*), Tormentil (*Potentilla erecta*), Carnation Sedge (*Carex panicea*) and Bell Heather (*Erica cinerea*).

Saltmeadows occur at the southern section of the site in old meadows where the embankment has been breached, along the tidal stretches of in-flowing rivers below Stokestown House, in a narrow band on the channel side of Common Reed (*Phragmites*) beds and in narrow fragmented strips along the open shoreline. In the larger areas of salt meadow, notably at Carrickcloney, Ballinlaw Ferry and Rochestown on the west bank;

Fisherstown, Alderton and Great Island to Dunbrody on the east bank, the Atlantic and Mediterranean sub types are generally intermixed. At the upper edge of the salt meadow in the narrow ecotonal areas bordering the grasslands where there is significant percolation of salt water, the legally protected species Borrer's Saltmarsh-grass (*Puccinellia fasciculata*) and Meadow Barley (*Hordeum secalinum*) (Flora Protection Order, 1987) are found. The very rare Divided Sedge (*Carex divisa*) is also found. Sea Rush (*Juncus maritimus*) is also present. Other plants recorded and associated with salt meadows include Sea Aster (*Aster tripolium*), Sea Thrift (*Armeria maritima*), Sea Couch (*Elymus pycnanthus*), Spear-leaved Orache (*Atriplex prostrata*), Lesser Sea-spurrey (*Spergularia marina*), Sea Arrowgrass (*Triglochin maritima*) and Sea Plantain (*Plantago maritima*).

Salicornia and other annuals colonising mud and sand are found in the creeks of the saltmarshes and at the seaward edges of them. The habitat also occurs in small amounts on some stretches of the shore free of stones.

The estuary and the other Habitats Directive Annex I habitats within it form a large component of the site. Extensive areas of intertidal flats, comprised of substrates ranging from fine, silty mud to coarse sand with pebbles/stones are present. Good quality intertidal sand and mudflats have developed on a linear shelf on the western side of Waterford Harbour, extending for over 6 km from north to south between Passage East and Creadaun Head, and in places are over 1 km wide. The sediments are mostly firm sands, though grade into muddy sands towards the upper shore. They have a typical macro-invertebrate fauna, characterised by polychaetes and bivalves. Common species include *Arenicola marina*, *Nephtys hombergii*, *Scoloplos armiger*, *Lanice conchilega* and *Cerastoderma edule*.

The western shore of the harbour is generally stony and backed by low cliffs of glacial drift. At Woodstown there is a sandy beach, now much influenced by recreation pressure and erosion. Behind it a lagoonal marsh has been impounded which runs westwards from Gaultiere Lodge along the course of a slow stream. An extensive reedbed occurs here. At the edges is a tall fen dominated by sedges (*Carex* spp.), Meadowsweet, Willowherb (*Epilobium* spp.) and rushes (*Juncus* spp.). Wet woodland also occurs. This area supports populations of typical waterbirds including Mallard, Snipe, Sedge Warbler and Water Rail.

The dunes which fringe the strand at Duncannon are dominated by Marram grass (*Ammophila arenaria*) towards the sea. Other species present include Wild Sage (*Salvia verbenaca*), a rare Red Data Book species. The rocks around Duncannon ford have a rich flora of seaweeds typical of a moderately exposed shore and the cliffs themselves support a number of coastal species on ledges, including Thrift (*Armeria maritima*), Rock Samphire (*Crithmum maritimum*) and Buck's-horn Plantain (*Plantago coronopus*).

Other habitats which occur throughout the site include wet grassland, marsh, reed swamp, improved grassland, arable land, quarries, coniferous plantations, deciduous woodland, scrub and ponds.

Seventeen Red Data Book plant species have been recorded within the site, most in the recent past. These are Killarney Fern (*Trichomanes speciosum*), Divided Sedge (*Carex*

divisa), Clustered Clover (*Trifolium glomeratum*), Basil Thyme (*Acinos arvensis*), Hemp nettle (*Galeopsis angustifolia*), Borrer's Saltmarsh Grass (*Puccinellia fasiculata*), Meadow Barley (*Hordeum secalinum*), Opposite-leaved Pondweed (*Groenlandia densa*), Autumn Crocus (*Colchicum autumnale*), Wild Sage (*Salvia verbenaca*), Nettle-leaved Bellflower (*Campanula trachelium*), Saw-wort (*Serratula tinctoria*), Bird Cherry (*Prunus padus*), Blue Fleabane (*Erigeron acer*), Fly Orchid (*Ophrys insectifera*), Broomrape (*Orobanche hederae*) and Greater Broomrape (*Orobanche rapum-genistae*). Of these the first nine are protected under the Flora Protection Order 1999. Divided Sedge (*Carex divisa*) was thought to be extinct but has been found in a few locations in the site since 1990. In addition plants which do not have a very wide distribution in the country are found in the site including Thin-spiked Wood-sedge (*Carex strigosa*), Field Garlic (*Allium oleraceum*) and Summer Snowflake (*Leucojum aestivum*). Six rare lichens, indicators of ancient woodland, are found including *Lobaria laetevirens* and *L. pulmonaria*. The rare moss *Leucodon sciuroides* also occurs.

The site is very important for the presence of a number of EU Habitats Directive Annex II animal species including Freshwater Pearl Mussel (*Margaritifera margaritifera* and *M. m. durrovensis*), Freshwater Crayfish (*Austropotamobius pallipes*), Salmon (*Salmo salar*), Twaite Shad (*Alosa fallax fallax*), three Lamprey species - Sea (*Petromyzon marinus*), Brook (*Lampetra planeri*) and River (*Lampetra fluviatilis*), the marsh snail *Vertigo moulinsiana* and Otter (*Lutra lutra*). This is the only site in the world for the hard water form of the Pearl Mussel *M. m. durrovensis* and one of only a handful of spawning grounds in the country for Twaite Shad. The freshwater stretches of the River Nore main channel is a designated salmonid river. The Barrow/Nore is mainly a grilse fishery though spring salmon fishing is good in the vicinity of Thomastown and Inistioge on the Nore. The upper stretches of the Barrow and Nore, particularly the Owenass River, are very important for spawning.

The site supports many other important animal species. Those which are listed in the Irish Red Data Book include Daubenton's Bat (*Myotis daubentoni*), Badger (*Meles meles*), Irish Hare (*Lepus timidus hibernicus*) and Frog (*Rana temporaria*). The rare Red Data Book fish species Smelt (*Osmerus eperlanus*) occurs in estuarine stretches of the site. In addition to the Freshwater Pearl Mussel, the site also supports two other freshwater Mussel species, *Anodonta anatina* and *A. cygnea*.

The site is of ornithological importance for a number of E.U. Birds Directive Annex I species including Greenland White-fronted Goose, Whooper Swan, Bewick's Swan, Bar-tailed Godwit, Peregrine and Kingfisher. Nationally important numbers of Golden Plover and Bar-tailed Godwit are found during the winter. Wintering flocks of migratory birds are seen in Shanahoe Marsh and the Curragh and Goul Marsh, both in Co. Laois and also along the Barrow Estuary in Waterford Harbour. There is also an extensive autumnal roosting site in the reedbeds of the Barrow Estuary used by Swallows before they leave the country.

Landuse at the site consists mainly of agricultural activities – many intensive, principally grazing and silage production. Slurry is spread over much of this area. Arable crops are also grown. The spreading of slurry and fertiliser poses a threat to the water quality of the salmonid river and to the populations of Habitats Directive Annex II animal species within the site. Many of the woodlands along the rivers belong to old estates and support

many non-native species. Little active woodland management occurs. Fishing is a main tourist attraction along stretches of the main rivers and their tributaries and there are a number of Angler Associations, some with a number of beats. Fishing stands and styles have been erected in places. Both commercial and leisure fishing takes place on the rivers. There is net fishing in the estuary and a mussel bed also. Other recreational activities such as boating, golfing and walking, particularly along the Barrow towpath are also popular. There is a golf course on the banks of the Nore at Mount Juliet and GAA pitches on the banks at Inistioge and Thomastown. There are active and disused sand and gravel pits throughout the site. Several industrial developments, which discharge into the river, border the site. New Ross is an important shipping port. Shipping to and from Waterford and Belview ports also passes through the estuary.

The main threats to the site and current damaging activities include high inputs of nutrients into the river system from agricultural run-off and several sewage plants, overgrazing within the woodland areas, and invasion by non-native species, for example Cherry Laurel and Rhododendron (*Rhododendron ponticum*). The water quality of the site remains vulnerable. Good quality water is necessary to maintain the populations of the Annex II animal species listed above. Good quality is dependent on controlling fertilisation of the grasslands, particularly along the Nore. It also requires that sewage be properly treated before discharge. Drainage activities in the catchment can lead to flash floods which can damage the many Annex II species present. Capital and maintenance dredging within the lower reaches of the system pose a threat to migrating fish species such as lamprey and shad. Land reclamation also poses a threat to the salt meadows and the populations of legally protected species therein.

Overall, the site is of considerable conservation significance for the occurrence of good examples of habitats and of populations of plant and animal species that are listed on Annexes I and II of the E.U. Habitats Directive respectively. Furthermore it is of high conservation value for the populations of bird species that use it. The occurrence of several Red Data Book plant species including three rare plants in the salt meadows and the population of the hard water form of the Pearl Mussel which is limited to a 10 km stretch of the Nore, add further interest to this site.

