



Strategic Environmental Assessment

**Arterial Drainage Maintenance & High Risk Channel
Designation Programme 2011 – 2015**

Environmental Report

**Environment Section
Engineering Services
Office of Public Works**

December 2011

Non-Technical Summary

Introduction

This Non-Technical Summary summarises the Strategic Environmental Assessment (SEA) of Arterial Drainage Maintenance and High Risk Channel Designation draft Programme 2011-2015. The SEA Environmental Report (ER) identifies, evaluates and describes the likely significant effects, both positive and negative, of implementing the draft Programme on the environment. It then recommends actions to mitigate and monitor any identified significant adverse effects and ensure that these are communicated and addressed during the implementation of the Programme. The ER and this Non-Technical Summary have been prepared to meet the requirements of the European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations 2004. The SEA ER also specifically identifies the impacts of the draft Programme on sites of international and national nature conservation importance within through a "Appropriate Assessment" (AA) process, as required under European and Irish law, and makes appropriate mitigation recommendations.

The SEA process and timescale is broadly comprised of the following steps:

Table 1: SEA process

SEA Step / Stage	Purpose	Status
Screening	Decision on whether or not an SEA of a Plan/Programme is required.	Completed, 2009. SEA Screening Statement is available on OPW website
Scoping	Consultation with the defined statutory bodies on the scope and level of detail to be considered in the assessment.	Completed, 2009. Final Scoping Document is available on OPW website
Environmental Report	Assessment of the likely significant impacts on the environment as a result of the Plan or Programme culminating in the production of an Environmental Report.	Completed, December 2011.
Consultation	Consultation on the draft Plan/Programme and the associated Environmental Report.	Will take place between December 2011 and February 2012.
SEA Statement	Identification of how environmental considerations and consultation have been integrated into the Final Plan/Programme culminating in the production of an SEA Statement.	Scheduled to be published in 1 st quarter 2012.

Arterial Drainage Maintenance & High Risk Channel Designation Programme 2011-2015

The Office of Public Works (OPW) is the body through which the Central Government exercises its statutory responsibilities in respect of river drainage and flood relief. It derives its statutory authority from the Arterial Drainage Acts 1945 and 1995, the

Commissioners of Public Works (Functions and Powers) Act 1996 and the European Communities (Assessment and management of Flood Risks) Regulations 2010.

This SEA incorporates two sets of activities:

- Statutory arterial drainage maintenance, which entails the maintenance of completed Arterial Drainage Schemes and Flood Relief Schemes.
- High Risk Channel Designation, which is a process emanating from the Report of the Flood Policy Review Group. Based on clear prioritisation criteria, rivers, channels and defence assets will be 'designated' as priorities for maintenance and will be the responsibility of the OPW.

There is no existing overarching plan / programme which is directly applicable to the concept of carrying out an SEA. However, there are activities ongoing in the State in respect of Arterial Drainage Maintenance and in screening consultations with the Environmental Protection Agency (EPA), it has been deemed appropriate for an SEA to be carried out on these activities. Accordingly, for this SEA, the Programme is not a document formulated from a statutory requirement such as a County Development Plan (CDP), River Basin Management Plan (RBMP) or Catchment Flood Risk Assessment & Management Study (CFRAMS). The Programme has been produced to facilitate the SEA process and is in effect a statement of the ongoing annual statutory activities bundled into a five-year period. This SEA will consider the five-year period from 2011 – 2015.

Timescale

The 2011 – 2015 timescale has been adopted to facilitate future more effective coordination with the RBMP and CFRAMS. Both these plans will be reviewed in 2015 in accordance with the WFD and Flood Directives respectively, both are carrying out their individual SEAs, and with both sets of plans being managed at an River Basin District (RBD) scale, it is envisaged that more opportunities for alignment will arise in 2015 which may subsume or alter the scope of many other water sector SEAs such as this one.

The Programme – Part 1 - Arterial Drainage Maintenance

Statutory arterial drainage maintenance entails the maintenance of completed Arterial Drainage Schemes, completed Flood Relief Schemes, and the associated Scheme structures. The OPW are responsible for the maintenance of 11,500km of channel, 730km of embankments, some 18,500 bridges and 750 ancillary structures such as sluice gates, pumping stations and tidal barrages.

The majority of arterial drainage maintenance works is on channel maintenance with the average channel requiring maintenance every four to six years. While this varies, with some channels requiring maintenance annually and others only requiring maintenance every twenty years, circa 2000km of channels are maintained annually and nearly all of the 11,500km of channels will have been maintained at least once over the Programme cycle of six years. Accordingly, the Programme in terms of this SEA, is to apply to all the 11,500km of Arterial Drainage Scheme channels. Of the 750km of embankments, the frequency of maintenance tends to be more variable than that for channels with embankments scheduled for maintenance works as the need arises. To date there have been thirteen Flood Relief Schemes carried by the OPW and statutory arterial drainage maintenance includes the maintenance of these Schemes. In respect of the various bridges and structures associated with the Schemes, a relatively small number are maintained annually i.e. circa 170 bridges and 30 other structures which are restricted to the most critical structures. Note that a portion of the 18,500 bridges are

road bridges where the Local Authorities are responsible for the structural integrity, hence OPW maintenance operations typically exclude bridge deck or arch repair works on road bridges.

Part 1.1 - Scheme Channel Maintenance Works

Channel maintenance operations normally involves removing the build up of foreign or natural material that impedes the free flow of water. Predominately this consists of the removal of water-entrained silt and associated vegetation from the bed of the channel by suitably rigged hydraulic excavators. In most cases, no alterations to the bank are required and in some cases the channel is not disturbed at all if no build up of material is present. Circa 2,000km of Scheme channels are maintained annually.

Part 1.2 - Maintenance of Scheme Structures

Currently all Scheme structure maintenance work is carried out by direct labour gangs. Approximately 170 bridges are repaired/replaced each year. Ancillary structures such as sluice gates, tidal barrages and pumping stations are repaired or replaced as necessary to maintain their respective operating function.

Part 1.3 - Scheme Embankment Maintenance

Most Embankment Schemes are tidal in nature hence they tend to be located at estuaries. The programme extends to the refurbishment of the deteriorated embankments in Kerry, Wexford and Donegal. The Shannon Embankments are also undergoing refurbishment works, due to their importance to flood defence for Limerick and Shannon Town. The refurbishment of the embankments is carried out by contract or by direct labour.

Part 1.4 - Flood Relief Scheme Maintenance

Flood Relief Schemes completed since the Arterial Drainage (Amendment) Act, 1995 also have a statutory maintenance requirement. Maintenance cycles vary depending on the characteristics of the Flood Relief Scheme.

The Programme – Part 2 - High Risk Channel Designation

Following major floods in 2000 and 2002, a review of national flood policy was initiated by the then Minister of State with responsibility for the OPW, Mr. Tom Parlon, T.D. This review was aimed at determining policy on flood risk management for the future, and clarifying roles and responsibilities among the various Departments, the Local Authorities and other organisation involved with managing and responding to floods. The recommendations of the Report of the Flood Policy Review Group were approved by Government in September 2004, setting the framework for how Ireland is to manage flood risk in the future.

The Report of the Flood Policy Review Group identified, among other things, that:

- There are a substantial number of watercourses for which no State authority has legislative responsibility for flood management.
- The lack of maintenance of watercourses and their associated defences and structures is a potential major cause of flooding on influence on flood processes.

The report recommended that a system be put in place to 'designate' high-risk channels and give permissive powers of maintenance to the central authority (OPW). The general objective of "Designation" is to ensure that potentially high-risk channels or defences are maintained to reduce the flood risk that may otherwise arise. This system is intended however, only to be applicable to channels or defences that pose a

significant risk, or that are of strategic importance. The report also recommended that an asset register be developed to aid in identifying and prioritising watercourses and structures for “Designation”.

The Commissioners of Public Works have introduced a funding mechanism to Local Authorities for localised works to alleviate flooding where the following conditions are satisfied:

- There is a technically viable option to mitigate or eliminate flooding.
- A legal mechanism is available to carry out the option and the necessary consents, agreements and licenses are in place.
- The option is cost effective and government requirements for assessing costs and benefits have been met. A simple method of assessing benefits is used for less expensive proposals, and full cost benefit analysis may be used for more expensive options.

Typically this means that works that do not require an Environmental Impact Statement (EIS) and cost less than €0.5 million are funded under this mechanism.

No legal mechanism is yet in place to allow the Commissioners to ‘designate’ particular channels or other structures. In many cases minor works in excess of maintenance are required to address specific issues. The minor works funding mechanism has proved effective in addressing this type of issue. In addition, there are complex responsibilities, rights and interests in the management of watercourses. As a result, careful consideration of the incentives that arise for the various stakeholders is necessary to ensure that appropriate action is taken.

Part 2.1 - Relevant Legislation

Directive 2007/60/EC on the assessment and management of flood risks entered into force on 26 November 2007. This Directive now requires Member States to assess if all water courses and coast lines are at risk from flooding, to map the flood extent and assets and humans at risk in these areas and to take adequate and coordinated measures to reduce this flood risk.

This Directive along with the Report of the Flood Policy Review Group resulted in the introduction of S.I. 122/2010 – European Communities (Assessment and Management of Flood Risks) Regulations 2010. The S.I. Addresses items such as “The preparation of schemes of flood risk management works and measures”, “Designation Orders”, “Powers of the Minister” and “the costs of flood risk management”. This legislation is relatively recent and it will take some time before all components are fully implemented.

Part 2.3 - Roles & Responsibilities

The key feature of a ‘Designation’ process is that it coordinates actions by a variety of stakeholders to provide a greater benefit than could be achieved by the stakeholders on their own, particularly taking the tendency toward negative behaviour into account. The key players are the riparian owners, the riparian community and statutory bodies, together with other parties with property related rights and beneficial use related rights or interests. The OPW also has a key role to play. The fact that stakeholders have overlapping responsibilities tends to dilute the incentive to perform them, even though the benefits to be achieved may be clear. All stakeholders have responsibilities for cooperation with other stakeholders and responsibilities to take appropriate actions and refrain from inappropriate action.

Programme Exclusions

This SEA is not intended to directly consider the following related activities:

- New Arterial Drainage or Flood Relief Schemes
- CFRAMS
- Drainage Districts

Scoping

Scoping for the SEA was carried out between September 2009 – December 2009, incorporating consultation with the designated “environmental authorities”

- Department of Communications, Energy and Natural Resources (DCENR);
- Department of Environment, Heritage & Local Government (DEHLG); and
- Environmental Protection Agency (EPA).

The final version of the Scoping Report is available on the OPW website www.opw.ie

Structure and Content of Environmental Report

The structure and content of this SEA ER has been prepared to meet the legislative requirements and are outlined in the table below:

Table 2: Key Elements of the Environmental Report

Requirement of SEA Directive (Article 5(1), Annex 1)	Section of Environmental Report
An outline of the contents and main objectives of the plan or programme, or modification to a plan or programme, and relationship with other relevant plans or programmes.	Chapter 3: Description of the Programme
The relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme, or modification to a plan or programme.	Chapter 5: Baseline Environment
The Environmental characteristics of areas likely to be significantly affected	Chapter 5: Baseline Environment
Any existing environmental problems that are relevant to the plan or programme, or modification to a plan or programme, including, in particular, those relating to any areas of particular environmental importance, such as areas designated pursuant to the Habitats Directive or the Birds Directive.	Chapter 5: Baseline Environment
The environmental protection objectives, established at international, European Union or national level, which are relevant to the plan or programme, or modification to a plan or programme, and the way those objectives and any environmental considerations have been taken into account during its preparation	Chapter 6: Review of relevant Plans, Programmes and Policies
The likely significant effects on the environment, including on issues such as flora, fauna, biodiversity, population, human health, water, air, climate, cultural heritage including archaeological and architectural heritage, landscape, material assets, geology, soil.	Chapter 9: Impact Assessment

landuse, and the interrelationship between the above factors.	
The measures envisaged to prevent, reduce and as fully as possible offset any significant effects on the environment, from implementing the plan or programme, or modification to a plan or programme.	Chapter 10: Mitigation and Monitoring
An outline of the reasons for selecting the alternatives dealt with, and a description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information.	Chapter 2: Methodology. Chapter 7: Strategic Environmental Objectives, Targets and Indicators. Chapter 8: Alternatives
A description of the measures envisaged concerning monitoring of the significant environmental effects of implementation of the plan or programme, or modification to a plan or programme.	Chapter 10: Mitigation and Monitoring
A non-technical summary of the information provided under the above headings	Non-Technical Summary

Relevant Plans and Programmes

This report addresses the relationship between the Arterial Drainage Maintenance and High Risk Channel Designation Programme with other relevant Plans, Policies and Programmes, at international, national, regional and local level. The relevance of the following were considered:

- UN Convention on Biological Diversity (1992)
- Ramsar Convention on Wetlands of International Importance
- UN Framework Convention on Climate Change: The Kyoto Protocol (1997)
- European Union
- EU Floods Directive (2007/60/EC)
- EU Water Framework Directive (2000/60/EC)
- EU Habitats Directive (92/43/EEC)
- EU Birds Directive (2009/147/EC)
- EU Freshwater Fish Directive (78/659/EEC)
- EU Groundwater Directive (2006/118/EC)
- EU SEA Directive (2001/42/EC)
- EU EIA Directive (85/337/EEC)
- EU Biodiversity Strategy to 2020
- Convention on Protection of Archaeological Heritage: Valletta Convention (1992)
- National Spatial Strategy 2002-2020
- National Development Plan 2007-2013
- Wildlife Act 1976 and Amendment Act 2000
- National Biodiversity Plan (2011)
- European Communities (Natural Habitats) Regulations, as amended
- Regional Planning Guidelines
- River Basin Management Plans
- Flood Risk Management Plans
- County and City Development Plans

- Local Area Plans

Baseline Environment

As arterial drainage schemes are located in seven of the eight River Basin Districts (RBDs), (North-Eastern RBD excluded), the baseline data includes information from both Ireland and Northern Ireland. An extensive volume of baseline data is collated in the Environmental Report under the following main headings:

- Biodiversity, Flora and Fauna
- Human Beings
- Water
- Air & Climate
- Cultural Heritage
- Landscape and Visual
- Material Assets
- Soil, Geology & Land Use
- Interrelationships

To summarise this large volume of information, for each of the main headings, their evolution in the absence of the Programme is detailed below.

Biodiversity, Flora and Fauna

The drainage maintenance regime is designed to maintain the current drainage status. In the absence of drainage a dramatic change to the ecosystem within an enlarged flood plain would be expected, both positive and negative impacts on the flora and fauna would be associated with this change.

In the absence of Arterial Drainage Maintenance and High Risk Channel Designation activities being implemented, a dramatic change to the flora and fauna would be expected. The risk of flooding to the benefiting lands would increase significantly, with more wetlands therefore, expected to become established in flooded areas. Many areas of agricultural land would be expected to be less productive as flooding increases and wet grassland, swamp, fen habitats and riparian woodland become established through succession due to changes in the water table. It is likely that the altered hydrological regime would positively affect peatland habitats such as bogs, as drains become clogged with silt and aquatic vegetation over time. Over time water levels would rise to pre-drainage levels.

An increase in the abundance of wetland habitats is likely to result in an increase in the species associated with those habitats; for example little egret, red grouse and snipe are known to use wetland habitats. Conversely species such as badgers and Irish hare, which are known to be associated with dry habitats such as dry meadows and agricultural grassland may decrease in abundance.

The absence of arterial drainage maintenance is likely to impact on aquatic species such as otter, crayfish, freshwater pearl mussel, salmon and lamprey. Siltation events associated with in-stream maintenance works would cease, however increased nutrient loading associated with flooding would be expected to increase eutrophication in some waterways. In the absence of drainage the build up of silt and aquatic vegetation may decrease the suitability of the habitat for species such as otter and crayfish.

Should arterial drainage maintenance works cease, the Environmental River

Enhancement Programme (EREP) would also cease. This OPW funded project focuses on the enhancement of river corridors within the OPW maintenance programme. The project is coordinated and managed jointly with Inland Fisheries Ireland (IFI), and aims to enhance or increase the diversity of the physical and flow regimes within arterially drained channels, thereby leading to an increase in flora and fauna biodiversity within the channels.

Human Beings

The Arterial Drainage Maintenance and High Risk Channel Designation works form part of a series of OPW works programmes that aim to ensure effective management of flood risk. These works are carried out under the requirements of the Arterial Drainage Act 1945 and Arterial Drainage Amendment Act 1995, which shifted the emphasis of flood management activity from the improvement of agricultural land to the protection of urban areas subject to flooding. These works reduce the risk of flooding and its associated impacts on human health and safety, infrastructure and amenities, and the associated financial losses and costs.

Water

The Arterial Drainage Maintenance and High Risk Channel Designation works form part of a series of OPW works that aim to ensure effective management of flood risk. These works will assist in reducing the risk of flooding and its associated impacts on water quality, and water supply and wastewater infrastructure.

All rivers, lakes, estuaries, coastal waters and groundwater in Ireland must achieve the standards of 'Good Ecological Status' (GES) and or 'Good Chemical Status' by 2015 to meet the requirements of the Water framework Directive (WFD). The ecological status classification combines three factors:

- Biology;
- Supporting water quality conditions; and
- Supporting hydrology and morphology (physical condition)

The hydrology (i.e. river flows, lake levels and tidal patterns) and morphology (i.e. physical condition of surface waters) that support the ecology of waterbodies have the potential to be directly affected by changes in the flooding regime and the implementation of flood risk management measures. Therefore the contribution of these physical factors to the achievement of Good Ecological Status is a key focus of this SEA. The WFD objectives, risks and measures have been taken into account, where relevant in the assessment of Arterial Drainage Maintenance and High Risk Channel Designation, by considering whether maintenance operations or 'Designation' proposals would adversely affect the implementation of proposed measures relating to hydromorphology. Furthermore, where Arterial Drainage Maintenance operations are proposed within or where they could affect a Natura 2000 site, i.e. a Special Area of Conservation or Special Protection Area, an Appropriate Assessment in line with Article 6 of the Habitats Directive (92/43/EEC) is carried out.

The main objective of the EREP is to assist in achieving 'Good Ecological Status' of OPW channel to comply with the requirement of the Water Framework Directive. OPW Channels identified as "At Risk" of failing to achieve 'Good Ecological Status' by 2015 due to channelisation, will be enhanced through the EREP.

Air & Climate

Future changes in climate and the associated impacts on river flows and tide levels are

likely to change the frequency, extent, distribution and pattern of flooding. Higher sea levels and wetter winters, with more intense rainstorms, together with possible increases in storminess could significantly increase both the frequency and intensity of flooding. For example, floods which currently have a 1 in 100 chance (1% probability) of occurring in any one year could occur much more frequently (*'The Planning System and Flood Risk Management: Guidelines for Planning Authorities'*, OPW, 2009). In addition to the ongoing maintenance of Arterial Drainage Schemes, which aims to reduce flood risk, the High Risk Channel Designation scheme will identify high-risk channels and give permissive powers of maintenance to the OPW. This will ensure that new and previously unidentified potentially high-risk channels or defences that pose a significant flood risk or are of strategic importance are maintained to reduce the flood risk that may occur.

Cultural Heritage

During the course of the original Arterial Drainage Scheme excavations following the 1945 Act, approximately 18,500 accommodation bridges were modified or replaced as required. These bridges provide riparian farmers with farm vehicular/foot access. In general, as channel maintenance work proceeds, the bridges are inspected by supervisory industrial staff, and if required, repairs or replacements are carried out. On many occasions, it is not necessary to fully replace the structure, and repairs such as under-pinning foundations or replacement of wind walls, parapets or deck are carried out to extend the bridge life. Approximately 170 bridges, some of which may be of architectural heritage interest, are repaired or replaced each year. Ancillary structures such as sluice gates, tidal barrages and pumping stations - some of which may also be of architectural heritage interest - are repaired or replaced as necessary to maintain their respective operating function.

In more general terms, the OPW works reduce the flood risk to benefiting lands, thereby also reducing the flood risk to sites and features of archaeological and architectural heritage located within these lands.

For High Risk Channel Designations, archaeological assessments may be required prior to works commencing.

Landscape and Visual

The landscape and visual impacts associated with arterial drainage maintenance in most cases will be negligible. These impacts are limited to the immediate vicinity of the works and are carried out where the arterially drained channels are already part of the existing landscape. The works that could potentially give rise to localised landscape or visual impacts include tree removal (where the tree is impinging on channel capacity), the spreading of material that has been removed in maintenance operations along the bank or on top of existing spoil heaps where present, and repair works to embankments, in the form of topping up with clay to design height.

Material Assets

Flood defences are a material asset. The Arterial Drainage Maintenance and High Risk Channel Designation works entail the maintenance of watercourses and their associated flood defences to ensure effective management of flood risk into the future. This management of flood risk provides protection for other material assets from flooding.

Soil, Geology & Land Use

Channel maintenance operations involve removing the build up of foreign or natural material that impedes the free flow of water. The material removed in the maintenance operations is normally spread along the bank or on top of existing spoil heaps where present. Restrictions in channels due to bank slippage or damage are regarded to the original profile. Channel breaches due to bank erosion are resolved by re-profiling the bank in-situ or in some cases by importing protection material such as rock armour or log poles.

The Arterial Drainage Maintenance and High Risk Channel Designation works form part of group of Work Programmes that aim to ensure effective management of flood risk. These works reduce the risk of flooding to the benefiting lands, thereby protecting the soil and geology resources within these lands.

Interrelationships

In carrying out the assessment these important direct and indirect relationships have been taken into account fully to ensure a robust and complete assessment. **Figure 1** highlights the key interrelationships and these are taken into account in the assessment of the different alternatives.

Biodiversity, Flora & Fauna	√							
Population & Human Health	√	√						
Soils/ Geology	√	√	√					
Water	√	√	√	√				
Air & Climatic	√	√	√	√	√			
Material Assets	√	√	√	√	X	√		
Cultural Heritage	X	√	√	√	X	√	√	
Landscape	X	√	√	√	√	√	√	√
	Biodiversity, Flora & Fauna	Population & Human Health	Soils/ Geology	Water	Air & Climatic	Material Assets	Cultural Heritage	Landscape

Figure 1: Potential Inter-Relationships Between SEA Topics

Environmental Objectives

Each of the SEA objectives, where appropriate, is divided into more specific sub-objectives relating to each topic. For each objective, and relevant sub-objective(s), a framework of associated indicators and targets was established; thus enabling the use of the objectives as appraisal criteria within the option assessment process. The first target sets a minimum requirement that needs to be met for an option to be acceptable; or at least, could be acceptable through the implementation of appropriate mitigation strategies to offset any potential adverse effects. The second, more demanding and environmentally beneficial, aspirational target does not need to be met for the acceptance of options; although options meeting these higher targets will achieve a higher score and are likely to be favoured.

The SEA objectives and their associated sub-objectives, indicators and targets are presented in detail in the Environmental Report. The following is a summary of the objectives and sub-objectives:

Flora, Fauna and Biodiversity

- Support the achievement Of Good Ecological Status/Good Ecological Potential (GES/GEP) under the Water Framework Directive (WFD).
 - Maintain existing and, where feasible, enhance natural fluvial processes in support of proposed WFD measures.
 - Avoid conflicts with the aim for all water bodies to achieve good status by 2015.
- Protect the flora and fauna within the river, river corridor and along machine and vehicular access points and where possible enhance biodiversity.
 - Avoid damage to internationally and nationally designated sites of nature conservation importance.
 - Avoid damage to habitats supporting legally protected species and other known species of conservation concern.
 - Protect existing riverine and wetland habitats to maintain naturally functioning ecosystems
 - Minimise the risk of spread of any invasive aquatic species.
- Protect and, where possible, enhance the integrity of fisheries within the Arterially Drained Scheme catchments, Flood Relief Scheme channels and 'Designated' channels.
 - Maintain existing habitat supporting salmonid fisheries and carry out enhancement where possible.
 - Expand salmonid habitat where feasible due to barrier removal.
 - Ensure no adverse effects on commercial shellfisheries.

Social

- Protect existing waterside access for recreational and community facilities during Scheme maintenance and 'Designation' operations.
- Protect public health, safety and employment (including physical, psychological and economic aspects of flooding).
 - Maintain the level of flood protection provided under the original Arterial Drainage Schemes & Flood Relief Schemes.
- Avoid negative impacts to existing water-based leisure activities.
 - Maintain the level of flood protection provided under the original Arterial Drainage Schemes & Flood Relief Schemes.
- Avoid negative impacts to existing water-based leisure activities.
 - Maintain the level of flood protection provided under the original Arterial Drainage Schemes & Flood Relief Schemes.

Economic

- Reduce vulnerability to the impacts of climate change and maintain flexibility for future responses.
 - Frequency and level of flooding on Arterially Drained Scheme catchments, Flood Relief Schemes and on 'Designated' channels and embankments.
- Avoid damage to the function and quality of the soil resource.
 - Maintain soil quality and function for productivity on agricultural lands.
- Support economic activities without conflicting with environmental objectives.
 - Maintain lands available for economic activity and no change as to render existing economic activity unviable.

- Reduce inappropriate floodplain development, through advice and guidance to Local Authorities.
- Mitigate the risk of flooding to existing developments, infrastructure and material assets.

New 'Designation' Projects Only

Cultural Heritage

- Protect known features of cultural heritage.
 - Protect architectural buildings and structures listed on the Record of Protected Structures (RPS) and designated areas of architectural importance such as Architectural Conservation Areas (ACAs).
 - Protect archaeological features listed on the Record of Monuments and Places (RMP) or other listed National Monument and Archaeological Sites that are at risk from flooding.

Social

- Protect and where possible enhance landscape character and visual amenity for new 'Designation' projects.
 - Protect the character of designated landscape protection areas such as Scenic Views and Scenic Routes within urban and rural areas.

Alternatives

The following alternative options, which represent potential strategies that could be adopted by the OPW with regards to flood management, have been assessed as part of this SEA:

- Do-nothing scenario;
- Do absolute minimum;
- Continue statutory maintenance;
- Proactive approach to mitigate flood risk;
- Proactive approach to mitigate flood risk with heightened environmental enhancement.

The environmental, economic and social considerations have been taken into account in assessing the suitability and sustainability of the alternative flood management options and are discussed in detail in the Environmental Report. The environmental effects of flooding are considered in terms of flora, fauna and biodiversity, water quality, soil quality, air quality and climate change taking account of the existing processes, Environmental Management Protocols, Environmental River Enhancement Programme (EREP), and the WFD Hydromorphology Programme Of Measures. The OPW's Environmental Management Protocols are an existing extensive system of work practices to ensure there are no negative impacts on flora, fauna, biodiversity or water quality.

Environmental River Enhancement Programme (EREP)

The EREP is an existing OPW funded project, coordinated and managed jointly with Inland Fisheries Ireland (IFI). The annual budget for the project is in the order of €1.1 million, which equates to a substantial environmental investment of over 6% of the arterial drainage maintenance budget. This includes consultancy fees, materials, plant and labour. The initial five year cycle (2008-2012) focuses primarily on the enhancement of selected drained salmonid channels, building on the knowledge and experience that has been developed with previous Fisheries and OPW works. All

enhancement designs are prepared by Inland Fisheries Ireland, in consultation with OPW. The enhancement works, both capital and enhanced maintenance, are implemented through the use of OPW's direct labour force and mechanical fleet. It is to improve the channel's hydromorphology and biodiversity while maintaining its drainage function. The EREP has been set up to strategically align with the OPW's obligations under EU Water Framework Directive and the National Biodiversity Plan, and is a proactive approach to improve the ecology of drained rivers in Ireland.

WFD Hydromorphology Programme Of Measures

The WFD highlighted the need for a management framework for freshwater morphology in Ireland and the necessary elements of classification and monitoring, risk assessment, and programmes of measures have been developed through the national Freshwater Morphology POMS Study in 2007 – 2008. In terms of arterial drainage maintenance, the primary measure for implementation is under hydromorphology. A risk assessment carried out by the national Freshwater Morphology POM Study concluded that circa 470 waterbodies were not at risk due to channelisation with a further circa 580 waterbodies were possibly at risk from channelisation pressure as presented and require further investigations. The Freshwater Morphology POMS Study identified a number of basic measures and supplementary measures to address the issue of channelisation in Irish waters. Basic measures will consist of a new regulatory framework to manage hydromorphological activities in waterways and this legislation has yet to be drafted and enacted. This legislation will introduce a form of binding codes of practice, formal authorisation and licensing, depending on the scale of the hydromorphological activity. It's envisaged that with OPW having developed an extensive list of environmental management procedures and protocols for works in waterways, these OPW standards will become a main component of legally binding rules for any operator in waterways. River enhancement schemes were considered the most appropriate supplementary measure in assisting recovery from channelisation. Of the waterbodies at risk due to channelisation and embankments, 11 waterbodies were confirmed as impacted using available fish status and Q status information. The remaining at risk waterbodies require investigation to confirm morphology status, fish status and/or Q Status before appropriate supplementary measures can be assigned.

Hydromorphology Supplementary Measures

The OPW is responsible for Water Bodies (WB) relevant to Arterial Drainage Schemes (ADS) i.e. 11 WBs wholly and a portion of 2 WBs. Local Authorities are responsible for WBs relevant to Drainage Districts (DD) i.e. 3 WBs wholly and a portion of 2 WBs as set out in the table below. OPW will undertake works to assist recovery in the Arterial Drainage Scheme waterbodies and these works will be commenced under the current Environmental River Enhancement Programme (EREP) 2008 – 2012.

Table 3: *Authorities responsible to implement Supplementary Measures.*

Water Body	Drainage Name	Responsible Authority
WE_34_1187	Moy ADS	OPW
WE_30_2401	Corrib ADS & Meelick-Pollshask DD	OPW & Galway Co. Co.
WE_30_3370_1	Corrib ADS	OPW
WE_30_1922	Corrib ADS	OPW
WE_30_1898	Corrib ADS	OPW

WE_29_263	Dunkellin DD	Galway Co. Co.
WE_29_635	Dunkellin DD	Galway Co. Co.
SH_27_287	Sixmilebridge-Kilkeshen DD	Clare Co. Co.
SH_24_776	Maigue ADS	OPW
EA_07_990	Boyne ADS & Garr DD	OPW, Kildare Co. Co. & Offaly Co. Co.
EA_07_1894_1	Boyne ADS	OPW
EA_07_1894_2	Boyne ADS	OPW
EA_07_1894_3	Boyne ADS	OPW
WE_30_3370_2	Corrib ADS	OPW
WE_30_3370_3	Corrib ADS	OPW
WE_30_3370_4	Corrib ADS	OPW

Preferred Option

In assessing the alternative flood management strategies, the alternative that emerges as the preferred option is 'Option 5: Proactive approach to mitigate flood risk with heightened environmental enhancement'.

Options 1 and 2 entail little or no maintenance or 'Designation' works, which would contravene current drainage legislation. An increased level of flooding would in some cases have an environmental benefit, for example a potential increase in the bird species associated with wetland habitats. In other instances however, increased flooding would result in significant negative environmental impacts. Such impacts would be in contravention of the EU Floods Directive (2007/60/EC), the EU Water Framework Directive (2000/60/EC) and the EU Habitats Directive (92/43/EEC). Under Options 1 and 2, State expenditure for river maintenance would reduce but economic losses would increase significantly due to a loss in land productivity and to flood-related damage. Both Options would also be socially unacceptable to the agricultural sector and other parties affected by flood risk issues.