CARLOW
COUNTY COUNCIL

Water Quality (Dangerous Substances) Regulations, 2001 S.I. No. 12 of 2001

Dangerous Substances Implementation Report 2006

Table of Contents

1.0 Introduction

Dangerous Substances have the potential to cause the most harm to aquatic life due to their persistence, toxicity or bioaccumulation. Many human activities, and some natural processes, release chemicals into rivers and the sea. Industrial plants and sewage treatment works are the biggest source of the most harmful or dangerous substances, which include certain metals and pesticides. The aim of the EU Dangerous Substances Directive (76/464/EEC and Daughter Directives) is to improve water quality through the elimination and/or reduction of dangerous substances discharged to the aquatic environment.

The Water Quality (Dangerous Substances) Regulations, 2001, prescribe water quality standards in relation to certain substances in surface waters, e.g., rivers, lakes and tidal waters. The substances include certain pesticides (atrazine, simazine, tributylin), solvents (dichlormethane, toluene, xylene), metals (arsenic, chromium, copper,lead, nickel,zinc) and certain other compounds (cyanide and fluoride). The Regulations give further effect to the EU Dangerous Substances Directive (76/464/EC) and give effect to certain provisions of the EU Water Framework Directive (200/60/EC).

The Regulations specify quality standards for the country's rivers and lakes that must be achieved by 31st of December 2010. Carlow County Council is the local authority assigned statutory responsibility to implement the Regulations in County Carlow and is required to submit a Measures Report to the EPA in line with Article 10(1) of the Regulations.

This measures report is based on the 'Guidance Manual to Local Authorities on Preparation and submission of Measures and Implementation Reports' issued by the EPA. It will also be based on the experience gained from the implementation of the actions specified in the Phosphorous Measures Report and the fundamental principles of an environmental management systems approach.

2.0 Current Water Quality and Targets

2.1 Main rivers in County Carlow

There are two main river Catchment systems in County Carlow, the River Barrow and the River Slaney. The western portion of the county is drained by the Barrow and its tributaries while the Slaney and its tributaries drain the eastern portion. The main rivers and their tributaries are shown in Tables 2.1 and 2.2 with the relevant EPA Hydrometric Codes provided (EPA, 2001).

Table 2.1 Barrow Catchment – Hydrometric Area 14

River	River Code
Aghalona	14AO2
Barrow	14BO1
Burren	14B05
Lerr	14LO1
Mountain	14MO1
Pollmounty	14PO3

Table 2.2 Slaney Catchment - Hydrometric Area 12

River	River Code
Clody	12CO3
Clonmore Stream	12CO5
Derreen	12DO1
Derry	12DO2
Douglas	12DO3
Slaney	12SO2

The Slaney has been designated a salmonid river under the European Communities (Quality of Salmonid Waters) Regulations (S.I. No. 293 of 1988). Designated waters are required to meet the quality standards set out in the Regulations. In Carlow sampling is carried out by the EPA on a monthly basis which complies with the sampling requirements set out in the salmonid regulations.

2.2 Water Quality Standards

The target substances and applicable standards to be achieved by 2010 as specified in the Regulations are presented in the tables below.

Table 2.3

	Substance	**Standard ug/l**
Pesticides	Atrazine	1.0
	Simazine	1.0
	Tributyltin	0.001 **
Solvents	Dichloromethane	10.0
	Tolulene	10.0
	Xylenes	10.0

Note**
The standard for Tributyltin shall apply in relation to tidal waters only and shall be deemed to be met if the results of biological monitoring for biological effects indicate no reproductive impairment in gastropods.

Table 2.4

	Substance	**Standard (ug/l) for Freshwaters** Hardness of water measured in mg/lCaCO3	
		<100	>100
Metals	Arsenic	25	25
	Chromium	5	30
	Copper	5	30
	Lead	5	10
	Nickel	8	50
	Zinc	See notes **	100
Inorganic ions	Fluoride	500	500
	Cyanide	10	10

Note**
The value for metals are for total concentration (dissolved and colloidal/ss). In the case of zinc the standard is 8ug/l for water hardness 10mg/lCaCO3 and 50ug/l for water hardness between 10mg/l and 100mg/l CaCO3.

2.3 Current Water Quality Status

All the main river channels in the county are subject to routine quality monitoring, which is carried out by the EPA, on behalf of Carlow County Council. The current monitoring programme was established to monitor general water quality and was not designed to target the substances listed in the Dangerous Substances Regulations. It must be emphasized that poor water quality, as measured by biological and/or chemical assessment, cannot be taken to indicate the presence of Dangerous substances.

In the past the Council has conducted monitoring in the rivers, which included analyses for some of the target substances including copper, nickel, chromium and lead. The purpose of the monitoring was to assess the overall water quality in terms of suitability for abstraction for use as a potable water supply. The monitoring has not identified any problem with metal levels however, the detection limits were based on the limits set in the EC (Quality of Water intended for the Abstraction of Drinking Water) Regulations and Directive 78/659/EC, which were higher than the standards set in the Dangerous Substances Regulations. The data is therefore unsuitable for use in evaluating water quality status in the context of the Regulation requirements.

The EPA were commissioned by Carlow County Council, together with other local authorities in the South East Region, to carry out sampling of river waters and analysis for the presence of Dangerous Substances in these samples in 2004. The results of this survey are contained within a Report to the Local Authorities for the South East Region on Dangerous Substances in Surface Waters dated 19th Nov. 04. The survey focused on sites where pollution from the selected substances was most likely i.e. on watercourses downstream of major towns and in areas where arable farming was predominant. The survey included three sampling sites in County Carlow:

- River Barrow – d/s Carlow.
- River Slaney – Rathvilly.
- River Burren – Carlow Abstraction point.

The results of this sampling, which were carried out on 22nd September 2004, found that all samples complied with the specified parameters of the Dangerous Substances Regulations where tested. No substances were present in any environmentally significant concentration. Details of Dangerous substances monitoring are shown in Table 2.5. Full details of monitoring carried out are also given in Appendix A.

The surface water potable water supply sources in the County are subject to routine quality monitoring as required by EC (Drinking Water) Regulations 2000. The monitoring carried out on these sources in Carlow have not identified any significant problems with Dangerous substances in surface water supply sources.

3.0 Identification of potential pressures

The main pressures due to dangerous substances on the general water quality in the county are located at or near the major population centres within the county. This is due to the concentration of households, industries, waste disposal facilities, construction sites etc located in these areas.

Dangerous substances pose a major threat to general water quality however there is limited knowledge of the occurrence of these substances in the county. Dangerous substances can enter the aquatic environment from both point and non-point (diffuse) sources. Point sources are potentially of most concern in relation to acute accidents while diffuse sources e.g. leaching and run-off can have a significant accumulative effect.

Carlow County Council has conducted a review of all activities in the County, which had the potential to use any of the Dangerous substances identified in the regulations. The review included the following activities:

3.1 Wastewater Treatment Plants

The Council's Wastewater Treatment Plants can be identified as a pressure source in terms of general water quality. The influent to these treatment works and the associated effluent from the plants may potentially contain some of the target substances and therefore enter and contaminate the receiving aquatic environment. The current monitoring programme at the WWTP does not include the specified Dangerous Substances. (the effluent from these treatment works are tested in accordance with the requirements of the Urban Wastewater Treatment Directive.) Samples of the effluent from the main wastewater treatment plants in the county were due to be analysed for the presence of dangerous substances in 2005 however this has not taken place as yet. A programme to conduct the required analysis is being prepared with implementation planned by the end of 2006.

3.2 Industrial discharges

Discharges by industry either directly to waters or indirectly through the sewer network have the potential to cause pollution of watercourses and in particular to affect the levels of dangerous substances in the watercourses. In order to control pollution from such discharges, any industry whose effluent has the potential to cause pollution is licensed and monitored in accordance with the provisions of the Water Pollution Act.

Unregulated drainage from industries to sewer collection systems can effect treatment processes in downstream plants resulting in reduced operational efficiency or in the worst case scenario, failure of the plant treatment processes resulting in discharge of untreated industrial and domestic sewage.

IPC Licensed facilities in the county are controlled and regulated by the EPA. The Licences specify the monitoring and reporting requirements for the licensed facility, some of which include the specified Dangerous Substances. The EPA is responsible for licensing, auditing and compliance monitoring of IPC licensed industries. The IPC licensed industries are required to provide monitoring data to the EPA.

The Council also investigates incidents of water pollution. The investigation records are a potential source of information on incidents where spills or incidents may have resulted in the discharge of Dangerous Substances to surface waters.

3.3 Agricultural Activity

Agriculture is the main land use and industry within both catchments especially the Barrow. Agricultural point and diffuse loads are therefore another major threat to general water quality in the region. Agricultural practices are very intensive in the northern region of the county leading to increased pollution levels especially in the Barrow catchment. Whilst phosphorous and nitrate levels are of particular concern in the county, agricultural run-off may also result in other pollutants entering water bodies including pesticides and BOD and bacterial loadings. The main threat in relation to dangerous

substances is the usage of herbicides and pesticides in the region. Accidental releases of oils and other chemicals can also occur and need to be investigated. The application of pig slurries to land poses another threat to both catchments as copper is a very important feed additive in the pig industry. A requirement for Nutrient Management Planning is included in all intensive agriculture planning permissions.

3.4 Urban stormwater overflows and runoff

Untreated urban runoff from the major population centres such as Carlow town can have a significant affect on the water quality in the catchments. This runoff enters the water courses through gullies etc following periods of heavy rain and can potentially contain high levels of metals, hydrocarbons, organic pollutants etc. There is currently no register of outfalls or overflows from urban areas in the county and no monitoring data for the quality of effluent from such systems.