'Options 3 and 4' uphold the statutory drainage requirements under the 1945 and 1995 Arterial Drainage Acts and would largely maintain the environment at current status. These options also represent cost-effective expenditure by the State and are likely to be socially acceptable to the agricultural sector and other relevant parties. However, there is little or no potential for environmental enhancement associated with either option.

- The preferred option, 'Option 5', will uphold the statutory drainage requirements under the 1945 and 1995 Arterial Drainage Acts and can be executed in a cost-effective way by the State. It is also likely to be socially acceptable to the agricultural sector and other relevant parties affected by flood risk. However, unlike the other alternative options considered, this option also incorporates heightened environmental enhancement with the aim of creating more positive environmental impacts.

Table 4: Summary of Alternative Flood Management Options

Management Option	Potential Measures	Economically Viable	Socially Acceptable	Environmentally Appropriate	Sustainability
1. Do-nothing scenario	<ul style="list-style-type: none"> Revoke statutory requirement and cease maintenance of channels, embankments and associated structures. 'Designation' works not carried out. 	--	--	-	--
2. Do absolute minimum	<ul style="list-style-type: none"> Revoke statutory requirement and carry out maintenance of channels, embankments and associated structures on a reactive basis. Ad-hoc 'Designation' works carried out on a reactive basis. 	--	-	-	-
3. Continue statutory maintenance	<ul style="list-style-type: none"> Continue statutory maintenance of channels, embankments and associated structures. Implement a criteria-based 'Designation' process as per Flood Policy. 	+	+	++	++
4. Proactive approach to mitigate flood risk	<ul style="list-style-type: none"> Continue statutory maintenance of channels, embankments and associated structures. Propose a series of 'Designation's for channels or defenses of strategic importance. 	++	+	++	+
5. Proactive approach to mitigate flood risk with heightened environmental enhancement.	<ul style="list-style-type: none"> Continue statutory maintenance of channels, embankments and associated structures. Integrate environmental enhancement opportunities under OPW's Environmental River Enhancement Programme. Propose a series of 'Designation's for channels or defenses of strategic importance. Integrate environmental enhancement opportunities under OPW's Environmental River Enhancement Programme. 	++	++	+	++

Key

- ++ Very positive/beneficial option
- + Positive/beneficial option
- ++ Mixed positive and negative/negligible
- Negative option
- Very negative option

Likely significant effects on the environment

An objective-led approach has been applied in the assessment of the flood management works. The works have been assessed with reference to each of the Strategic Environmental Objectives and Sub-objectives. The flood management works have been subdivided into four separate components and each component has been assessed separately. The SEA Environmental Report provides a detailed impact assessment results table for each of the following components:

- Impact Assessment: Arterial Drainage Maintenance
- Impact Assessment: High Risk Channel Designation

Impacts were considered for the following aspects:

- Human Beings
- Flora and Fauna (peatland, fens, riverine habitats, lakes, turloughs, estuarine habitats, salmon, crayfish, lamprey, otters and birds)
- Geology and Soils
- Water
- Air and Climate
- Landscape
- Cultural Heritage
- Material Assets

Summary of Impacts

- Impacts on human beings range from 'Little' or 'No Impact' to 'Very Positive/Beneficial Impact'.
- Impacts on flora and fauna range from having an 'Undetermined/Uncertain Impact' to 'Very Positive/Beneficial Impact'. Where an impact has been found to be 'Undetermined' or 'Uncertain', the mitigation works as described in the Environmental Report will avoid negative impacts.
- Impacts on geology and soils range from 'Little' or 'No Impact' to 'Very Positive/Beneficial Impact'.
- Impacts on water range from 'Little' or 'No Impact' to 'Very Positive/Beneficial Impact'.
- Impacts on air and climate range from 'Little' or 'No Impact' to 'Positive/Beneficial Impact'.
- Impacts on the landscape range from 'Little' or 'No Impact' to 'Positive/Beneficial Impact'.
- For cultural heritage, the majority of sub-objectives have 'Little' or 'No Impact' and with reference to new 'Designation' Projects, the specific objective to protect features of cultural heritage has a 'Very Positive/Beneficial Impact'.
- Impacts on material assets range from 'Little' or 'No Impact' to 'Very Positive/Beneficial Impact'.

Mitigation

For drainage maintenance activities, there is an environmental management system in place to minimise any negative significant environmental impacts and in many cases to affect a positive impact. It is envisaged that the proposed 'Designation' process will incorporate this system as applicable to the type of project. An overview of the environmental management system is as follows:

Environmental Management Protocols

A suite of Environmental Management Protocols were formally introduced nationally by OPW in May 2009 setting out how regional management staff manage a range of aspects, from environmental stakeholder consultations, forward planning for Article 6 Assessments, national recording of relevant conservation data, the approach to a range of protected species such as crayfish, lamprey, otter etc through to the approach to invasive species.

Standard Operating Procedures

A number of Standard Operating Procedures (SOPs) have been used in operations for some years but in May 2009, a full suite of all SOPs (7 No.) were introduced nationally in a folder format to be used by all operational staff on-site. The 7 SOP's currently in place are as follows:

- Environmental Drainage Maintenance Guidance Notes (10 Steps to Environmentally Friendly maintenance)
- Lamprey SOP
- Crayfish SOP
- Otter SOP
- Mussels SOP
- Invasive Species SOP
- Zebra Mussel SOP

The complete set of OPW's Environmental Management Protocols and Standard Operating Procedures are shown in **Appendix 4** of the Environmental Report.

Environmental Research

The research strategy 'Screening Report', along with all emanating EcIAs is published in a series entitled "*Series of Ecological Assessments on Arterial Drainage Maintenance*", ISSN 1649-9840. The completed series as listed below are available in all main Irish and UK University libraries, and can be downloaded through www.opw.ie/en/FloodRiskManagement/Publications/.

Table 5: *Series of Ecological Assessments on Arterial Drainage Maintenance*

Issue No.	Title
1	Screening of Natura 2000 Sites for Impacts of Arterial Drainage Maintenance Operations
2	EcIA of the Effects of Statutory Arterial Drainage Maintenance Activities on Raised Bogs & Associated Habitats
3	EcIA in Relation to Atlantic Salmon in Special Areas of Conservation & potential for Impact of OPW's Channel Maintenance Work
4	EcIA of the Effects of Statutory Arterial Drainage Maintenance Activities on the Otter (<i>Lutra lutra</i>)
5	EcIA of the Effects of Statutory Arterial Drainage Maintenance Activities on Water Courses of Plain to Montane Levels with Aquatic Vegetation (Floating River Vegetation)
6	EcIA of the Effects of Statutory Arterial Drainage Maintenance Activities on birds Dependent on Riparian Habitats
7	EcIA of the Effects of Statutory Arterial Drainage Maintenance Activities on Freshwater Pearl Mussels
8	EcIA of the Effects of Statutory Arterial Drainage Maintenance Activities on the Turloughs

9	EclA of the Effects of Statutory Arterial Drainage Maintenance Activities on three Lamprey Species (<i>Lampetra planeri</i> Bloch, <i>Lampetra fluviatilis</i> L., and <i>Petromyzon marinus</i> L.)
10	EclA of the Effects of Statutory Arterial Drainage Maintenance Activities on White-clawed Crayfish (<i>Austropotamobius pallipes</i>)
11	EclA of the Effects of Statutory Arterial Drainage Maintenance Activities on Fens, Mires & Whorl Snails
12	EclA of the Effects of Statutory Arterial Drainage Maintenance Activities on Kingfisher (<i>Alcedo atthis</i>) and other Riparian Birds II.

Mitigating measures consisting of the following aspects are also explained in more detail in the Environment Report:

- Liaison with Statutory Bodies
- Broader Stakeholder Interaction
- Environmental Drainage Maintenance
- Environmental River Enhancement Programme 2008-2012
- Environmental Training
- Geographical Information Systems (GIS)
- Ecological Assessments
- Environmental Impact Assessments
- Planning & Development

Monitoring

The proposed monitoring programme will be carried out under existing projects and some additional projects and, depending on the results, adjustments to targets and indicators may be made to ensure the continues effectiveness of the monitoring programme in the interest of optimal environmental protection. Monitoring information will be gathered on the following topics:

- Auditing
- Scientific Monitoring
- River Corridor Biodiversity
- Physical Monitoring
- Floral Monitoring
- Macro-invertebrate Monitoring
- Fish Sampling
- Bird Population Studies
- Lamprey & Crayfish Studies

Next Steps

Written submissions or observations are now invited with respect to Arterial Drainage Maintenance & High Risk Channel Designation, and the associated Environmental Report and Habitats Directive Assessment. Written submissions should be forwarded to OPW's Environment Section by Fri 3rd February 2012 (contact details below). These submissions / observations will be taken into consideration before publication of the SEA Statement. Early responses would be appreciated to allow more time to clarify and resolve any issues that may arise.

Environment Section
Office of Public Works
Headford
Co. Galway
Fax: +353 93 35631
Email: info@opw.ie (marked attention of Environment Section)

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Report prepared by The Office of Public Works Environment Section, with ecological input from McCarthy Keville O'Sullivan Planning and Environmental Consultants.

OPW wish to acknowledge the considerable volume of feedback and direction given by SEA Section, EPA, in particular Tadhg O' Mahony, throughout this SEA process.

1.0 Introduction

This Environmental Report has been prepared as part of the Strategic Environmental Assessment of the Arterial Drainage Maintenance and High Risk Channel Designation Programme 2011-2015 in accordance with national and EU legislation. The purpose of this Environmental Report is to:

- inform the Arterial Drainage Maintenance and High Risk Channel Designation process;
- identify, describe and evaluate the likely significant effects of Arterial Drainage Maintenance and High Risk Channel Designation and reasonable alternatives;
- provide an opportunity for the statutory authorities and the public to offer views on any aspect of this Environmental Report, through consultation.

1.1 Background to Strategic Environmental Assessment

Strategic Environmental Assessment (SEA) is a process for evaluating, at the earliest appropriate stage, the environmental effects of plans or programmes. It also gives the public and other interested parties an opportunity to comment and to be kept informed of decisions and how they are made. An early consideration of environmental concerns in the planning process creates an opportunity for environmental factors to be considered explicitly alongside other factors such as social, technical or economic aspects.

The European Directive (2001/42/EC) on the Assessment of the Effects of Certain Plans and Programmes on the Environment (the SEA Directive), was transposed into national legislation in Ireland by the European Communities (Environmental Assessment of the Effects of Certain Plans and Programmes) Regulations 2004 (S.I. 435/2004) and the Planning and Development (Strategic Environmental Assessment) Regulations 2004 (S.I. 436/2004). The latter regulations relate only to land use plans such as county development plans, local area plans or regional planning guidelines. This SEA is within the water management sector, thus S.I. 435/2004 is the most applicable national legislation.

The overall objective of the SEA Directive is to: *“to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and with a view to promoting sustainable development, by ensuring that, an environmental assessment is carried out of certain plans and programmes which are likely to have significant effects on the environment”*. The Directive provides a systematic method to consider likely effects on the environment and ensures environmental considerations are addressed as early as possible and in balance with technical and economic factors. It also requires the delivery of multiple objectives and stakeholder inclusion. **Figure 1.1** shows an overview of the SEA Process.



Figure 1.1 Overview of SEA Process

1.2 Arterial Drainage Maintenance and High Risk Channel Designation

The Office of Public Works (OPW) is the body through which the Central Government exercises its statutory responsibilities in respect of river drainage and flood relief. It derives its statutory authority from the Arterial Drainage Acts 1945 and 1995, the

Commissioners of Public Works (Functions and Powers) Act 1996 and the European Communities (Assessment and management of Flood Risks) Regulation 2010.

This SEA incorporates two sets of activities:

1. Statutory Arterial Drainage Maintenance, which entails the maintenance of completed Arterial Drainage Schemes and Flood Relief Schemes.
2. High Risk Channel Designation, which is a process emanating from the Report of the Flood Policy Review Group. Based on clear prioritisation criteria, rivers, channels and defence assets will be 'designated' as priorities for maintenance and will be the responsibility of the OPW.

2.0 METHODOLOGY

2.1 INTRODUCTION

The SEA Directive requires that certain Plans and Programmes, which are likely to have a significant impact on the environment, be subject to the SEA process. The SEA process is broadly comprised of the following steps:

Table 2.1 SEA Process

SEA Step / Stage	Purpose	Status
Screening	Decision on whether or not an SEA of a Plan/Programme is required.	Completed, 2009. SEA Screening Statement is available on the OPW website
Scoping	Consultation with the defined statutory bodies on the scope and level of detail to be considered in the assessment.	Completed, late 2009. The Final Scoping Document is available on the OPW website
Environmental Report	Assessment of the likely significant impacts on the environment as a result of the Plan or Programme culminating in the production of an Environmental Report.	Completed, February 2012.
Consultation	Consultation on the draft Plan/Programme and the associated Environmental Report.	This will take place between December 2011 and February 2012.
SEA Statement	Identification of how environmental considerations and consultation have been integrated into the Final Plan/Programme culminating in the production of an SEA Statement.	Scheduled to be published in March 2012.

2.2 GUIDANCE

The Environmental Report contains the findings of the assessment of the likely significant effects on the environment, resulting from implementation of the Arterial Drainage Maintenance and High Risk Channel Designation Programme 2011-2015. It reflects the requirements of the SEA Directive (2001/42/EC) on the assessment of the effects of certain plans and programmes on the environment, and also the transposed regulations in Ireland (S.I. 435/2004). The Strategic Environmental Assessment has been carried out in accordance with the guidelines provided by the Environmental Protection Agency (EPA) and the Department of the Environment, Heritage and Local Government (DEHLG):

- Strategic Environmental Assessment (SEA) Pack. May 2008. Environmental Protection Agency.
- Implementation of SEA Directive (2001/42/EC). Assessment of Certain Plans and Programmes on the Environment. Guidelines for Regional Planning Authorities. November 2004. Department of Environment, Heritage and Local Government.

- Development of Strategic Environmental Methodologies for Plans and Programmes in Ireland – Synthesis Report’. EPA, 2003.

2.3 KEY STEPS IN STRATEGIC ENVIRONMENTAL ASSESSMENT

The guidelines state that the main steps taken in the SEA process involve scoping and consultation, the carrying out of a baseline environmental study, the consideration of alternatives, the environmental assessment of the objectives and policies of the plan or programme in question and the formulation of mitigation and monitoring measures. The plan or programme is also assessed for compatibility with relevant plans and guidance documents at national, regional and local level.

2.3.1 Scoping

The objective of scoping is to identify key issues of concern that should be addressed in the environmental assessment, so that they can be considered in appropriate detail. Scoping also helps determine the boundaries of the assessment in terms of geographical extent and time horizon for the assessment.

Scoping for the SEA was carried out between September 2009 – December 2009. In line with the SEA Directive, specific “environmental authorities” (Statutory Consultees) were consulted on the scope and level of detail of the information to be included in the Environmental Report. For Arterial Drainage Maintenance & High Risk Channel Designation the relevant Statutory consultees are:

- Department of Communications, Energy and Natural Resources (DCENR);
- Department of Environment, Heritage & Local Government (DEHLG); and
- Environmental Protection Agency (EPA).

A draft scoping document was prepared and sent to the designated statutory consultees. In addition the document was circulated internally in the Engineering Services Business Unit of the OPW. The final version was placed on the OPW website in June 2010 (www.opw.ie).

Further details on consultation (dates, comments received, etc.) can be found in **Appendix 1** of this Environmental Report. Note that in addition to EPA’s correspondence as enclosed, a detailed constructive commentary was supplied via direct corrections to the draft scoping report, which are too large of a volume to include in Appendix 1.

2.3.1.1 DEFINING THE SCOPE

The following table provides a summary of the scope of the SEA.