3.5 Powerstown Landfill Facility

The Waste License for Powerstown Landfill facility requires that monitoring be carried out throughout the lifecycle of the landfill, from operational phase through to the aftercare phase. Carlow County Council undertake monitoring with the EPA carrying out annual audits. The Waste License issued by the EPA permits the Council to discharge treated landfill leachate to the Barrow subject to quality and flow restrictions. However this route is not utilized. Leachate is collected in a lagoon on-site and transported for treatment in the Mortarstown Treatment Plant. There is therefore no impact from landfill discharges on the Barrow.

4.0 Programme of measures of implementation

Refer to table 4.1 for implementation programme summaries.

In the programme, the timescale column is defined by the EPA in their report "Guidance Manual to Local Authorities on Preparation and Submission of Measures and Implementation report".

Immediate term	by July 2004
Short term	by July 2006
Medium term	by July 2008
Long term	by July 2010

4.1 Monitoring programme & Catchment Management

Water samples for measuring the concentrations of Dangerous Substances within rivers in Carlow were taken at three sites during 2004 with all sites being sampled on one day only. All results for these parameters were within the limits specified within the regulations. The limited data available indicates that the presence of the specified substances is not a cause for concern. It should be noted that whilst the samples taken were tested for the parameters specified in the Dangerous Substances Regulations, the samples were analysed for the presence of a total of 84 parameters – no substance was found to be present in any environmentally significant concentration for any of the samples. The samples were not tested for Atrazine, simazine, tributyltin and cyanide.

The river catchments of Co. Carlow are part of the South Eastern River Basin District (SERBD) area. The SERBD project has been set up to satisfy the requirements of the Water Framework Directive and the need to have a catchment based national strategy to the implementation to the Water Framework Directive. The objective is to prepare a programme of measures designed to maintain and /or achieve at least good water quality for all waters, which includes assistance in complying with the Water Quality (Dangerous Substances) Regulations 2001.

The **Characterization Report** for the SERBD project has been completed. The purpose of this report was to collect and analyse all existing datasets to provide a baseline report of the Water quality within the SERBD project area. This will facilitate the development of recommendations for monitoring programmes and the design of measures which will be required to ensure compliance with the requirements of the Water Framework Directive. Such monitoring must cover both surface and groundwater and must be operational by 22nd December 2006. The lack of data in relation to dangerous substances will be addressed by additional data collection and monitoring for the first river basin management plan.

In addition to the work of the SERBD project, in 2003 a **National Dangerous Substances Expert Group** was established, by the DoEHLG, to assist with developing lists of dangerous substances relevant to water quality in an Irish context. Having reviewed available datasets the Expert Group has put forward a list of pollutants that are potentially relevant in Ireland. These substances will have particular relevance to the implementation of the Dangerous Substances and Water framework Directives.

A National Substances Screening Monitoring Programme was started in 2005. The programme will run until October 2006 and includes monitoring over 200 dangerous substances identified. The programme will serve to feed into the setting of national E.Q.S. for waters.

Carlow County Council, on behalf of the combined river basin districts, utilized 2 main facilities to carry out the analysis for priority action substances (41 no.), candidate relevant pollutants (161 no.) and candidate general components (24 no.) The first phase of this programme investigated evidence of substances at specific locations in the vicinity of likely potential sources of pollutants. This provided a general overview of the presence or absence of substances. In the second phase, further target sites were be selected to isolate the causes of individual substances identified by the initial investigations.

As much of the potential usage of chemicals in concentrated in major urban centres, sampling in the vicinity of the major population centres was undertaken during the first phase. This included the sampling of the River Barrow at two locations - upstream of Carlow Town and upstream of St Mullins. Results from the sampling will not be available until November 2006.

4.2 Wastewater Treatment Works

Whilst the effluent from Wastewater treatment works has been identified as a potential source of dangerous substances to river water systems, there is no data available to confirm if these substances are present. In order to investigate this, it is proposed that samples of the effluent from the major wastewater treatment works in the County be analysed, on a once off basis, for the presence of these substances.

A number of the plants in Carlow County require upgrading to cater for new development in urban and village centres in the county and also to comply with the requirements of the relevant EU directives .

- Mortarstown – upgraded to provide nutrient removal
- Tinnahinch – now connected to the new WWTP at Graiguenamanagh.
- Raheendoran – WWTP installed in 3005

Improvement works to be carried out in 2006 include the following plants :

- Leighlinbridge
- Muinebheag
- Ballon
- Myshall

Improvements are also planned for Palatine, Rathvilly, Hacketsown and documents for the appointment of Consultants have been prepared for the WWTP at Tullow, Fenagh and Rathoe.

4.3 Industrial Discharges

Carlow County Council will continue on an ongoing basis to license industrial discharges to waters and sewers in accordance with the provisions of the Water Pollution Act. Where any of the Dangerous Substances identified in the Regulations are present in the effluent, the requirements of the Regulations will be considered in setting the discharge limits. A review of the application process for licenses will be carried out with specific reference to the Dangerous substances regulations.

Since January 2004, Carlow County Council has issued 65 new/revised Section 4 licenses (discharge to waters) and 14 new/revised Section 16 licenses (discharge to sewers) under the Water Pollution Act.

4.4 Consultative and Cooperative Measures

There are many different stakeholders who have an impact on the quality of waters. Setting up consultative and co-operative structures that involve all stakeholders is essential to the successful management of the implementation programme for the Water Framework Directive and other EU regulations including the Dangerous Substances Regulations. The SERBD project has provided a suitable forum for bringing these stakeholders together – these stakeholders include Teagasc, Irish farmers Association, Coillte, IBEC, Teagasc, Duchas, neighbouring local authorities , Barrow Catchment Group.

4.5 Public Education and Advisory Measures

An important element of the programme is raising public awareness of the importance of prevention of emissions to the aquatic environment. This involves the development of an education programme targeted at the sectors both directly and indirectly involved in the usage and emission of target substances. Carlow Co Council has appointed an environmental awareness officer whose role includes the development and delivery of this programme.

The SERBD project has created a project website which is aimed at providing information to the general public on water quality issues in the region.

Carlow Co Co participates in the Rural Environmental Protection Scheme (REPS) lectures organized by Teagasc and deliver lectures/talks on an ongoing basis to the farming community on topics in relation to Water Quality issues and measures which they can take to protect water quality. The REPS scheme makes particular reference to the use by farmers of pesticides and fertilizers near rivers/streams etc – such substances are included in the lists of substances specified in the Dangerous Substances Regulations.

Appendix A

WWTW DWF Effluent Discharges
Ortho P concentrations in Receiving River Waters

Table 2 Total P =2mg/l

River Flow		WTTW PE = 500			WTTW PE = 800			WTTW PE = 1000			WTTW PE = 1500			WTTW PE = 2000		
l/s		Dilution	BOD mg/l	MRP mg/l	Dilution	BOD mg/l	MRP mg/l	Dilution	BOD mg/l	MRP mg/l	Dilution	BOD mg/l	MRP mg/l	Dilution	BOD mg/l	MRP mg/l
5	Sample	4.32	5.79	0.231	2.70	9.26	0.370	2.16	11.57	0.463	1.44	17.36	0.694	1.08	23.15	0.926
10	95%ile	8.64	2.89	0.116	5.40	4.63	0.185	4.32	5.79	0.231	2.88	8.68	0.347	2.16	11.57	0.463
15	Flow	12.96	1.93	0.077	8.10	3.09	0.123	6.48	3.86	0.154	4.32	5.79	0.231	3.24	7.72	0.309
20		17.28	1.45	0.058	10.80	2.31	0.093	8.64	2.89	0.116	5.76	4.34	0.174	4.32	5.79	0.231
30		25.92	0.96	0.039	16.20	1.54	0.062	12.96	1.93	0.077	8.64	2.89	0.116	6.48	3.86	0.154
40		34.56	0.72	0.029	21.60	1.16	0.046	17.28	1.45	0.058	11.52	2.17	0.087	8.64	2.89	0.116
50		43.20	0.58	0.023	27.00	0.93	0.037	21.60	1.16	0.046	14.40	1.74	0.069	10.80	2.31	0.093
60		51.84	0.48	0.019	32.40	0.77	0.031	25.92	0.96	0.039	17.28	1.45	0.058	12.96	1.93	0.077
75		64.80	0.39	**0.015**	40.50	0.62	0.025	32.40	0.77	0.031	21.60	1.16	0.046	16.20	1.54	0.062
95	Expectd	82.08	0.30	0.012	51.30	0.49	0.019	41.04	0.61	0.024	27.36	0.91	0.037	20.52	1.22	0.049
105	50%ile	90.72	0.28	0.011	56.70	0.44	0.018	45.36	0.55	0.022	30.24	0.83	0.033	22.68	1.10	0.044
115	Flow	99.36	0.25	0.010	62.10	0.40	0.016	49.68	0.50	0.020	33.12	0.75	0.030	24.84	1.01	0.040
150		129.60	0.19	0.008	81.00	0.31	0.012	64.80	0.39	**0.015**	43.20	0.58	0.023	32.40	0.77	0.031
200		172.80	0.14	0.006	108.00	0.23	0.009	86.40	0.29	0.012	57.60	0.43	0.017	43.20	0.58	0.023
250		216.00	0.12	0.005	135.00	0.19	0.007	108.00	0.23	0.009	72.00	0.35	**0.014**	54.00	0.46	0.019
300		259.20	0.10	0.004	162.00	0.15	0.006	129.60	0.19	0.008	86.40	0.29	0.012	64.80	0.39	**0.015**
350		302.40	0.08	0.003	189.00	0.13	0.005	151.20	0.17	0.007	100.80	0.25	0.010	75.60	0.33	0.013
400		345.60	0.07	0.003	216.00	0.12	0.005	172.80	0.14	0.006	115.20	0.22	0.009	86.40	0.29	0.012
450		388.80	0.06	0.003	243.00	0.10	0.004	194.40	0.13	0.005	129.60	0.19	0.008	97.20	0.26	0.010
500		432.00	0.06	0.002	270.00	0.09	0.004	216.00	0.12	0.005	144.00	0.17	0.007	108.00	0.23	0.009
600		518.40	0.05	0.002	324.00	0.08	0.003	259.20	0.10	0.004	172.80	0.14	0.006	129.60	0.19	0.008
700		604.80	0.04	0.002	378.00	0.07	0.003	302.40	0.08	0.003	201.60	0.12	0.005	151.20	0.17	0.007
800		691.20	0.04	0.001	432.00	0.06	0.002	345.60	0.07	0.003	230.40	0.11	0.004	172.80	0.14	0.006