Table 2.2 *Scope of the SEA*

Geographic Scope	Between 1945 and 1995 the OPW completed thirty-four arterial drainage schemes on river catchments together with five estuarine embankment schemes. The primary purpose of the schemes was to provide agricultural land with flood alleviation and outfall for land drainage. Over 260,000 hectares of land benefited from these schemes. To date under the 1995 Amendment Act, thirteen Flood Relief Schemes have been completed. High Risk Channel Designation projects will cover areas outside those mentioned above.
Temporal Scope	This SEA will cover the period from 2011 up to 2015, in line with the planning cycles of the WFD and the River Basin Management Plans

	(RBMP), and will be reviewed after five years. In line with the SEA Directive, short, medium and long-term impacts (including reference to secondary, cumulative, synergistic, permanent and temporary, positive and negative effects) will be considered during the assessment.
Scoping of SEA Environmental Topics	<p>In accordance with S.I. 435 of 2004 (SEA Regulations, Ireland), the following topics have been scoped in for the assessment of Arterial Drainage Maintenance and High Risk Channel Designation. These are:</p> <ul style="list-style-type: none"> • Biodiversity, Flora and Fauna • Population & Human Health • Water • Air & Climate • Cultural, Architectural & Archaeological Heritage • Landscapes • Material Assets • Geology, Soils & Landuse

2.3.1.2 CLIMATE CHANGE

The SEA Directive references climate as an environmental issue to be addressed in the assessment of a Plan/Programme. The SEA has considered climatic factors by considering first if climate change can impact on Arterial Drainage Maintenance and High Risk Channel Designation, and if so whether it could be compromised in the future as a result of climate change. In addition, the SEA has also considered how Arterial Drainage Maintenance and High Risk Channel Designation could contribute to climate change through generation and emission of greenhouse gases.

2.3.1.3 FLOODING

The frequency and intensity of flood events in Ireland and Europe has increased in recent years, and it is predicted that this situation will continue into the future. In response to this the EU has developed a directive on the assessment and management of flood risk, EU Floods Directive 2007/60/EC. The purpose of the Floods Directive is *“to establish a framework for the assessment and management of flood risks, aiming at the reduction of the adverse consequences for human health, the environment, cultural heritage and economic activity associated with floods in the community”*.

2.3.2 ENVIRONMENTAL ASSESSMENTS AND ENVIRONMENTAL REPORT

2.3.2.1 Structure and Content of the SEA Environmental Report

The structure and content of this SEA ER has been prepared to meet the requirements of the EU Council Directive 2001/42/EC of the Assessment of the Effects of Certain Plans and Programmes on the Environment (the SEA Directive) and the transposing Irish Regulations. **Table 2.3** outlines the content of the 10 chapters of this report, demonstrating, where appropriate, how each section fulfils the requirements of the SEA Directive. A Non-Technical Summary, which presents the key findings of the SEA and summarises the content of the SEA ER, is also included.

Table 2.3 *Key Elements of the Environmental Report*

Requirement of SEA Directive (Article 5(1), Annex 1)	Section of Environmental Report
An outline of the contents and main objectives of the plan or programme, or modification to a plan or programme, and relationship with other relevant plans or programmes.	Chapter 3: Description of the Programme
The relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme, or modification to a plan or programme.	Chapter 5: Baseline Environment
The Environmental characteristics of areas likely to be significantly affected	Chapter 5: Baseline Environment
Any existing environmental problems that are relevant to the plan or programme, or modification to a plan or programme, including, in particular, those relating to any areas of particular environmental importance, such as areas designated pursuant to the Habitats Directive or the Birds Directive.	Chapter 5: Baseline Environment
The environmental protection objectives, established at international, European Union or national level, which are relevant to the plan or programme, or modification to a plan or programme, and the way those objectives and any environmental considerations have been taken into account during its preparation	Chapter 6: Review of relevant Plans, Programmes and Policies
The likely significant effects on the environment, including on issues such as flora, fauna, biodiversity, population, human health, water, air, climate, cultural heritage including archaeological and architectural heritage, landscape, material assets, geology, soil, landuse, and the interrelationship between the above factors.	Chapter 9: Impact Assessment
The measures envisaged to prevent, reduce and as fully as possible offset any significant effects on the environment, from implementing the plan or programme, or modification to a plan or programme.	Chapter 10: Mitigation and Monitoring
An outline of the reasons for selecting the alternatives dealt with, and a description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information.	Chapter 2: Methodology. Chapter 7: Strategic Environmental Objectives, Targets and Indicators. Chapter 8: Alternatives
A description of the measures envisaged concerning monitoring of the significant environmental effects of implementation of the plan or programme, or modification to a plan or programme.	Chapter 10: Mitigation and Monitoring
A non-technical summary of the information provided under the above headings	Non-Technical Summary

2.3.2.2 ENVIRONMENTAL ASSESSMENT

For the purposes of Strategic Environmental Assessment, the Environmental Report must contain a description of existing environmental conditions. The description of the existing environment, as set out in **Chapter 5** of this Environmental Report, was compiled by the project team during the SEA process. The compilation of this baseline information was carried out according to EPA and DEHLG guidelines. The purpose of this baseline description is to identify the current state of the environment, against which the likely effects of implementing the programme can be assessed. Generally, an SEA does not require major new research; rather, existing and available data is compiled from recognised and credible sources, such as those listed in **Table 2.4**.

Table 2.4 Sources of Environmental Data for SEA (EPA and DEHLG Guidelines)

Environmental Issue	Sources of Data and Information	Type of data
Biodiversity, Flora & Fauna	Department of the Environment, Heritage and Local Government, Department of Communications, Marine and Natural Resources, National Parks & Wildlife Service, Marine Institute, Inland Fisheries Ireland	Designated areas, protected species and habitats
Population & Human Health	Central Statistics Office (CSO), EPA, County Development Boards, Regional Health Boards	Census data, population trends, Regional Health Board statistics
Water	EPA, Office of Public Works (OPW), Geological Survey of Ireland (GSI), Marine Institute, Waterways Ireland	Annual Water Quality reports, Drinking Water Quality reports, Groundwater Protection zones, Coastal water quality, flooding and drainage data
Soil & Geology	Teagasc, GSI, Local Authorities	Types, quality and significant potential for contamination
Air & Climate	EPA, Local Authority monitoring data, Met Éireann	Local air quality, changes in air quality, sources of emissions, long-term climate data, climate-change reports
Cultural Heritage (Architectural and Archaeological Heritage)	NPWS, OPW, Heritage Council, Local Authority, Local/Regional Museum, Archaeological Survey of Ireland, Excavations Database	Protected buildings, sites and monuments, architectural inventories, National Heritage Plan
Material Assets	Local Authorities, GSI, EPA	Infrastructure, traffic, noise, community facilities, open space, services
Landscape	NPWS, Forest Service, Landscape Character Assessments	Landscape character types, protected views and landscapes

The 'Do Nothing Scenario' is also described for each environmental topic. This is an estimate of how current environmental conditions would change over time without implementation of the flood management works.

A detailed description of the impact assessment process is provided in **Chapter 9** of this report.

2.3.3 SEA Statement

The main purpose of the SEA Statement is to provide information on the decision making process and to document how environmental considerations, i.e. the views of consultees and the recommendations of the Environmental Report, have been taken into account in Arterial Drainage Maintenance and High Risk Channel Designation. The SEA Statement illustrates how decisions were taken, making the process more transparent.

The SEA Statement for Arterial Drainage Maintenance and High Risk Channel Designation will be compiled after the statutory consultation on the Environmental Report has been completed.

2.4 HABITATS DIRECTIVE ARTICLE 6 ASSESSMENT

The Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora) obliges member states to designate Special Areas of Conservation (SACs) to protect and conserve habitats and species of importance in a European Union context. Article 6 is one of the most important articles of the Habitats Directive in determining the relationship between conservation and site use. Article 6(3) requires that *"Any plan or project not directly connected with or necessary to the conservation of a site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives"*.

A Habitats Directive Assessment of Arterial Drainage Maintenance and High Risk Channel Designation was carried out in parallel with the SEA process, with the findings of the Habitats Directive Assessment used to guide the development of alternatives to be considered as part of the SEA.

2.5 DIFFICULTIES AND DATA GAPS

This SEA has been undertaken using best available data and methodologies at the time of the assessment. However, a number of data gaps and technical deficiencies remain, which limit the scope and content of the assessment. These include:

- Lack of quantitative baseline indicator data to cover all SEA topics/issues, in particular those relating to biodiversity.
- Lack of digitised data on some topic areas.

3.0 Description of Programme

3.1 Introduction

There is no existing overarching plan / programme which is directly applicable to the concept of carrying out an SEA. However, there are activities ongoing in the State in respect of Arterial Drainage Maintenance and in screening consultations with the Environmental Protection Agency (EPA), it has been deemed appropriate for an SEA to be carried out on these activities. Accordingly, for this SEA, the Programme is not a document formulated from a statutory requirement such as a County Development Plan (CDP), River Basin Management Plan (RBMP) or Catchment Flood Risk Assessment & Management Study (CFRAMS). The Programme has been produced to facilitate the SEA process and is in effect a statement of the ongoing annual statutory activities bundled into a five-year period. This SEA will consider the five-year period from 2011 – 2015.

This SEA covers two sets of activities:

- (1) Arterial Drainage Maintenance
- (2) High Risk Channel Designation.

A detailed description of both activities is given in this chapter. Thereafter, these activities will be referred to as the “Programme”.

3.2 Timescale

The 2011 – 2015 timescale has been adopted to facilitate future more effective coordination with the RBMP and CFRAMS. Both these plans will be reviewed in 2015 in accordance with the WFD and Flood Directives respectively, both are carrying out their individual SEAs, and with both sets of plans being managed at an RBD scale, it is envisaged that opportunities to form more synergies will arise in 2015 which may subsume or alter the scope of many other water sector SEAs such as this one. In the event that the activities covered in this SEA are not subsumed in to the RBMP and CFRAMS framework, it is envisaged that a further SEA will be carried out on these activities for 2016 – 2021 to align with the RBD management process.

3.3 The Programme

3.3.1 Programme Introduction

Where the Commissioners of Public Works have completed a drainage scheme under the Arterial Drainage Acts, 1945 and 1995, they are required to maintain drainage works forming part of the Scheme in “proper repair” and “effective condition”. These drainage works include watercourses, embankments and other structures. Watercourses are subject to siltation and erosion, among other processes, while embankments are subject to settlement and erosion. A programme of maintenance is required to maintain the drainage works. Works are prioritised based on the rate of deterioration and the risk arising from this. In any one year, approximately one-fifth of watercourses are maintained. Other drainage works are maintained less frequently. This maintenance programme is considered as part 1 of “The Programme” for the purpose of this SEA.

The OPW carries out some works to alleviate flood risk in various parts of the country as a result of localised problems. These works, which include ‘Minor Works’ funded by OPW, and periodic maintenance activities funded by OPW, are collectively identified as High Risk Channel Designation, and is considered as part 2 of “The Programme” for the purpose of this SEA.

3.3.2 Legislative Background to Arterial Drainage in Ireland

3.3.2.1 History of Flood Risk Management

Flooding has been a major concern in this country for at least the past two centuries as reflected by the various Drainage Acts passed in, inter alia, 1842, 1867, 1925, 1928, 1945 and 1995.

3.3.2.2 The Arterial Drainage Act, 1945

The Arterial Drainage Act, 1945 was written following on from the report of the Browne Commission (Report of The Drainage Commission 1938-1940), which examined flooding and improvement of land through drainage. This Commission was appointed by the Oireachtas and commenced its deliberations in 1938. This is the primary piece of legislation that OPW have operated over the last 50 years, and empowered the OPW to undertake catchment-wide Arterial Drainage Schemes for *“any catchment area for the purpose of preventing or substantially reducing the periodical flooding of lands in that area or of improving by drainage lands in the said area”*.

3.3.2.3 Arterial Drainage Act Amendment, 1995

The emphasis of the 1945 Act was the improvement of agricultural land. Following severe flooding of a number of towns in the mid to late 80s and early 90s, the act was amended in 1995, when the emphasis of flood management activity shifted to the protection of urban areas subject to flooding. This amendment empowered the OPW to undertake localised flood relief schemes to protect and reduce flood risk in individual urban areas.

3.3.2.4 Review of National Flood Policy, 2002-2004

Following major floods in 2000 and 2002, a review of national flood policy was initiated by the then Minister of State with responsibility for the OPW, Mr. Tom Parlon, T.D. This review was aimed at determining policy on flood risk management for the future, and clarifying roles and responsibilities among the various Departments, the Local Authorities and other organisation involved with managing and responding to floods. The recommendations of the Report of the Flood Policy Review Group were approved by Government in September 2004, setting the framework for how Ireland is to manage flood risk in the future.

The Report of the Flood Policy Review Group made a series of recommendations in relation to new work and approaches that should be taken to identify and manage flood risk, and recommended that the OPW be appointed as lead agency for flood risk management.

Following government approval of these recommendations, the OPW and its partner organisations (notably the Department of Environment, Heritage and Local Government, the Department of Agriculture, Food and Rural Development and the Local Authorities) have been developing and implementing a wide range of integrated and comprehensive work programmes to ensure effective management of flood risk into the future. These work programmes, along with the existing programmes of capital flood relief and drainage maintenance, now form the focus of OPW's current activities.

Directive 2007/60/EC on the assessment and management of flood risks entered into force on 26 November 2007. This Directive now requires Member States to assess if all water courses and coast lines are at risk from flooding, to map the flood extent and

assets and humans at risk in these areas and to take adequate and coordinated measures to reduce this flood risk.

The 'Floods' Directive was transposed into Irish law by S.I. 122/2010 – European Communities (Assessment and Management of Flood Risks) Regulations 2010. The Regulations set out the responsibilities of the OPW and other public bodies in the implementation of the Directive, on consultation, and details the process for implementation of the measures set out in the flood risk management plans.

3.3.2.5 Flood Policy Implementation

The National Catchment Flood Risk Assessment and Management (CFRAM) Programme was initiated to implement some of the key recommendations of the Report of the Flood Policy Review Group and to deliver on the requirements of the EU Floods Directive. The CFRAM programme is being coordinated with the requirements of the EU Water Framework Directive and the current River Basin Management Plans. Each CFRAM study will go through both Strategic Environmental Assessment (SEA) and Appropriate Assessment. These SEAs will take a holistic approach to water management and will have regard to the outcomes of this document. Sites suitable for High Risk Channel Designation may be identified as measures in the CFRAM studies.

3.3.2.6 Arterial Drainage Maintenance

3.3.2.6.1 Background to Drainage Schemes in Ireland.

Ireland by its nature is liable to flooding and drainage problems principally due to the fact that the country has a relatively low-lying interior surrounded by coastal highlands. Many major rivers are sluggish in character and this coupled with our relatively high rainfall inevitably leads to chronic drainage problems. Accordingly, drainage works have a long history in Ireland stretching back to the mid 19th century. Improvement Schemes were carried out under the 1842 Arterial Drainage Act (The Drainage and Navigation (Ireland) Acts, 1842 to 1857; The Drainage and Improvement of Lands (Ireland) Acts, 1863 to 1892) on localised areas of river catchments. Several hundred of these minor schemes were carried out, with Local Authorities having statutory maintenance responsibility for them. Some of these schemes have since been subsumed into Arterial Drainage Schemes carried out under the 1945 Arterial Drainage Act.

3.3.2.6.2 Arterial Drainage Schemes

The Office of Public Works is the body through which Central Government exercises its statutory responsibilities in respect of river drainage and flood relief. It derives its statutory authority from the Arterial Drainage Acts, 1945 and 1995 and the Commissioners of Public Works (Functions and Powers) Act, 1996.

The '1945 Act' Arterial Drainage Schemes differed from the historical schemes in that they dealt with the total river catchment rather than on a localised piecemeal basis. The 1945 Act was then amended in 1995 in response to serious urban and localised flooding problems. Since the 1995 Amendment Act, the OPW has embarked on a programme of Flood Relief Schemes. While these are not catchment based, regard is had of the downstream effect. Typically these Schemes address urban flooding but also address some localised rural areas where dwellings or infrastructure is subjected to flood damage.