Per capita discharge	200 l/c/d
BOD	25 mg/l
P	2 mg/l
MRP	1 mg/l

WWTW DWF Effluent Discharges
Ortho P concentrations in Receiving River Waters

Table 1 Total P =10mg/l

River Flow		WTTW PE =	500		WTTW PE =	800		WTTW PE =	1000		WTTW PE =	1500		WTTW PE =	2000	
l/s		Dilution	BOD mg/l	MRP mg/l	Dilution	BOD mg/l	MRP mg/l	Dilution	BOD mg/l	MRP mg/l	Dilution	BOD mg/l	MRP mg/l	Dilution	BOD mg/l	MRP mg/l
5	Sample	4.32	5.79	1.157	2.70	9.26	1.852	2.16	11.57	2.315	1.44	17.36	3.472	1.08	23.15	4.630
10	95%ile	8.64	2.89	0.579	5.40	4.63	0.926	4.32	5.79	1.157	2.88	8.68	1.736	2.16	11.57	2.315
15	Flow	12.96	1.93	0.386	8.10	3.09	0.617	6.48	3.86	0.772	4.32	5.79	1.157	3.24	7.72	1.543
20		17.28	1.45	0.289	10.80	2.31	0.463	8.64	2.89	0.579	5.76	4.34	0.868	4.32	5.79	1.157
30		25.92	0.96	0.193	16.20	1.54	0.309	12.96	1.93	0.386	8.64	2.89	0.579	6.48	3.86	0.772
40		34.56	0.72	0.145	21.60	1.16	0.231	17.28	1.45	0.289	11.52	2.17	0.434	8.64	2.89	0.579
50		43.20	0.58	0.116	27.00	0.93	0.185	21.60	1.16	0.231	14.40	1.74	0.347	10.80	2.31	0.463
60		51.84	0.48	0.096	32.40	0.77	0.154	25.92	0.96	0.193	17.28	1.45	0.289	12.96	1.93	0.386
75		64.80	0.39	0.077	40.50	0.62	0.123	32.40	0.77	0.154	21.60	1.16	0.231	16.20	1.54	0.309
95	Expected	82.08	0.30	0.061	51.30	0.49	0.097	41.04	0.61	0.122	27.36	0.91	0.183	20.52	1.22	0.244
105	50%ile	90.72	0.28	0.055	56.70	0.44	0.088	45.36	0.55	0.110	30.24	0.83	0.165	22.68	1.10	0.220
115	Flow	99.36	0.25	0.050	62.10	0.40	0.081	49.68	0.50	0.101	33.12	0.75	0.151	24.84	1.01	0.201
150		129.60	0.19	0.039	81.00	0.31	0.062	64.80	0.39	0.077	43.20	0.58	0.116	32.40	0.77	0.154
200		172.80	0.14	0.029	108.00	0.23	0.046	86.40	0.29	0.058	57.60	0.43	0.087	43.20	0.58	0.116
250		216.00	0.12	0.023	135.00	0.19	0.037	108.00	0.23	0.046	72.00	0.35	0.069	54.00	0.46	0.093
300		259.20	0.10	0.019	162.00	0.15	0.031	129.60	0.19	0.039	86.40	0.29	0.058	64.80	0.39	0.077
350		302.40	0.08	0.017	189.00	0.13	0.026	151.20	0.17	0.033	100.80	0.25	0.050	75.60	0.33	0.066
400		345.60	0.07	0.014	216.00	0.12	0.023	172.80	0.14	0.029	115.20	0.22	0.043	86.40	0.29	0.058
450		388.80	0.06	0.013	243.00	0.10	0.021	194.40	0.13	0.026	129.60	0.19	0.039	97.20	0.26	0.051
500		432.00	0.06	0.012	270.00	0.09	0.019	216.00	0.12	0.023	144.00	0.17	0.035	108.00	0.23	0.046
600		518.40	0.05	0.010	324.00	0.08	0.015	259.20	0.10	0.019	172.80	0.14	0.029	129.60	0.19	0.039
700		604.80	0.04	0.008	378.00	0.07	0.013	302.40	0.08	0.017	201.60	0.12	0.025	151.20	0.17	0.033
800		691.20	0.04	0.007	432.00	0.06	0.012	345.60	0.07	0.014	230.40	0.11	0.022	172.80	0.14	0.029

Per capita discharge	200 l/c/d
BOD	25 mg/l
P	10 mg/l
MRP	5 mg/l

WWTW DWF Effluent Discharges
Ortho P concentrations in Receiving River Waters

Table 3 Total P =1mg/l

River Flow l/s		WTTW PE = 500			WTTW PE = 800			WTTW PE = 1000			WTTW PE = 1500			WTTW PE = 2000		
		Dilution	BOD mg/l	MRP mg/l	Dilution	BOD mg/l	MRP mg/l	Dilution	BOD mg/l	MRP mg/l	Dilution	BOD mg/l	MRP mg/l	Dilution	BOD mg/l	MRP mg/l
5	Sample	4.32	5.79	0.116	2.70	9.26	0.185	2.16	11.57	0.231	1.44	17.36	0.347	1.08	23.15	0.463
10	95%ile	8.64	2.89	0.058	5.40	4.63	0.093	4.32	5.79	0.116	2.88	8.68	0.174	2.16	11.57	0.231
15	Flow	12.96	1.93	0.039	8.10	3.09	0.062	6.48	3.86	0.077	4.32	5.79	0.116	3.24	7.72	0.154
20		17.28	1.45	0.029	10.80	2.31	0.046	8.64	2.89	0.058	5.76	4.34	0.087	4.32	5.79	0.116
30		25.92	0.96	0.019	16.20	1.54	0.031	12.96	1.93	0.039	8.64	2.89	0.058	6.48	3.86	0.077
40		34.56	0.72	**0.014**	21.60	1.16	0.023	17.28	1.45	0.029	11.52	2.17	0.043	8.64	2.89	0.058
50		43.20	0.58	0.012	27.00	0.93	0.019	21.60	1.16	0.023	14.40	1.74	0.035	10.80	2.31	0.046
60		51.84	0.48	0.010	32.40	0.77	**0.015**	25.92	0.96	0.019	17.28	1.45	0.029	12.96	1.93	0.039
75		64.80	0.39	0.008	40.50	0.62	0.012	32.40	0.77	**0.015**	21.60	1.16	0.023	16.20	1.54	0.031
95	Expectd	82.08	0.30	0.006	51.30	0.49	0.010	41.04	0.61	0.012	27.36	0.91	0.018	20.52	1.22	0.024
105	50%ile	90.72	0.28	0.006	56.70	0.44	0.009	45.36	0.55	0.011	30.24	0.83	0.017	22.68	1.10	0.022
115	Flow	99.36	0.25	0.005	62.10	0.40	0.008	49.68	0.50	0.010	33.12	0.75	**0.015**	24.84	1.01	0.020
150		129.60	0.19	0.004	81.00	0.31	0.006	64.80	0.39	0.008	43.20	0.58	0.012	32.40	0.77	**0.015**
200		172.80	0.14	0.003	108.00	0.23	0.005	86.40	0.29	0.006	57.60	0.43	0.009	43.20	0.58	0.012
250		216.00	0.12	0.002	135.00	0.19	0.004	108.00	0.23	0.005	72.00	0.35	0.007	54.00	0.46	0.009
300		259.20	0.10	0.002	162.00	0.15	0.003	129.60	0.19	0.004	86.40	0.29	0.006	64.80	0.39	0.008
350		302.40	0.08	0.002	189.00	0.13	0.003	151.20	0.17	0.003	100.80	0.25	0.005	75.60	0.33	0.007
400		345.60	0.07	0.001	216.00	0.12	0.002	172.80	0.14	0.003	115.20	0.22	0.004	86.40	0.29	0.006
450		388.80	0.06	0.001	243.00	0.10	0.002	194.40	0.13	0.003	129.60	0.19	0.004	97.20	0.26	0.005
500		432.00	0.06	0.001	270.00	0.09	0.002	216.00	0.12	0.002	144.00	0.17	0.003	108.00	0.23	0.005
600		518.40	0.05	0.001	324.00	0.08	0.002	259.20	0.10	0.002	172.80	0.14	0.003	129.60	0.19	0.004
700		604.80	0.04	0.001	378.00	0.07	0.001	302.40	0.08	0.002	201.60	0.12	0.002	151.20	0.17	0.003
800		691.20	0.04	0.001	432.00	0.06	0.001	345.60	0.07	0.001	230.40	0.11	0.002	172.80	0.14	0.003

Per capita discharge	200 l/c/d
BOD	25 mg/l
P	1 mg/l
MRP	0.5 mg/l

WWTW DWF Effluent Discharges
Ortho P concentrations in Receiving River Waters

Table 4 Total P =10mg/l - smaller works

River Flow l/s		WTTW PE = 50			WTTW PE = 75			WTTW PE = 100			WTTW PE = 150			WTTW PE = 200		
		Dilution	BOD mg/l	MRP mg/l	Dilution	BOD mg/l	MRP mg/l	Dilution	BOD mg/l	MRP mg/l	Dilution	BOD mg/l	MRP mg/l	Dilution	BOD mg/l	MRP mg/l
5	Sample	43.20	0.58	0.116	28.80	0.87	0.174	21.60	1.16	0.231	14.40	1.74	0.347	10.80	2.31	0.463
10	95%ile	86.40	0.29	0.058	57.60	0.43	0.087	43.20	0.58	0.116	28.80	0.87	0.174	21.60	1.16	0.231
15	Flow	129.60	0.19	0.039	86.40	0.29	0.058	64.80	0.39	0.077	43.20	0.58	0.116	32.40	0.77	0.154
20		172.80	0.14	0.029	115.20	0.22	0.043	86.40	0.29	0.058	57.60	0.43	0.087	43.20	0.58	0.116
30		259.20	0.10	0.019	172.80	0.14	0.029	129.60	0.19	0.039	86.40	0.29	0.058	64.80	0.39	0.077
40		345.60	0.07	0.014	230.40	0.11	0.022	172.80	0.14	0.029	115.20	0.22	0.043	86.40	0.29	0.058
50		432.00	0.06	0.012	288.00	0.09	0.017	216.00	0.12	0.023	144.00	0.17	0.035	108.00	0.23	0.046
60		518.40	0.05	0.010	345.60	0.07	0.014	259.20	0.10	0.019	172.80	0.14	0.029	129.60	0.19	0.039
75		648.00	0.04	0.008	432.00	0.06	0.012	324.00	0.08	0.015	216.00	0.12	0.023	162.00	0.15	0.031
95	Expected	820.80	0.03	0.006	547.20	0.05	0.009	410.40	0.06	0.012	273.60	0.09	0.018	205.20	0.12	0.024
105	50%ile	907.20	0.03	0.006	604.80	0.04	0.008	453.60	0.06	0.011	302.40	0.08	0.017	226.80	0.11	0.022
115	Flow	993.60	0.03	0.005	662.40	0.04	0.008	496.80	0.05	0.010	331.20	0.08	0.015	248.40	0.10	0.020
150		1296.00	0.02	0.004	864.00	0.03	0.006	648.00	0.04	0.008	432.00	0.06	0.012	324.00	0.08	0.015
200		1728.00	0.01	0.003	1152.00	0.02	0.004	864.00	0.03	0.006	576.00	0.04	0.009	432.00	0.06	0.012
250		2160.00	0.01	0.002	1440.00	0.02	0.003	1080.00	0.02	0.005	720.00	0.03	0.007	540.00	0.05	0.009
300		2592.00	0.01	0.002	1728.00	0.01	0.003	1296.00	0.02	0.004	864.00	0.03	0.006	648.00	0.04	0.008
350		3024.00	0.01	0.002	2016.00	0.01	0.002	1512.00	0.02	0.003	1008.00	0.02	0.005	756.00	0.03	0.007
400		3456.00	0.01	0.001	2304.00	0.01	0.002	1728.00	0.01	0.003	1152.00	0.02	0.004	864.00	0.03	0.006
450		3888.00	0.01	0.001	2592.00	0.01	0.002	1944.00	0.01	0.003	1296.00	0.02	0.004	972.00	0.03	0.005
500		4320.00	0.01	0.001	2880.00	0.01	0.002	2160.00	0.01	0.002	1440.00	0.02	0.003	1080.00	0.02	0.005
600		5184.00	0.00	0.001	3456.00	0.01	0.001	2592.00	0.01	0.002	1728.00	0.01	0.003	1296.00	0.02	0.004
700		6048.00	0.00	0.001	4032.00	0.01	0.001	3024.00	0.01	0.002	2016.00	0.01	0.002	1512.00	0.02	0.003
800		6912.00	0.00	0.001	4608.00	0.01	0.001	3456.00	0.01	0.001	2304.00	0.01	0.002	1728.00	0.01	0.003

Per capita discharge	200	l/c/d
BOD	25	mg/l
P	10	mg/l
MRP	5	mg/l

WWTW DWF Effluent Discharges
Ortho P concentrations in Receiving River Waters

Table 5 Total P =5mg/l - Larger Works

River Flow		WTTW PE = 2000			WTTW PE = 2500			WTTW PE = 3000			WTTW PE = 4000			WTTW PE = 5000		
l/s		Dilution	BOD mg/l	MRP mg/l	Dilution	BOD mg/l	MRP mg/l	Dilution	BOD mg/l	MRP mg/l	Dilution	BOD mg/l	MRP mg/l	Dilution	BOD mg/l	MRP mg/l
40		8.64	2.89	0.289	6.91	3.62	0.362	5.76	4.34	0.434	4.32	5.79	0.579	3.46	7.23	0.723
50		10.80	2.31	0.231	8.64	2.89	0.289	7.20	3.47	0.347	5.40	4.63	0.463	4.32	5.79	0.579
60		12.96	1.93	0.193	10.37	2.41	0.241	8.64	2.89	0.289	6.48	3.86	0.386	5.18	4.82	0.482
75		16.20	1.54	0.154	12.96	1.93	0.193	10.80	2.31	0.231	8.10	3.09	0.309	6.48	3.86	0.386
100		21.60	1.16	0.116	17.28	1.45	0.145	14.40	1.74	0.174	10.80	2.31	0.231	8.64	2.89	0.289
125	Sample	27.00	0.93	0.093	21.60	1.16	0.116	18.00	1.39	0.139	13.50	1.85	0.185	10.80	2.31	0.231
150	95%ile	32.40	0.77	0.077	25.92	0.96	0.096	21.60	1.16	0.116	16.20	1.54	0.154	12.96	1.93	0.193
175	Flow	37.80	0.66	0.066	30.24	0.83	0.083	25.20	0.99	0.099	18.90	1.32	0.132	15.12	1.65	0.165
200		43.20	0.58	0.058	34.56	0.72	0.072	28.80	0.87	0.087	21.60	1.16	0.116	17.28	1.45	0.145
250		54.00	0.46	0.046	43.20	0.58	0.058	36.00	0.69	0.069	27.00	0.93	0.093	21.60	1.16	0.116
300		64.80	0.39	0.039	51.84	0.48	0.048	43.20	0.58	0.058	32.40	0.77	0.077	25.92	0.96	0.096
350		75.60	0.33	0.033	60.48	0.41	0.041	50.40	0.50	0.050	37.80	0.66	0.066	30.24	0.83	0.083
400		86.40	0.29	0.029	69.12	0.36	0.036	57.60	0.43	0.043	43.20	0.58	0.058	34.56	0.72	0.072
450		97.20	0.26	0.026	77.76	0.32	0.032	64.80	0.39	0.039	48.60	0.51	0.051	38.88	0.64	0.064
500		108.00	0.23	0.023	86.40	0.29	0.029	72.00	0.35	0.035	54.00	0.46	0.046	43.20	0.58	0.058
600		129.60	0.19	0.019	103.68	0.24	0.024	86.40	0.29	0.029	64.80	0.39	0.039	51.84	0.48	0.048
700		151.20	0.17	0.017	120.96	0.21	0.021	100.80	0.25	0.025	75.60	0.33	0.033	60.48	0.41	0.041
800		172.80	0.14	**0.014**	138.24	0.18	0.018	115.20	0.22	0.022	86.40	0.29	0.029	69.12	0.36	0.036
900		194.40	0.13	0.013	155.52	0.16	0.016	129.60	0.19	0.019	97.20	0.26	0.026	77.76	0.32	0.032
1000	Expected	216.00	0.12	0.012	172.80	0.14	**0.014**	144.00	0.17	0.017	108.00	0.23	0.023	86.40	0.29	0.029
1500	50%ile	324.00	0.08	0.008	259.20	0.10	0.010	216.00	0.12	**0.012**	162.00	0.15	**0.015**	129.60	0.19	0.019
2000	Flow	432.00	0.06	0.006	345.60	0.07	0.007	288.00	0.09	0.009	216.00	0.12	0.012	172.80	0.14	**0.014**
2500		540.00	0.05	0.005	432.00	0.06	0.006	360.00	0.07	0.007	270.00	0.09	0.009	216.00	0.12	0.012

Per capita discharge	200 l/c/d
BOD	25 mg/l
P	5 mg/l
MRP	2.5 mg/l

CARLOW
COUNTY COUNCIL

Local Government (Water Pollution) Act, 1977
(Water Quality Standards for Phosphorus) Regulations, 1998

Implementation Report 2006

Introduction

The Local Government (Water Pollution) Act, 1977 (Water Quality Standards for Phosphorus) Regulations 1998 provide for specified improvements in water quality conditions in rivers and lakes based on molybdate-reactive phosphate levels (MRP) or the biological Q rating of the river water.

Each local authority is required to submit an implementation report to the Environmental Protection Agency in line with Article 4(3) of the Regulations. This report details the progress in implementing the Regulations in County Carlow to date (2006).