Between 1945 and 1995 the OPW completed thirty-four Arterial Drainage Schemes on river catchments together with five Estuarine Embankment Schemes. The primary

purpose of the Schemes was to provide agricultural land with flood alleviation and outfall for land drainage. The combined catchment areas account for some 30% of Ireland land area. In total, 253,000Ha of lands benefited from these Schemes.

In the same period, five Estuarine Embankment Drainage Schemes were carried out with four in the Shannon Estuary region and one in the Swilly region Co. Donegal. Some 10,000Ha of land benefited from these Embankment Schemes. To date under the 1995 Amendment Act, thirteen Flood Relief Schemes have been completed. **Table 3.1** details the duration of works and benefiting areas of the Schemes completed since the 1945 Act.

Schemes carried out under the 1945 Act, were generally designed to allow protection for a minimum of the three-year flood event, in addition to creating an outfall for drainage of the adjoining lands. Where the creation of an outfall dictated the design bed levels, greater protection than the three-year flood event would have been achieved as a consequence. In the case of modern urban Flood Relief Schemes, flood protection for a 100-year flood event would be the design objective.

Table 3.1 Operations carried out under Arterial Drainage Acts 1945 & 1995

Scheme	Duration of Works	Areas Benefiting (hectares)
Major Schemes (River Catchments over 100,000 acres in extent)		
Brosna	1948 - 1955	34883
Glyde & Dee	1950 - 1957	10643
Feale	1951 - 1959	10724
Corrib-Clare	1954 - 1964	30310
Maine	1959 - 1963	4694
Inny	1960 - 1968	20234
Deel	1962 - 1968	4816
Moy	1960 - 1971	24685
Corrib-Headford	1967 - 1973	7851
Boyne	1969 - 1986	48157
Maigue	1973 - 1986	12343
Corrib-Mask-Robe	1979 - 1986	9712
Boyle	1982 - 1992	10845
Blackwater (Monaghan)	1984 - 1992	2367
Minor Schemes (River Catchments 25,000 – 1000,000 acres)		
Nenagh	1955 - 1960	2630
Ballyteige/Kilmore	1959 - 1961	931
Broadmeadow & Ward	1961 - 1964	2995
Killimor/Cappagh	1962 - 1968	5099

Bonet	1982 - 1992	1295
<i>Other Small Schemes (River Catchments less than 25,000 acres)</i>		
Clareen	1959 - 1961	445
Owvane	1962 - 1963	162
Matt	1964 - 1965	202
Duff	1963 - 1965	1457
Brickey	1965 - 1967	405
Abbey	1964 - 1967	364
Knockcroghery	1967 - 1968	202
Creegh	1968 - 1969	405
Burnfoot/Skeoge	1968 - 1970	162
Kilcoo	1969 - 1971	162
Owenavorrach	1968 - 1970	1052
Carrigahorig	1968 - 1971	1538
Groody	1970 - 1973	1214
Deele and Swillyburn	1957 - 1961	1416
Cloonburn	1967 - 1968	162
<i>Estuarine Embankment Schemes</i>		
Shannon (Limerick)	1962 - 1971	4897
Shannon (Clare)	1958 - 1960	728
Fergus	1959 - 1963	2185
Owenogarney	1955 - 1959	850
Swilly etc.	1961 - 1968	1295
<i>Flood Relief Schemes</i>		
<i>Completion Date</i>		
Belclare, Clare River	1995	
Bridge End, Co. Donegal	2000	
Mulkear River, Cappaghmore, Co. Limerick	2000	
Suir River, Carrick-on-Suir	2003	
Lacken (Ardrahan), Co. Galway	1997	
Nanny River, Duleek, Co. Meath	1998	
Bandon River, Dunmanway, Co. Cork	2001	
Gort Town, Co. Galway	1997	
Shinkeen Stream, Hazelhatch, Co. Kildare	2001	
River, Nore, Kilkenny	2006	

Maam Valley, Co. Galway	2001
Mulkear River, Newport, Co. Tipperary	1998
Sixmilebridge, Co. Clare	1997

3.3.2.6.3 Drainage Districts

Under the various Drainage Acts between 1842 and 1928, a large number of isolated rural drainage schemes were executed throughout the country. These are referred to as Drainage Districts. Many of these Drainage Districts were subsumed into the catchment Schemes carried out by the OPW since 1945. There are, however, 170 Drainage Districts within catchments that are not incorporated into the Drainage Schemes carried out under the 1945 Act. The County Councils are responsible for the maintenance of these Drainage Districts, and under Section 30 of the 1945 Act, the Councils are responsible for furnishing an annual report to the Commissioners in respect of the condition of the Drainage District works.

3.3.2.6.4 OPW's Roles and Responsibilities in Arterial Drainage Maintenance

Under Section 37 of the Arterial Drainage Act 1945, the OPW is statutorily obliged to maintain all rivers, embankments and urban flood defences on which it has executed works since the 1945 Act in “proper repair and effective condition”.

Under the provisions of Section 26 of the Arterial Drainage Act 1925, the OPW is responsible for the inspection of 41 Drainage Districts “at least once in every five years”. On completion of the Quinquennial Inspection, the Commissioners must send a report as to the state of repair and general condition of the inspected drainage works to the relevant Local Authorities.

Maintenance referred to under the Arterial Drainage Act 1945 includes:

- i. The maintenance of river channels in a condition that ensures they are free-flowing, thus reducing flood risk and providing adequate outfall for land drainage
- ii. The maintenance of river and coastal embankments, in a condition that protects benefiting land, to the extent defined in the Scheme, from risk of flooding
- iii. The maintenance, repair and/or replacement of all structures forming part of a Scheme, including accommodation bridges, weirs, sluice barrages, sluices, pumping stations and tidal flap gates

The Act uses the terms “*proper repair and effective condition*”. In modern terms these are, respectively, criteria relating to the condition and the performance of the various watercourses, embankments etc. The performance criterion relates to the design standard of the original scheme works, rather than to any new standards that have been adopted in the meantime or that might arise e.g. from a change of land-use.

Failure to comply with these obligations would be contrary to the Drainage Acts and could lead to a “writ of mandamus” or an award of compensation arising from claims for damage to the benefiting lands. All of the completed Arterial Drainage and Estuarine Embankment Schemes are now maintained under the statutory obligation.

3.3.2.6.5 Extent of Operations

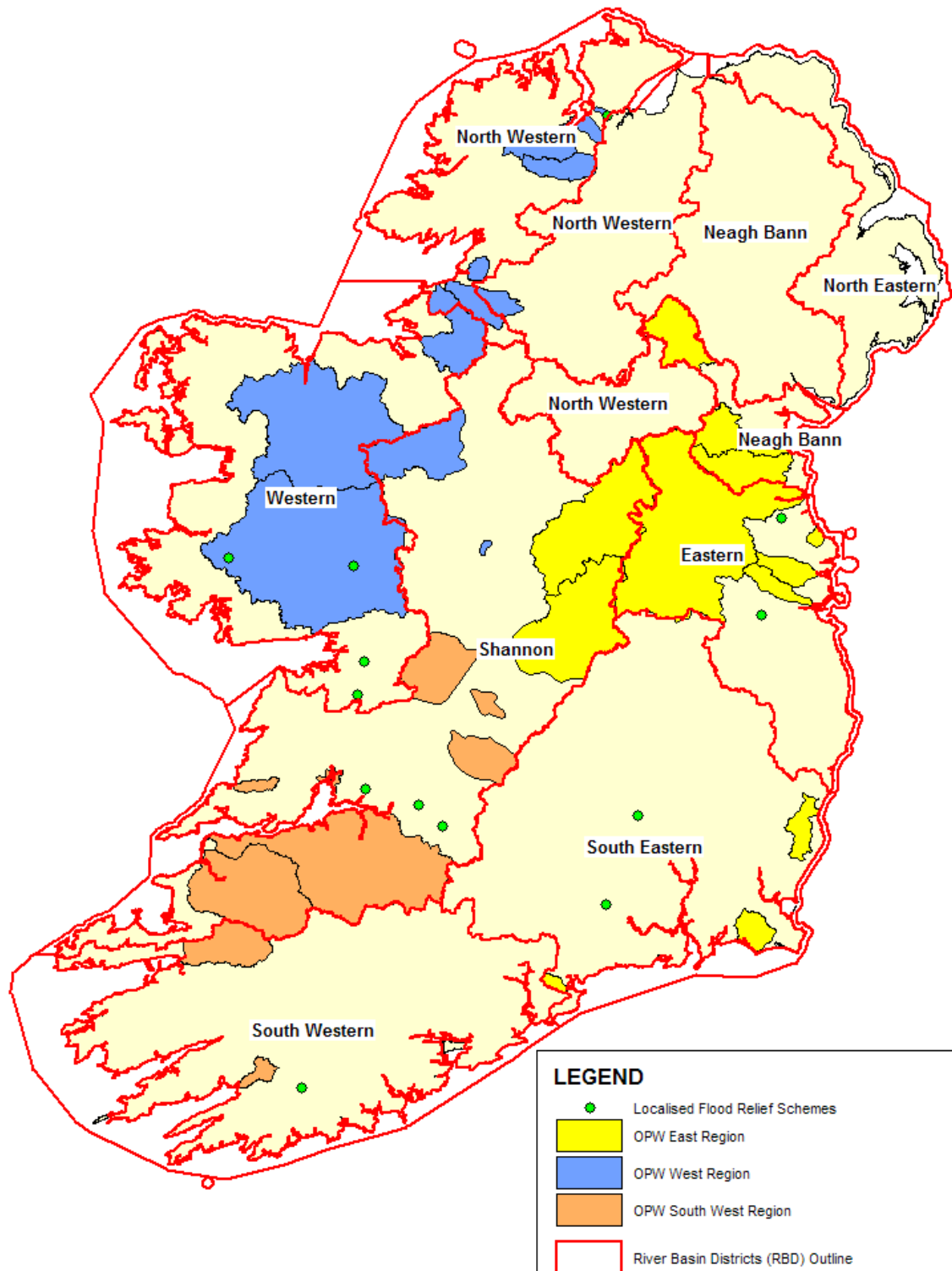
The OPW Head Office is based in Trim, Co Meath. The Maintenance function is divided into three regions for the purpose of programming and executing the work, **Table 3.2.**

Each region has a main regional office with at least one sub office. The annual maintenance budget is circa €17 Million. The OPW maintain their own transport and excavator fleet and other specialised equipment such as weed cutting boats. The operations are carried out by a trained direct labour work force numbering circa 300. OPW direct labour staff uses a fleet of approximately seventy hydraulic excavators nationwide to execute the maintenance programme.

Table 3.2 *OPW Drainage Maintenance Office Locations*

Region	Main Regional Office	Sub-Office(s)
East	Newtown, Trim, Co. Meath	Ardee, Monaghan, Mullingar & Wexford
South West	Templemungret, Co. Limerick	Listowel & Portumna
West	Headford, Co. Galway	Ballina & Lifford