Table of Contents

SECTION 1

WATER QUALITY

IN

COUNTY CARLOW

1.0 Water Quality in County Carlow

In order to assess compliance with the requirements of the Phosphorus Regulations and for the purposes of monitoring improvements or deteriorations in the river water quality, the regulations permit local authorities to use either the biological quality (Q) rating or the median concentration for molybdate-reactive phosphate (MRP).

For the MRP values to be used, the regulations specify a minimum number of samples required when calculating the median MRP. (a minimum of 10 samples must be taken at intervals of four weeks or longer in any twelve consecutive month period - where there are insufficient samples taken in a 12 month period, the period may be extended to a period up to 24 months during which at least 15 samples were taken).

This minimum number of samples has not been taken in Carlow in 2004/2005 for the majority of stations and so the Biological or Q rating for the rivers have been used as the primary basis for measuring improvement or deterioration in the water quality standard.

Carlow County Council commissions the Regional Water laboratory in Kilkenny to carry out the sampling and testing of river water quality in County Carlow. The laboratory prepares a yearly report on the physico/chemical and microbiological testing which is carried out during the year. For the purposes of this report, the "River Water Quality in County Carlow, 2005" report is used.

The Q values for each of the monitoring stations are assessed on a three yearly basis, with the country being divided into a number of hydrometric areas. Hydrometric areas 12 (River Slaney) and area 14 (River Barrow) include County Carlow. Biological surveys of each area are carried out every 3 years. For the purposes of this report, the biological data used is from the survey of Hydrometric area 14 carried out in 2003 and the survey of Hydrometric area 12 carried out in 2004.

Biological surveys are usually undertaken in the summer-autumn period (June-September) when flows are likely to be relatively low and water temperatures highest. Surveys during this period are therefore likely to coincide with the worst conditions to be expected in rivers affected by waste inputs.

The Q value for a river is based on a biological assessment of the water quality. The biological classification of water quality is carried out by examining the different types of macroinvertebrates (crustaceans, insects, worms, mollusks, leeches etc) that live in a river. Some species are sensitive and some are tolerant to pollution and a system for classifying water quality depending on the different numbers of the various macroinvertebrate species has been developed. Depending on the diversity of species found and their numbers, the river is classified on a scale of Q1 to Q5 with 5 the cleanest water and 1 the most polluted.

Biotic Quality Index (Q Value)	**Biological Quality Status**
Q5, Q4-5, Q4	Unpolluted
Q3-4	Slightly Polluted
Q3, Q2-3	Moderately Polluted
Q2, Q1-2, Q1	Seriously Polluted

Table 1.1 – A synopsis of River Water Quality in Carlow in 2005

River	Change from 2004	Overall Quality
Aghalona (Tributary of the Burren/Barrow)	No significant change observed.	Nitrates are high but appear to have stabilised in recent years. The Aghalona has also been subject to intermittent agricultural discharges.
Barrow	Improvements have been observed over the past four years downstream of the Carlow Sugar Factory and downstream of the Carlow Municipal Sewage Treatment Plant. .	Overall water quality in the Barrow is fair with a background of slight/moderate pollution from diffuse agricultural sources and sewage discharges from the various towns.
Burren	While nitrates are still elevated, levels appear to have improved and stabilised since 1999.	The Burren flows through a high tillage area in N. Carlow – Nitrates are high , but recent data indicate that levels have stabilised. There is evidence of enrichment at the middle and lower sections, with increased signs of eutrophication in recent years.
River Clody	No significant change observed.	Generally satisfactory
River Derreen	No significant change observed.	The Derreen is shows elevated nitrates but otherwise quality is satisfactory.
River Derry	No significant change observed.	Quality is generally satisfactory. –however quality can be affected by run-off during rain.
River Douglas	No significant change observed.	Elevated nitrates in the lower reaches. Otherwise satisfactory.
Lerr	There are indications of a levelling off in nitrate levels since 1998.	Nitrates are high due to intensive tillage in South Kildare – recent data indicates that nitrate levels are levelling off. Biological data indicates borderline conditions. Overall quality is mediocre.
Mountain	No significant change observed.	Generally satisfactory.
Poulmounty	No significant change observed.	Mainly satisfactory – but slight loss of quality downstream of fish farm at times.
Clonmore Stream (Tributary of the Derreen/Slaney)	No significant change observed.	Generally satisfactory.
Slaney	No significant change observed.	Overall the Slaney is reasonably satisfactory

Table 1.2 gives the overall trend in River Water Quality in County Carlow since the baseline year 1998. These results are graphed in Fig. 1.1. It is clear from this graph that the overall trend in river water quality is that it is improving on an ongoing basis.

Table 1.2 Overall trend in Water Quality in County Carlow

Year	Percentage samples in each category		
	Unpolluted	Moderately Polluted	Seriously Polluted
1998	61.6%	38.4%	0.0%
1999	80.6%	19.4%	0.0%
2000	76.4%	19.4%	4.2%
2001	86.7%	10.0%	3.3%
2002	81.5%	18.5%	0.0%
2003	90.2%	9.8%	0.0%
2004	89.9%	10.2%	0%
2005	91.2%	8.8%	0%

Figure 1.1 Overall trend in Water Quality in County Carlow

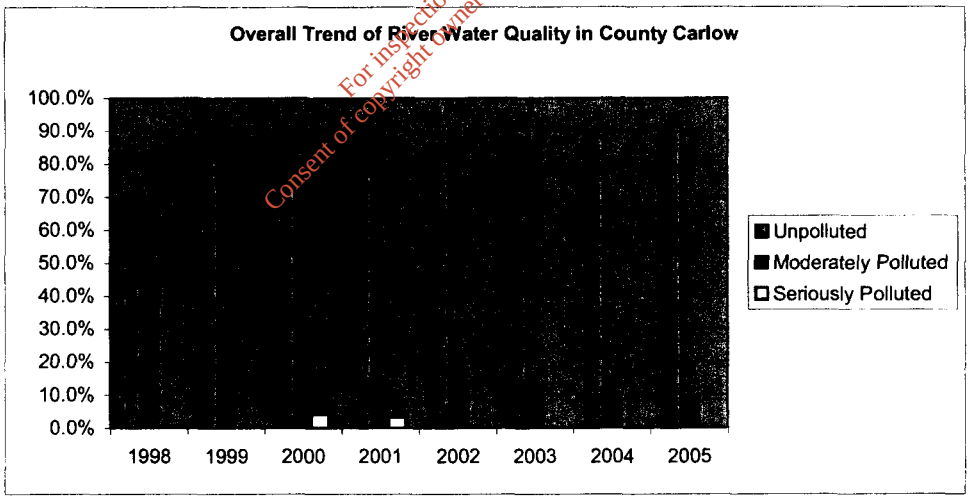
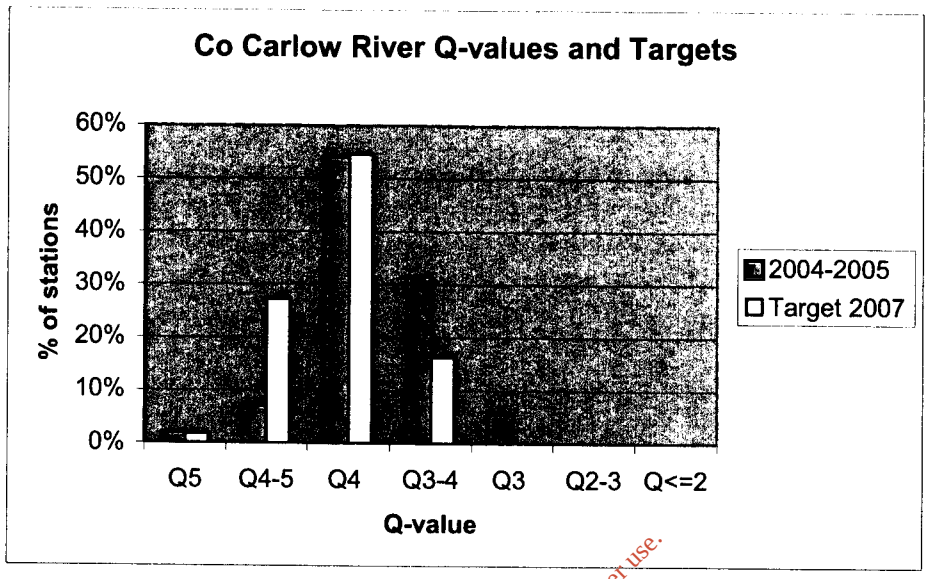


Table 1.3 gives the details of the current river water quality standards in County Carlow compared with the quality standards to be achieved by 2007. The Q values for the monitored stations are summarized in Figure 1.2.

Fig. 1.2 **Co. Carlow Q-value summary**



SECTION 2

IMPLEMENTATION OF PHOSPHORUS MEASURES

2.0 Implementation of Phosphorus Measures

The Phosphorus Measures Report, submitted by Carlow County Council to the EPA in September 1999, outlined the measures, which Carlow County Council intended taking to ensure compliance with the Phosphorus Regulations. These measures are reviewed on an ongoing basis. The measures currently being implemented are listed in Table 2.1 – Implementation Programme Summary Table for County Carlow and Table 2.2 - Implementation Programme Summary Table for Rivers in County Carlow.

SECTION 3

PROGRESS TO DATE

3.0 Implementation Programme

3.1 Planning Control and Enforcement Measures

Where it is deemed to be necessary the Environment Section examines planning applications and appropriate conditions are placed on the planning permission. These conditions are aimed at eliminating environmental pollution.