Figure 3.1 OPW Regions and River Basin Districts



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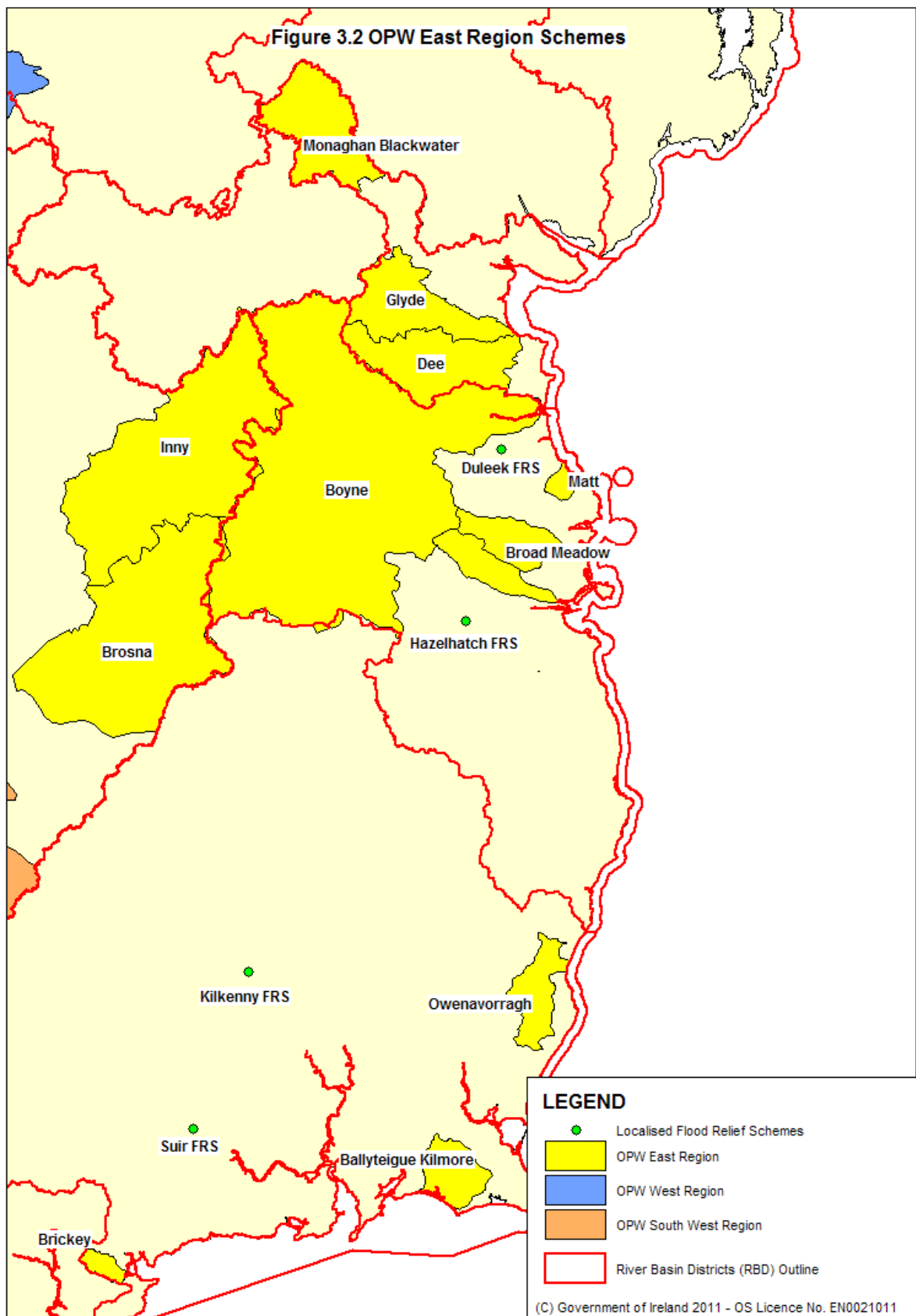
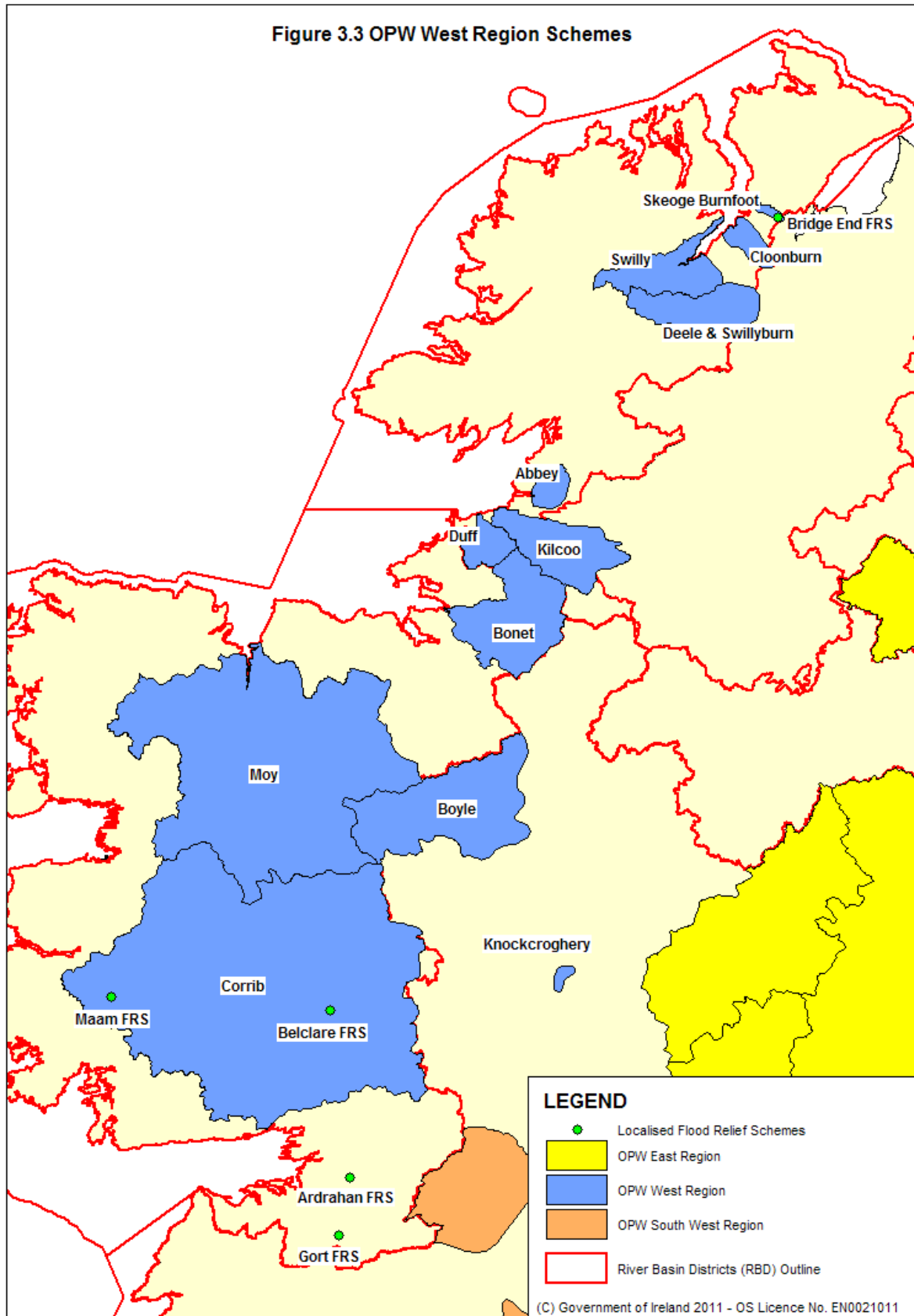
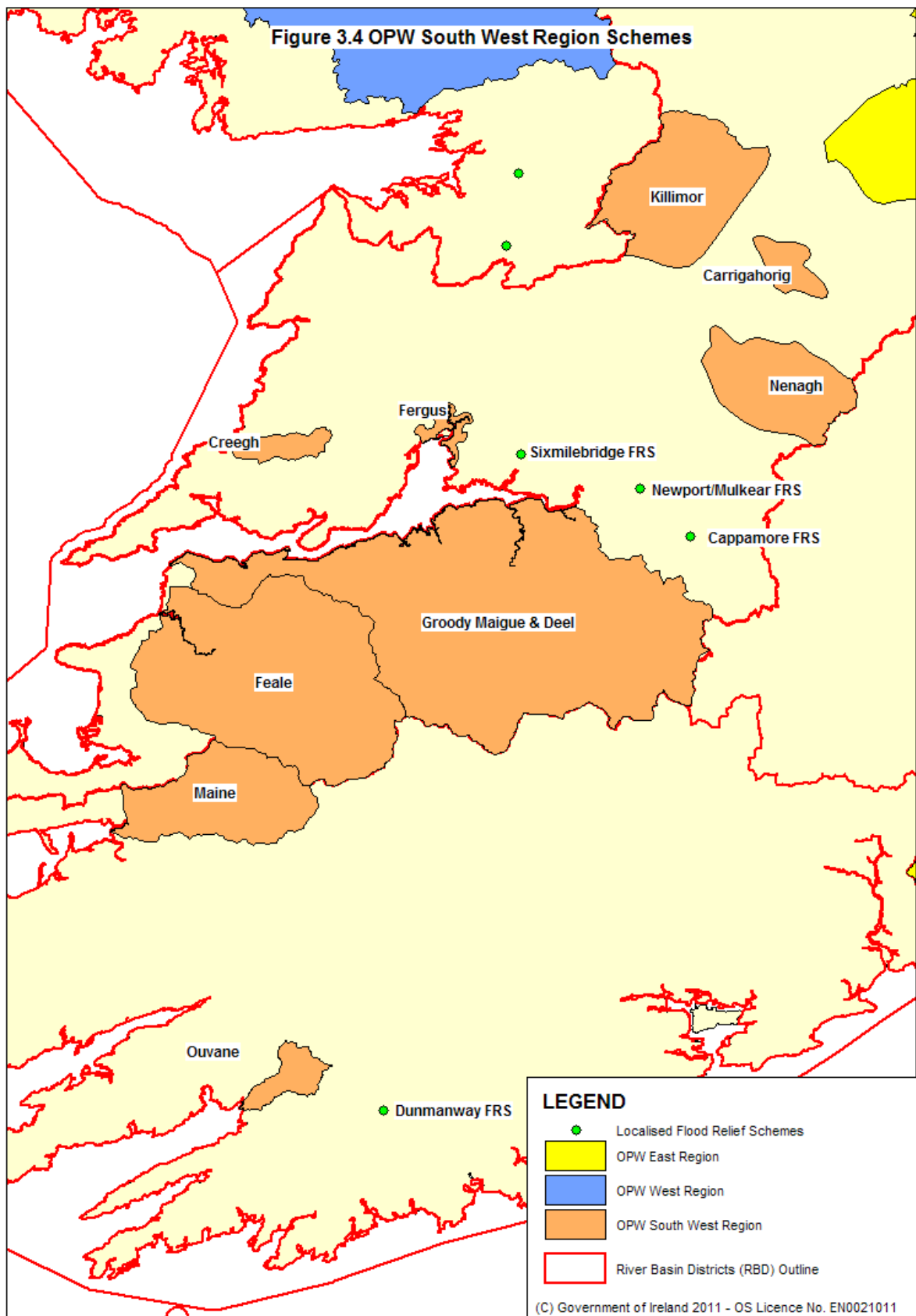


Figure 3.3 OPW West Region Schemes





3.3.3 Programme Elements

This Programme covers two sets of activities:

- Arterial Drainage Maintenance
- High Risk Channel Designation.

3.3.3.1 The Programme – Part 1 - Arterial Drainage Maintenance 2011 – 2015

Statutory arterial drainage maintenance entails the maintenance of completed Arterial Drainage Schemes, completed Flood Relief Schemes, and the associated Scheme structures. The OPW are responsible for the maintenance of 11,500km of channel, 730km of embankments, some 18,500 bridges and 750 ancillary structures such as sluice gates, pumping stations and tidal barrages.

The majority of arterial drainage maintenance works is on channel maintenance with the average channel requiring maintenance every four to six years. While this varies, with some channels requiring maintenance annually and others only requiring maintenance every twenty years, circa 2000km of channels are maintained annually and nearly all of the 11,500km of channels will have been maintained at least once over the Programme cycle of six years. Accordingly, the Programme in terms of this SEA, is to apply to all the 11,500km of Arterial Drainage Scheme channels. Of the 750km of embankments, the frequency of maintenance tends to be more variable than that for channels with embankments scheduled for maintenance works as the need arises. To date there have been thirteen Flood Relief Schemes carried by the OPW and statutory arterial drainage maintenance includes the maintenance of these Schemes. In respect of the various bridges and structures associated with the Schemes, a relatively small number are maintained annually i.e. circa 170 bridges and 30 other structures which are restricted to the most critical structures. Note that a portion of the 18,500 bridges are road bridges where the Local Authorities are responsible for the structural integrity, hence OPW Maintenance operations typically exclude bridge deck or arch repair works on road bridges.

3.3.3.1.1 The Programme – Part 1.1 - Scheme Channel Maintenance Works 2011 – 2015

Channel maintenance operations normally involves removing the build up of foreign or natural material that impedes the free flow of water. Predominately this consists of the removal of water-entrained silt and associated vegetation from the bed of the channel by suitably rigged hydraulic excavators. Restrictions in channels due to bank slippage or damage would be re-graded to the original profile. Channel breaches due to bank erosion would be resolved by re-profiling the bank in-situ or in some cases by importing protection material such as rock armour or log poles. In addition, other larger vegetation such as trees, which impinge on channel capacity are either removed in whole or impingement is reduced by selective removal of lower branches. The material removed in the maintenance operations is normally spread along the bank, or on top of existing spoil heaps where present. In most cases, no alterations to the bank are required and in some cases the channel is not disturbed at all if no build up of material is present.

Some channels are steep and fast flowing, which are subject to flash floods, bank erosion and rapid movement of bed gravel. However, 60 – 70% of Scheme channels are of gentle longitudinal gradient and subject to relatively rapid deposition of silt, especially those that are subject to prolific growth of in-stream vegetation. The steeper sections of channel normally require relatively little maintenance works. The majority of maintenance works are on smaller lower-lying channels, with 90% of works in channels

with a base width of less than three metres. The average channel requires maintenance every four to six years. Channels with prolific weed growth may require maintenance annually, particularly where downstream bridges are at risk of being blocked due to a flow of decaying vegetation in autumn. Conversely, some channels may only require maintenance every twenty years due to the self-cleaning characteristics of the channel. Circa 2,000km of Scheme channels are maintained annually.

A number of channels have an annual prolific growth of aquatic plants, but are too wide or the bank conditions are too unstable to allow maintenance by way of excavators. Weed cutting boats are engaged in these cases, or where a particular channel requires to be cleared of vegetation but it is not deemed necessary to remove silt or other heavy material. In all, approximately 90km of channel are cleaned annually by four weed cutting boats, operating on a seasonal basis, with the majority of the works concentrated in the West of Ireland.

Historical databases have been built up in all regions. From these are extracted a base line list of channels which are due for cleaning. Critical sections of these channels are inspected and a work programme developed. This takes account of requests from the general public and potential flooding risk to roads, properties, urban areas and sewage works.

In developing the works programme, special consideration is given to potential impacts on fisheries, Natura 2000 Sites and the environment. This includes assessment of all works for their potential to impact on Natura 2000 Sites by an external ecological consultants, specific timing of certain works, and consultation with both Inland Fisheries Ireland and National Parks and Wildlife Service

In general, Scheme channel maintenance work is carried out by trained OPW drivers, using a hydraulic excavator. The material removed is normally spread along the bank or on top of existing spoil heaps where present.

3.3.3.1.2 The Programme – Part 1.2 - Maintenance of Scheme Structures 2011 – 2015

During the course of the original Arterial Drainage Scheme excavations following the 1945 Act, circa 18,500 accommodation bridges were modified or replaced as required. These bridges provide riparian farmers with farm vehicular/foot access. The type of bridge provided depended on the width, depth and required flow capacity, and ranged from concrete piped culverts to larger concrete or masonry spanned bridges.

In general, as channel maintenance work proceeds, the bridges are inspected by supervisory industrial staff, and if required repairs/replacements are programmed. On many occasions, it is not necessary to totally replace the structure, and repairs such as under-pinning foundations or replacement of wing walls, parapets or deck are carried out to extend the bridge life.

Currently all Scheme structure maintenance work is carried out by the direct labour gangs. Approximately 170 bridges are repaired/replaced each year. Ancillary structures such as sluice gates, tidal barrages and pumping stations are repaired or replaced as necessary to maintain their respective operating function.

3.3.3.1.3 The Programme – Part 1.3 - Scheme Embankment Maintenance 2011 – 2015

Most Embankment Schemes are tidal in nature hence they tend to be located at estuaries. The foremost inland Embankment Scheme is the Annagh Embankments, on the Inny Arterial Drainage Scheme. During the period between 1987-1993 the financial resources for drainage maintenance were reduced resulting in a reduction in staff numbers and in the capability of OPW to carry out necessary work. By 1994 the deteriorating condition of the embankments, which at some critical locations had been eroded to less than half their original volume, gave cause for great concern, especially in Kerry, Wexford and Donegal. A programme of embankment strengthening was put in place to redress this.

Currently, programming of maintenance work consists of regular inspections of sections of embankments, which are known from experience to be at risk, together with additional inspections after a storm at sea, or a high tidal/flood event in the case of tidal embankments. Embankments are scheduled for works when it is deemed that the structure is in need of repair to maintain an effective condition. Repair works normally take the form of topping up clay embankments to design height and structural strengthening by importing rock/soil material or utilising in-situ material.

In addition, the programme extends to the refurbishment of the deteriorated embankments in Kerry, Wexford and Donegal. The Shannon Embankments are also undergoing refurbishment works, due to their importance to flood defence for Limerick and Shannon Town. The refurbishment of the embankments is carried out by contract or by direct labour.

3.3.3.1.4 The Programme – Part 1.4 - Flood Relief Scheme Maintenance 2011 – 2015

Flood Relief Schemes completed since the Arterial Drainage (Amendment) Act, 1995 also have a statutory maintenance requirement. The requirement for maintenance is identified at regional level on an annual basis, and included in the Annual Arterial Drainage Maintenance Programme. Maintenance cycles vary depending on the characteristics of the Flood Relief Scheme. Original Scheme works that included durable structural works such as new embankments, retaining walls or hard bank reinforcement typically require little or no maintenance while some Flood Relief Scheme channels require periodic silt removal or riparian vegetation management, to maintain the designed channel capacity.

3.3.3.2 The Programme – Part 2 - High Risk Channel Designation 2011 – 2015

3.3.3.2.1 Background to High Risk Channel Designation

The Report of the Flood Policy Review Group identified, among other things, that:

- There are a substantial number of watercourses for which no State authority has legislative responsibility for flood management.
- The lack of maintenance of watercourses and their associated defences and structures is a potential major cause of flooding on influence on flood processes.

The report recommended that a system be put in place to 'designate' high-risk channels and give permissive powers of maintenance to the central authority (OPW). The general objective of 'Designation' is to ensure that potentially high-risk channels or defences are maintained to reduce the flood risk that may otherwise arise. This system is intended however, only to be applicable to channels or defences that pose a

significant risk, or that are of strategic importance. The report also recommended that an asset register be developed to aid in identifying and prioritising watercourses and structures for 'Designation'.

The Commissioners have introduced a funding mechanism to Local Authorities for localised works to alleviate flooding where the following conditions are satisfied:

- There is a technically viable option to mitigate or eliminate flooding.
- A legal mechanism is available to carry out the option and the necessary consents, agreements and licenses are in place. Some of these mechanisms are identified below in **Section 3.3.3.2.2**.
- The option is cost effective and government requirements for assessing costs and benefits have been met. A simple method of assessing benefits is used for less expensive proposals, and full cost benefit analysis may be used for more expensive options.

Typically this means that works that do not require an EIS and cost less than €0.5 million are funded under this mechanism.

No legal mechanism is yet in place to allow the Commissioners to 'designate' particular channels or other structures. In many cases minor works in excess of maintenance are required to address specific issues. The minor works funding mechanism has proved effective in addressing this type of issue. In addition, there are complex responsibilities, rights and interests in the management of watercourses. As a result, careful consideration of the incentives that arise for the various stakeholders is necessary to ensure that appropriate action is taken. This is discussed further in **Section 3.3.3.2.3**.

3.3.3.2.2 Relevant Legislation

Existing legislation provides a number of mechanisms for carrying out watercourse improvement and maintenance works. A number of issues must be addressed for each mechanism, including:

- Authority to carry out works;
- Consultation;
- Environmental protection;
- Interference with owners and occupiers.