As part of planning control, a farm survey is carried out on all agricultural developments that apply for planning permission. In addition, all intensive agricultural enterprises are subject to Nutrient Management Plan requirements as part of the planning process.

3.2 Water Quality Management Plans

Carlow County Council is the lead Local Authority for the South Eastern River Basin District (SERBD) project Monitoring and Management System. The overall objectives of the project are to establish an integrated monitoring and management system for all waters within the river basin district, to develop a programme of management measures and to produce a River Basin Management Strategy to achieve 'Good' river water quality in all waters.

3.3 Groundwater Protection Plans

Groundwater characterisation and monitoring is included as part of the SERBD Management System. A ground water protection plan has previously been prepared by Carlow County Council for the boreholes in Bagenalstown. Draft groundwater protection plans have been prepared for the five other groundwater sources of drinking water in County Carlow. These plans will be finalised at the end of September 2006 (Bagenalstown, Leighlinbridge, Old Leighlin, Ballinkillen, Tynock and Bilboa).

3.4 Point Sources

3.4.1 Section 4 & 16 Licences

Continued reviewing of existing Section 4 & 16 discharges licenses has taken place since the last Implementation Report and license conditions have been changed where necessary to take consideration of the Phosphorus Regulations.

Since January 2004, Carlow County Council has issued 65 new/revised Section 4 licenses (including the trade and domestic effluents) and 14 new/revised Section 16 licenses under the Water Pollution Act. An inspection of all food outlets in Carlow, Bagenalstown and Tullow was conducted this summer. Where necessary premises are applying for licences to discharge into the public sewer (a minimum of 30 premises have been identified to date, with a target to have these facilities licensed by the end of 2006).

3.4.2 Urban Wastewater Discharges Treatment Plants

Progress has been made by Carlow County Council in relation to the improvement of discharges from Wastewater Treatment works, with particular reference to Phosphorus.

Existing treatment plants in both the Barrow and Slaney Catchments have been examined with a view to installing phosphorus removal facilities. Initial priority was directed towards the River Barrow. The "Scoping report for Identification of Water Quality Improvements to the River Barrow with particular reference to the Discharge of Wastewater from Existing Wastewater Treatment Plants" identified required improvements in the Barrow Catchment as follows: -

Table 3.0 - Sewerage Needs: 2000 – 2006

Mortarstown	36,000	Tertiary	2000/2001	Yes
Leighlinbridge	450	Secondary –To be pumped to Bagenalstown	End 2006	No
Muinebeag	4,000	Tertiary	End 2006	No

In addition, Carlow County Council is currently working on the upgrading of the following WWTP's, which affect both the Barrow and Slaney River Catchments.

Ballon, Myshall & Palatine

Existing plants are to be upgraded to provide additional capacity and improved treatment, including Phosphorus removal. These plants have been designed to achieve the following standard of effluent :

BOD	10 mg/l
SS	10 mg/l
Ammonia	5 mg/l
Phosphorus	1 mg/l

Ballon and Myshall upgrades shall be completed by the end of September 2006. Palatine is currently awaiting funding.

Raheendoran

The existing communal septic tank was replaced with a WWTP, including phosphorus removal in the summer of 2005. This effluent discharges directly to the River Barrow.

3.4.3 Septic Tanks

Carlow County Council continues to supervise groundwater and sub-soil percolation tests in relation to septic tank treatment systems, in accordance with the requirements of SR6 /

EPA guidelines for "Treatment Systems for Single Houses". Discharges to groundwater have been further controlled by the insertion of a maintenance clause for all small-scale treatment systems in planning permissions. Details of final sludge removal are also required to be submitted.

3.4.4 Agricultural Point-Sources

Where a pollution incident occurs legal proceedings will be brought against a person who allows polluting matter to enter a watercourse. In addition to this Notices are served under Section 12 and/or Section 23 of the Local Government (Water Pollution) Acts, 1977-1990 requesting information and/or specifying measures to be taken to prevent pollution of watercourses where required.

3.5 Diffuse Sources

3.5.1. Agriculture

The need for Byelaws to be enacted under Section 21 of the Local Government (Water Pollution) (Amendment) Act 1990 will be considered through the SERBD project. It is thought that any proposed Byelaws would address such topics as soil P testing, phosphate application limits, Code of Good Agriculture Practice etc. The introduction of such a Byelaw will not take place until the SERBD Management Plan has been completed.

It is proposed to carry out a review of the catchments in which it is considered that agriculture is the primary source of pollution, and that additional surveys of farms may be carried out in these areas.

3.6 Monitoring Measures

3.6.1 Regional Water Laboratory

The Regional Water Laboratory (EPA Kilkenny) is commissioned by Carlow County Council to carry out physico/chemical and biological sampling and analysis of the rivers in County Carlow. A yearly report is prepared by the laboratory giving details of all sampling and analysis carried out and also includes an assessment of the results.

3.6.2 South Eastern River Basin District (SERBD) Project

The establishment of appropriate monitoring systems for both surface and groundwater is one of the key tasks of the South Eastern River Basin District Project, which was set up for the purpose of implementing the Water Framework Directive.
A characterization report was produced by the SERBDM in 2005. The completeion of this intital characterization and analysis provides the baseline necessary to begin the next phase of the river basin management process.

The general objective of the Water Framework Directive (WFD) is to prevent deterioration of water status and to secure at least "good status" in relation to all waters by 2015.

The WFD requires management of water bodies on the basis of river catchment management, rather than each local authority looking after the section of a river in their administrative area only. The establishment of the SERBD project has provided the necessary structure for Carlow County Council to liaise with the other local authorities who have responsibilities in the Barrow and Slaney River Catchments in relation to River Water Quality.

3.6.3 LabInfo

Carlow County Council has commenced using the LabInfo computer package. The package in use for drinking water and wastewater treatment discharges only. It is intended to extend the database to include the sampling and testing of river water if compatibility with the EPA database can be achieved. This will allow all information

to be easily assessed with regard to the implementation of the Phosphorus Regulations.

3.7 Public Education and Advisory Measures

Carlow County Council participate in the Rural Environmental Protection Scheme (REPS) lectures organised by Teagasc and deliver lectures/talks on an ongoing basis to the Farming community on topics in relation to Water Quality issues and measures which they can take to protect water quality.

Public Participation has been highlighted as being a key requirement of the implementation of the Water Framework Directive with all stakeholders to be represented. The SERBD project includes amongst its interest groups Teagasc, Irish Farmers Association (IFA), Coillte, Fishery Boards and Community Groups. Their involvement in the project is a very important and effective way of keeping these organisations informed of the issue of Water Quality Management. The SERBD project has had information stands at agricultural events such as the ploughing championships, which have helped to make individual farmers more aware of water quality issues.

The SERBD project also has information available on a website, which can be accessed from the Carlow County Council website.

It is intended that further information in relation to Water Quality issues will be added to the Carlow County Council website including a link to the Implementation report and the EPA website.

Carlow County Council, through the SERBD project has developed a website has which provides environmental information on the Barrow and Slaney catchments. Interactive maps are provided allowing for the interrogation of all relevant data relating to water quality.

3.8 Financial & Other Measures

Funding has been secured for the following projects & infrastructural works :

- Catchment Based Monitoring and Management System (SERBD project).
- Leighlinbridge Sewerage Scheme– to pump wastewater to Bagenalstown WWTP.
- Ballon and Myshall WWTP– upgrade each of these WWTP to include Phosphorus removal.
- Fenagh WWTP- contractor has been appointed
- Rathoe WWTP – currently undergoing site selection
- Tullow WWTP – consultant has been appointed to produce a preliminary report for upgrade

Funding/approval is also being sought for the upgrading of the following WWTP – Rathvilly, Hacketstown, Palatine and Bagenalstown WWTP – upgrade to provide Tertiary Treatment

Phosphorous Standard for Wastewater Treatment Works

1.0 Introduction

Carlow County Council has to set a phosphorous discharge standard for the wastewater treatment works(WWTWs) in its region. To do so it must comply with current environmental legislation namely the Urban Wastewater Treatment Directive and the Phosphorous Regulations.

2.0 Legislation

The urban waste water treatment directive (UWWTD) is concerned with the collection, treatment and disposal of urban waste waters and the treatment and discharge of industrial waste waters.

The principal elements of the Directive are summarised as requiring:

- Collection systems (sewerage) in urban agglomerations designed and constructed in accordance *with Best Available Technology Not Entailing Excessive Cost* (**BATNEEC**) having regard to:
  - Volume and characteristics of urban waste water.
  - Prevention of leaks.
  - Limitation of pollution of receiving waters due to stormwater overflows.
- Collection systems to be in place by 31 December 1998, 2000 and 2005 for discharges to sensitive waters, populations of more than 15,000 and populations between 2,000 and 15,000 respectively.
- Waste water to be subjected to Secondary Treatment or equivalent prior to discharge.
- Treatment to be in place by 31 December 2000 and 2005 depending on size and location.
- **A higher level of treatment where discharge is to 'sensitive' waters.**
- The disposal of waste water be the subject of regulation.
- The discharge of industrial waste water into urban collection systems and treatment plants be the subject of regulation.
- The elimination of the disposal of sludge to surface waters by 31 December 1998.
- Sludge arising from waste water be reused whenever appropriate.
- **Discharges from treatment plants be monitored and reported.**
- A concession in relation to the classification of waters as *'less-sensitive'* and allowing treatment of a lower order than Secondary Treatment is included in the Directive.

The UWWT Directive was transposed into Irish Law by the Environmental Protection Agency Act, 1992 (Urban Waste Water Treatment) Regulations 1994 (SI 419 of 1994).

The UWWTD sets P discharge consent standards of 2mg/l of total phosphorous for WWTW between 10,000 and 100,000 pe and 1mg/l total P for WWTW greater than 100,000 pe where the WWTW is discharging into 'sensitive waters'. An equivalent percentage reduction in inlet P concentrations is also permissible. A list of 'sensitive' receiving waters is included in the Regulations. All these waters are inland. No waters around Ireland are classified as 'less-sensitive'.

The implications of the UWWTD for P reduction in WWTW are as follows:

- There is no P standard required by the UWWTD for WWTW under 10,000 pe.
- For WWTW greater than 10,000 pe and less than 100,000 pe a 2mg/l total P standard is required if the receiving water is designated 'sensitive'
- For WWTW greater than 100,000 pe a 1mg/l total P standard is required if the receiving water is designated 'sensitive'
- Employ the principle of BATNEEC in treatment of wastewater.

The other legislation concerning control of P discharges from wastewater treatment works is the Phosphorous Regulations of 1998 (Local Government (Water Pollution) Act, 1977 (Water Quality Standards for Phosphorous) Regulations, 1998). These regulations require that a Local Authority review the EPA's water quality data of inland river and lake waters and prepare a baseline report by 1998 of inland surface waters within their boundaries. The regulations require that the existing water quality or biological quality rating, as set out in this baseline report, be maintained if it is currently satisfactory or where the baseline biological rating is less than satisfactory that the rating is improved over time to a satisfactory condition and then is maintained. The Third Schedule of the Regulations defines various ratings and the improvements required. The Third Schedule uses both Biological Quality Ratings – Q Ratings and Molybdate Reactive Phosphate(MRP) concentrations. MRP concentrations are matched against Q Ratings. The LA is then required to plan, report and implement(under the BATNEEC principle) any measures required to maintain and/or improve the baseline water quality as required by the regulations.

The MRP concentrations detailed in the Third Schedule are very low and range from 0.015 mgMRP/l to 0.07 mgMRP/l in the surface water. These are median concentrations and by the sampling regime required to measure the median concentration they are based on an annual variation in surface water conditions. The relationship between total P and MRP is not easily defined and a useful guide when assessing discharges from WWTW is that the MRP is taken as half of the total P concentration.

The implications of the Phosphorous Regulations of 1998 for P reduction in WWTW are as follows:

- Very low annual median concentrations of MRP are set depending on the baseline water quality of the surface water as set by the EPA data available up to 1998.
- There is no method proposed for relating median MRP concentrations in the surface waters to WWTW final effluent discharges.

- Employ the principle of BATNEEC in maintaining/improving the baseline Biological Rating of the surface water.

3.0 Defining P Reduction Concentrations.

The UWWTD does not apply to WWTW under 10,000 pe with regard to P consent standards and for works greater than 10,000 pe it only applies if the receiving water has been designated sensitive. Therefore the principle environmental legislation that controls the discharges of phosphorous to surface water is the Phosphorous Regulations of 1998 (Local Government (Water Pollution) Act, 1977 (Water Quality Standards for Phosphorous) Regulations, 1998).

To evaluate the requirements of the P Regulations with regard to effluent discharges from WWTW a spreadsheet has been developed that calculates the MRP concentration in a stream/river for various sizes of WWTW and for various total P discharges. Three tables from this spreadsheet demonstrate the impact of P reduction concentrations for WWTW from 500 pe up to 2000 pe for three different discharge levels of total P – 10mgP/l, 2mgP/l and 1 mgP/l. The MRP value has been taken as half the total P concentration for calculating the MRP concentration in the receiving water. For discussion purposes a stream with a low 95%ile flow(10l/s) has been used to examine the MRP concentrations, this is a small stream but one that dose not quite dry up in the summer usually. The median flows are based on estimates for similar sized streams using data from the EPA.

Table 1 shows a total P discharge of 10 mg/l which is for a WWTW without any P reduction process in place. The light shading show the MRP concentrations at the 95% ile flow and at the estimated median flows. The P Regulations Third Schedule has the following MRP levels defined;

Existing Q Rating	Minimum Target Q Rating	MRP Median Concentration (mg/l)
5	5	0.015
4-5	4-5	0.020
4	4	0.030
3-4	4	0.030
3	3-4	0.050
2-3	3	0.070
<=2	3	0.070

Table 1 shows that WWTW discharges without P reduction can increase the level of MRP above the 0.070 mgMRP/l very quickly at median flows ie unless the river has a fairly high flow or the WWTW is small (<500 pe). The 0.070 MRP concentration is associated with seriously polluted waters as seen from the above data. For WWTW to require no P reduction the median flows would have to be very high as shown

by the heavier shaded boxes on the table – 350l/s for a 500pe works, 600l/s for a 800 pe works and 700l/s for a 1000pe works and this would be without background P levels in the river being taken into account. Therefore P reduction is required at WWTW.

In deciding what level of P reductions is required the levels set in the UWWTD are used as a guide. These are 2 mg/l and 1 mg/l. Table 2 shows the impact of a 2mg/l total P discharge in the final effluent and clearly shows that the river water concentrations of MRP for a Q5 water quality are more readily achieved for small WWTW(500 pe). However for larger works of 1500pe and over the MRP level from the WWTW alone is above 0.030 mg/l which is equivalent to a slightly polluted water and when background levels of MRP are taken into account could be equivalent to a moderately polluted water with MRP values in excess of 0.05 mg/l. Also when the 95%ile flows are considered the MRP levels are an order of magnitude greater than those required at the median level in the river throughout the year by the regulations.

Table 3 shows the impact of a 1mg/l total P discharge in the final effluent from a range of WWTWs and the table demonstrates that the MRP levels(0.015 – 0.03 mg/l) associated with Q4, Q4-5 and Q5 is achievable for WWTW of 2,000pe and under discharging into a fairly small stream as represented by the lighter shaded area. The MRP levels at the 95%ile flows are also significantly reduced and while still high compared to the median values required they will only occur in the river/stream for a short period and statistically a high value that occurs in the lower 50 % of results does not affect the median value. P unlike BOD and ammonia is not immediately toxic and therefore relatively high levels for a short period will not cause a pollution incident. The relevance of an annual median value of MRP appears to be that it reflects or relates to the biological diversity and hence health of the river/stream over an annual cycle. As can be see from Table 3 for the smaller works the Q5 MRP value is being well exceeded in the receiving water, but it must be remembered that there will be background P levels which are unaccounted for in the table. It is very difficult to evaluate the background level of MRP as an existing small WWTW without P reduction will be contributing a significant amount to the MRP level in any given waterway as is demonstrated by Table 1.

Reviewing Table 1 clearly shows that there is requirement for P reduction at WWTWs. Table 2 shows that a 2mg/l total P in the final effluent from a WWTW is insufficient to meet the requirements of the 1998 P Regulations on all but the smallest of WWTWs. Table 3 indicates that a 1mg/l level of total P in the final effluent will meet the requirements of the P Regulations unless there is a relatively large works (2,000 pe) discharging into a small stream with very low median flows.

Another consideration with regard to setting a P reduction standard is the process technology available to reduce the P to the required level. The traditional P reduction process is the use of an acid such as ferric chloride which changes the solubility of the P and makes it more readily settleable. Then more recently particularly on larger works there is biological P reduction which uses alternating anaerobic, anoxic and aerobic conditions to adsorb the soluble P. The third principle method is the use of membrane technology

which physically removes the soluble P. To achieve a lower than 1 mg/l total P is not feasible using biological P reduction on its own. The chemical addition method can achieve lower concentrations but not without other process difficulties as the addition of the acid reduces the pH which will prevent nitrification if there is insufficient alkalinity. Also the acid addition significantly increases the sludge production from a works. Membrane technology can achieve lower P concentrations down to quite low values of less than 0.1 mg/l, however it is very expensive to install and operate. Under the principle of BATNEEC the cost of membrane technology is unacceptable on both capital and operating grounds for P reduction alone as it can more than double the cost of the treatment works. If there are other factors driving final effluent requirements such as very low BOD or Faecal Coliform standards then the use of membrane technology could be considered.

4.0 Selecting the P Concentration for Final Effluent Discharges

A 1 mg/l total P final effluent standard is therefore selected and set for all WWTWs in the Carlow County Council region as this will meet the requirements of the regulations and maintain the principle of BATNEEC. There are two exceptions to this that can apply:

- Where a WWTW is less than 200 pe and is demonstrated as discharging into a stream with suitable 95%ile and median flows, as shown in Table 4, for this exception to apply supporting data must be fully and clearly presented.
- Where a WWTW is discharging into a river with larger median flows as shown in Table 5, in this case P reduction will still be required however the standard can be increased to a total P of 5 mg/l provided that the river can sustain this and that that the river flow data is available to demonstrate this.

The implications to Carlow County Council in setting a P reduction standard are as follows

- WWTW effluents will meet the 1998 P Regulations
- The UWWTD will be met in that the standard is greater than set by the UWWTD for P reduction into 'sensitive waters' unless one of the above exceptions are considered and then the UWWTD must be taken into account.
- There will be an increase in the amount of sludge produced from each works and this should be accounted for in the final design of the sludge handling stream and sludge treatment centre. For small works sludge treatment using sludge reed beds should be considered as these are more cost effective than transporting and treating sludge from these small works, particularly given the additional volumes expected.
- There will be an additional cost of treatment both in capital and operating costs at each WWTW.