In addition to the specific maintenance powers of the Commissioners, Local Authorities and Drainage Boards, the following mechanisms provide a means of dealing with the issues identified above:

- Maintenance works by a person on their own land are exempted development under the Planning and Development Act, 2000, although there are some restrictions and licensing requirements designed to protect the environment.
- The Commissioners of Public Works can promote a scheme under the Arterial Drainage Acts, 1945 and 1995 to prevent or substantially reduce flooding or to improve drainage of land. This legislation provides the necessary means to promote a scheme, subject to an EIS.
- The Commissioners of Public Works can carry out a scheme by agreement with other persons under the Commissioners of Public Works (Functions and Powers) Act, 1996. This act provides only an outline of functions and powers and does not identify a mechanism for delivering a scheme.

- A Local Authority may carry out works under the Local Authorities (Works) Act, 1949 for a number of purposes including to prevent or repair damage from flooding.
- A Local Authority may carry out works or development in its functional area under Part XI of the Planning and Development Act, 2000 and Part VIII of the Planning and Development Regulations 2001. These acts provide authority and a mechanism for granting planning permission where an EIS is not required. Powers of entry and compensation are not covered in the planning acts.
- A Local Authority may carry out works in its functional area, where an EIS is required, under the Planning and Development Act, 2000 as amended by the Strategic Infrastructure Act, 2006. An Bord Pleanála determines the mechanism to be adopted and, if appropriate, whether planning permission may be given for works under this legislation.
- A Local Authority may direct that works be included as part of a development as a condition under the Planning and Development Act, 2000. Different sections apply if the works are necessary for the development to proceed or if they are in excess of the needs of the development.
- A Local Authority may, by zoning in the county development plan, or a variation, promote or prevent development to reduce the risk of flooding.

Directive 2007/60/EC on the assessment and management of flood risks entered into force on 26 November 2007. This Directive now requires Member States to assess if all water courses and coast lines are at risk from flooding, to map the flood extent and assets and humans at risk in these areas and to take adequate and coordinated measures to reduce this flood risk.

This Directive along with the Report on the Flood Policy Review Group resulted in the introduction of S.I. 122/2010 – European Communities (Assessment and Management of Flood Risks) Regulations 2010. The S.I. Addresses items such as “The preparation of schemes of flood risk management works and measures”, “Designation Orders”, “Powers of the Minister” and “the costs of flood risk management”. This legislation is relatively recent and it will take some time before all components are fully implemented.

3.3.3.2.3 Roles & Responsibilities

The key feature of a ‘Designation’ process is that it coordinates actions by a variety of stakeholders to provide a greater benefit than could be achieved by the stakeholders on their own, particularly taking the tendency toward negative behaviour into account. The key players are the riparian owners, the riparian community and statutory bodies, together with other parties with property related rights and beneficial use related rights or interests. The OPW also has a key role to play.

The fact that stakeholders have overlapping responsibilities tends to dilute the incentive to perform them, even though the benefits to be achieved may be clear. All stakeholders have responsibilities for cooperation with other stakeholders and responsibilities to take appropriate actions and refrain from inappropriate action.

Riparian Owners:

Riparian owners have control over access to the watercourse and are also responsible for maintenance under the common law. They are also likely to suffer damage as a result of flooding.

OPW:

The OPW, as lead agency in Flood Risk Management, has a role in coordinating the activities of statutory stakeholders and as a service provider to citizens.

Local Authorities:

Local authorities have a number of complementary functions in relation to 'Designation'. They can collect and assess information on the need for 'Designation'. They have powers to carry out some maintenance and other works. They provide emergency services. They are also the primary democratic organ at the local level.

Communities:

Riparian communities, in addition to being riparian owners, can organise and coordinate riparian owners and benefit from improved amenity, environmental and heritage resources. They are also likely to be called on for emergencies and to share in the economic effects of floods. Riparian communities often act through the Local Authority, but they also act in a self-organised or ad-hoc manner.

Beneficial Users:

Beneficial Users have property related rights, or rights or interests in beneficial uses of a watercourse, including power generation, fishing, watering animals, recreational use etc. Beneficial Users benefit from the maintenance of watercourses, and can reasonably be expected to contribute to their maintenance.

Statutory Regulators:

Statutory Regulators have a role in the management of watercourses from a variety of legislation including protecting water quality, natural environments, and natural resources.

Statutory Undertakers:

Statutory Undertakers have responsibilities for the provision of water related services, including water supply, wastewater treatment, power-generation, navigation, and resource management. They generally have some statutory powers to enable them to perform these duties.

3.4 Programme Exclusions

This SEA is not intended to directly consider the following related activities:

- New Arterial Drainage Schemes - while there are currently no OPW proposals for any new large scale catchment wide Arterial Drainage Scheme, if the case arises, any new Scheme will progress through its own due process for environmental legislative compliance.
- CFRAMS - will be carrying out their individual SEAs as stated in **Section 1**, which will incorporate all their associated recommendations for Flood Risk Management in that catchment.

- New Flood Relief Schemes – carried out under the Arterial Drainage Acts 1945-1995, which entail aspects such as public exhibition and Ministerial approval. Modern Flood Relief Schemes typically involve relatively large-scale engineering construction, generally within the confines of an urban area and designed to specific criteria such as 1 in 100 year flood protection.
- Drainage Districts – channel maintenance works on the various Drainage Districts by Local Authorities or Drainage Boards.

4.0 CONSULTATION

4.1 CONSULTATION DURING SCOPING STAGE

External consultation is a key part of the SEA process and consultation was undertaken to ensure the knowledge, experience and views of stakeholders and the general public were taken into account in accordance with statutory consultation requirement under the SEA Regulations.

The following Environmental Authorities were consulted with at the scoping stage:

Table 4.1 *Statutory Consultees for SEA*

Environmental Authorities
Environmental Protection Agency (EPA)
Department of the Environment, Community and Local Government (DECLG)
Department of Agriculture, Marine and Food (DAMF)
Department of Communications, Marine and Natural Resources (DCENR)
Department of Arts Heritage & Gaeltacht Affairs (DAHGA)
Department of Environment's Environment & Heritage Service, Northern Ireland

At this stage comments were received from the:

- Department of Communications, Energy & Natural Resources (11/10/09, 13/10/09 and 29/10/09);
- Department of the Environment, Heritage & Local Government (28/10/09);
- Environmental Protection Agency (09/12/09)

The comments received in relation to the Scoping Report generally consisted of:

- Comments on the assessment methodology;
- Information on potential sources of baseline data;
- Additional types of impacts to be considered.

All of the comments received are included in **Appendix 1**, and have been considered in the development of this Environmental Report. The Scoping Report is available at www.opw.ie. Note that in addition to EPA's correspondence as enclosed, a detailed constructive commentary was supplied via direct corrections to the draft scoping report, which is of too large a volume to include in **Appendix 1**.

4.2 PROPOSED CONSULTATION ON ENVIRONMENTAL REPORT

This Environmental Report does not form the final step in the SEA process. In Ireland a consultation period of not less than 4 weeks is required for the Environmental Report (S.I. 435/2004 Article 13 (2)(a)).

Consultation on the Environmental Report prepared as part of this SEA will last for six weeks.

The development of the consultation programme for the SEA is currently underway. Please see www.opw.ie for details, which will be posted as they become available. Following consultation on the Environmental Report, the comments received will be

considered and an SEA Statement will be completed. **Chapter 11** outlines the next steps in the SEA Process.

4.3 HABITATS DIRECTIVE ASSESSMENT CONSULTATION

Consultation on the methodology used for the Habitats Directive Article 6 Assessment and the results from the assessment was held with the National Parks & Wildlife Service (NPWS) (part of the DAHGA), who are the competent authority for conservation of habitats and species in Ireland, and with the Northern Ireland Environment Agency (NIEA), who are the competent authority for conservation of habitats and species in Northern Ireland. Comments were received on the proposed assessment methodology. For further information please see Habitats Directive Assessment.

5.0 BASELINE ENVIRONMENT

5.1 INTRODUCTION

This section of the Environmental Report examines the relevant aspects of the current state of the environment in relation to fauna, flora, biodiversity, population, human health, water, air, climate, cultural heritage (including architectural and archaeological), landscape, material assets, soils, geology, land-use and the interrelationships between these factors.

As Arterial Drainage Schemes are located in seven of the eight River Basin Districts (RBDs), the baseline data includes information from both Ireland and Northern Ireland. The baseline data has been compiled using available datasets and indicators suggested during the scoping stage. The main sources of data used in the compilation of this baseline are listed in the **Chapter 14 References**.

5.2 Current State of the Environment

5.2.1 Ireland

According to recent EPA publications, Ireland's natural environment, although under increasing pressure, generally remains of good quality and represents one of the country's most essential national assets (EPA, 2008). The EPA's *'2020 Vision: Protecting the Irish Environment'* document notes that pressures on the environment have increased significantly. As Ireland's economy grew in the past decade these pressures accelerated at a rate that far exceeds that observed in other countries.

The EPA's *'State of the Environment Report 2008'* (the most recent such assessment carried out by the EPA, published in 2009) identified four priority challenges for the environment, which, if addressed successfully, should benefit the present and future quality of Ireland's environment. These challenges are summarised in **Table 5.1**.

Table 5.1 Challenges for the Environment highlighted by EPA

Challenges	Components
Limiting and Adapting to Climate Change	Mitigating the causes and effects of climate change
	Adapting to climate change impacts
	Improving our understanding of climate change
Reversing Environmental Degradation	Preventing eutrophication and other water pollution
	Protecting natural habitats and species populations
	Remediation of contaminated land
Main-streaming Environmental Considerations	Incorporating environmental considerations into policies and plans
	Ensuring environmentally responsible businesses
	Changing behaviours
Complying with Environmental Legislation and Agreements	Building a culture of environmental compliance
	Enforcement of legislation at national and local level
	Meeting EU and other international obligations

In 2010 *Vision: Protecting the Irish Environment* (EPA, 2007) the EPA outlines six environmental goals which reflect on the main challenges identified in the *State of the Environment* reports as well as key issues at the global and EU level as reflected in the 6th Environmental Action Plan (EAP). These goals are:

- Limiting and adapting to climate change;

- Clean air;
- Protected waters;
- Protected soils and biodiversity;
- Sustainable use of natural resources; and
- Integration and enforcement.

These goals are identified as a means of realising the vision of protecting and improving Ireland's Environment.

5.2.2 Northern Ireland

The major environmental issues facing Northern Ireland are set out in Northern Ireland's first '*State of the Environment Report*' (Environment and Heritage Service Northern Ireland, 2008), as summarised in **Table 5.2**.

Table 5.2 *Challenges for the Environment*

Challenges	Components
Climate Change	There is a need to greatly reduce greenhouse gas emissions and to change the way the environment is managed in order to cope with predicted changes in the climate such as extreme weather conditions.
Economic Growth	Many benefits have come with economic growth along with significant environmental costs. More sustainable ways of pursuing economic expansion and limiting the impact on the environment need to be found.
Rural Land Use	More sustainable agriculture and rural land use practices need to be adopted to allow for compatibility between modern agricultural practices and a high quality environment.
Water Quality	Nutrient enrichment, or eutrophication, is the greatest threat to the state of Northern Ireland waters and their biodiversity. Positive steps to address the diffuse sources of pollution causing this issue are required.

5.3 Baseline and Relevant Environmental Problems

5.3.1 Flora, Fauna and Biodiversity

5.3.1.1 Introduction

Ireland contains a variety of terrestrial, wetland, freshwater, estuarine and coastal habitats which support a range of species; many of which are of particular conservation concern. Approximately 20% of these habitats and species occur within areas designated for nature conservation; thus the majority of biodiversity within the country is located outside designated sites. The National Biodiversity Plan highlights the fact that lakes and rivers as well as other wetlands such as peatlands and fens in Ireland's inland water ecosystems are of considerable importance for biodiversity.

5.3.1.2 Designated Sites

With the introduction of the European Union (EU) Habitats Directive (92/43/EEC) which was transposed into Irish law as the Natural Habitats Regulations, 1997, the European Union formally recognised the significance of protecting rare and endangered species of flora and fauna and also, more importantly, their habitats. Member States were directed to provide lists of sites for designation. Both Ireland and Northern Ireland have

designated sites and species of conservation value and/or concern in accordance with EU legislation.

Designated sites are areas containing habitats or species of national or international conservation importance. There are four types of designation considered in this Environmental Report; Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar Sites and Natural Heritage Areas (NHA).

Special Areas of Conservation are protected under the EU Habitats Directive (92/43/EEC) and Special Protection Areas are designated under the EU Birds Directive (2009/147/EC), together these sites form the backbone of Natura 2000 network. SACs are designated for the conservation of flora, fauna and habitats of European importance and SPAs for the conservation of bird species and habitats of European importance.

Ramsar Sites are wetlands of international importance under the Ramsar Convention, an inter-governmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.

Natural Heritage Areas (NHAs) are sites that were designated for the protection of flora, fauna, habitats and geological sites of national importance. Management of NHAs is guided by planning policy and the Wildlife (Amendment) Act 2000. It was from these NHAs that the most important sites were selected for international designation as SACs and SPAs.

Areas of Special Scientific Interest (ASSI) are designated under The Environment (Northern Ireland) Order 2002, which provides much of the legislative basis for the protection of sites for nature conservation in Northern Ireland. ASSIs are areas of land that have been identified by scientific survey as being of the highest degree of conservation value. Note that ASSIs are not considered in this report.

Table 5.3 shows the total number of designated sites in the Republic of Ireland compared to the number, which are within or intersected by OPW drainage channels. The locations of these sites are shown in **Figures 5.1 to 5.4**.

Table 5.3 Numbers and Types of Designated Sites (including Proposed / Candidate Sites) in Ireland intersected by OPW Scheme Channels

Designation	No. in Republic of Ireland	No. of OPW Channels within or intersecting Designated Area
Special Area of Conservation	419*	68*
Special Protection Areas	156*	29*
Ramsar Site	45	11
Natural Heritage Area	1244*	175*

* Figures based on protected areas on www.heritagedata.ie October 2011.

Figure 5.1 OPW Scheme Channels & Embankments and Special Areas of Conservation

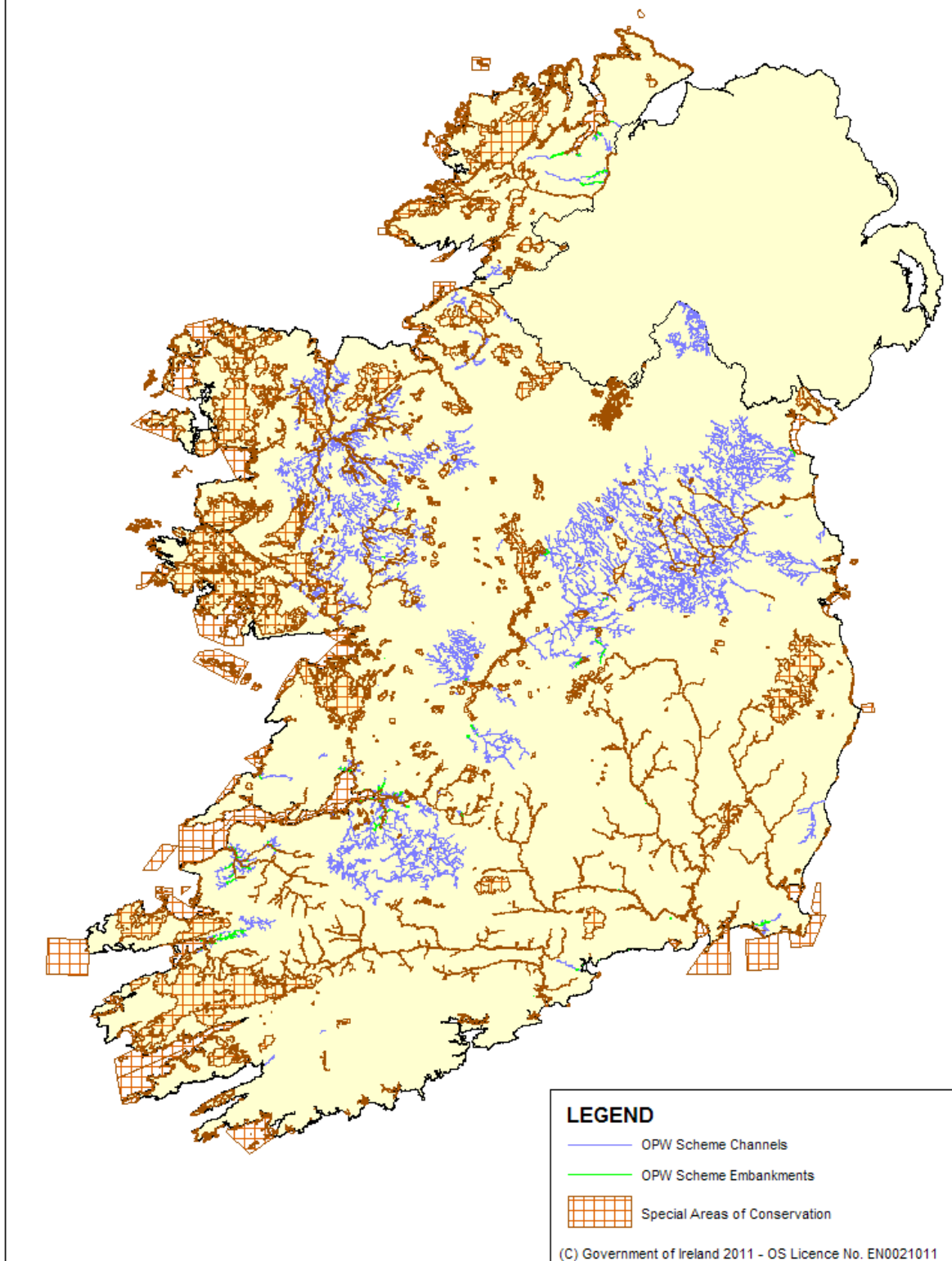


Figure 5.2 OPW Scheme Channels & Embankments and Special Protection Areas

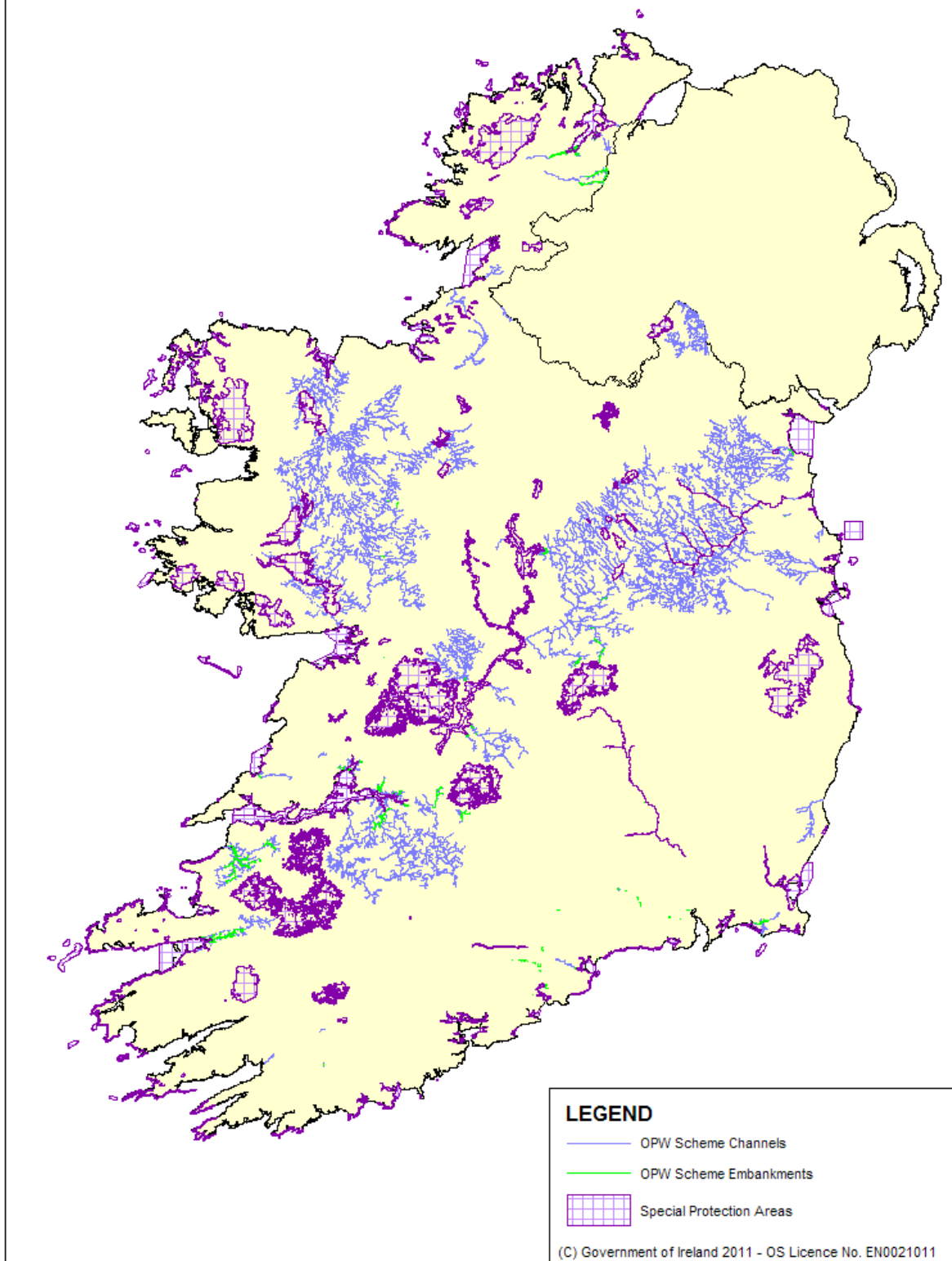


Figure 5.3 OPW Scheme Channels & Embankments and Ramsar Sites

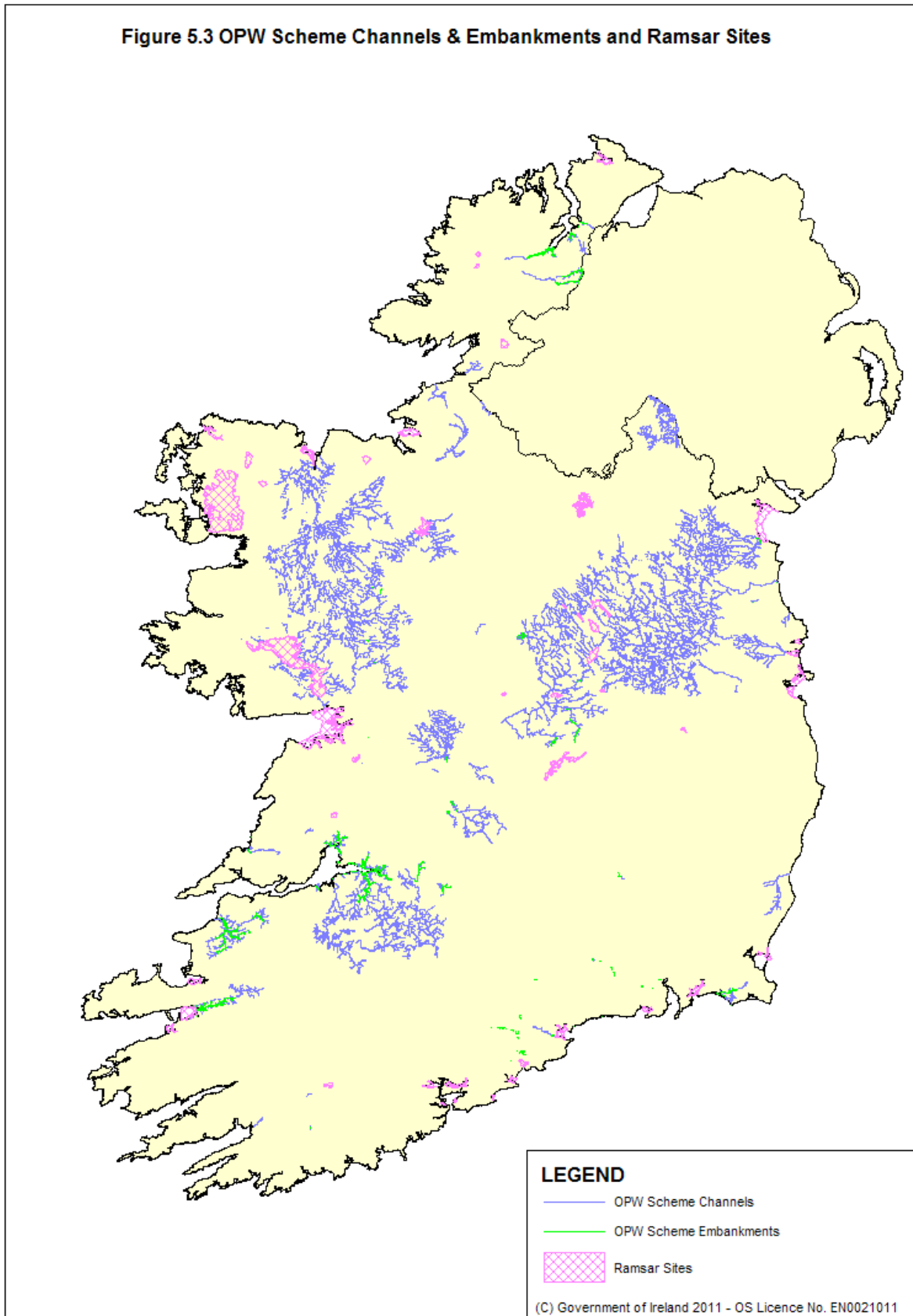
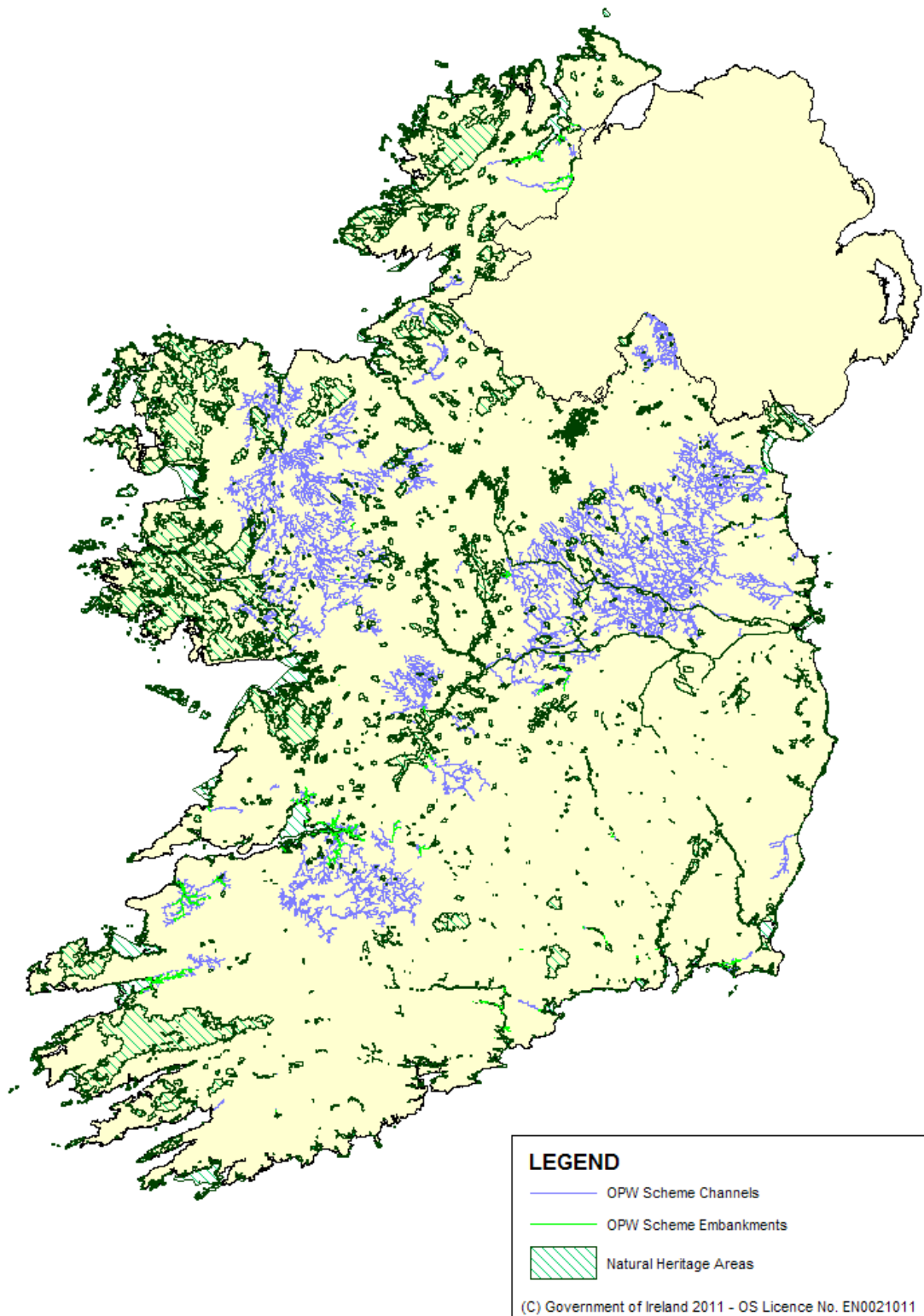


Figure 5.4 OPW Scheme Channels & Embankments and Natural Heritage Areas



5.3.1.3 Protected Species and Habitats

Annex I of the EU Habitats Directive lists certain habitats that must be given protection. Certain habitats are deemed 'priority' and have greater protection. Irish habitats include raised bogs, active blanket bogs, turloughs, heaths, lakes and rivers. Annex II of the directive lists species whose habitats must be protected and includes lesser horseshoe bat, otter, salmon and white-clawed crayfish. Many of these habitats and species occur outside designated areas.

A range of species is also protected under the Wildlife Act (1976) and the Wildlife Amendment Act (2000), the Flora Protection Order 1999, and under Annex IV of the EU Habitats Directive.

Under Article 17 of the Habitats Directive, each member state is obliged to report to the European Commission on the status of listed habitats and species every six years. The conservation status for listed habitats and species was assessed across the whole national territory, not just in Special Areas of Conservation. The assessment for conservation status brought together information on four parameters for habitats and species: range; area/population; structure and functions of habitats/ area of suitable habitat for species; and future prospects. 'The Status of EU Protected Habitats and Species in Ireland' was published in 2008. A summary of the results for all habitats and species is given in **Appendix 2**

In the OPW research publication entitled – Screening of Natura 2000 Sites for Impacts of Arterial Drainage Maintenance as published under International Standard Series Number ISSN 1649-9840, habitats and species were divided into three categories based on the likelihood of impact as a result of drainage maintenance.

Category I

Conservation aspects that are located in the waterway corridor, or on lands adjoining the waterway. They are in close proximity to maintenance operations and have some form of sensitivity to these works. It is deemed that there is a realistic possibility that a significant effect could occur and that some form of an ecological assessment is warranted.

Category II

Conservation aspects that could have some sensitivities to maintenance operations but this is largely dependent on their proximity to waterways where maintenance is carried out. Further analysis is required to delineate their proximity to maintenance works. Insufficient information at present to decide if they are to be deemed as Category I or Category III.

Category III

Conservation aspects that have less sensitivity to maintenance operations and are not in close proximity to these works. It is expected that a significant impact is highly unlikely and further study would not be warranted unless contrary knowledge arises in the future.

5.3.1.4 Water Dependent Habitats and Species

Article 6 of the Water Framework Directive (2000/60/EC), requires each Member State to establish a register of water dependent habitats or species including salmonid waters, Special Areas of Conservation and Special Protection Areas. Water dependent habitats and species are the main concern of this section of the report as these habitats and

species are the most likely to be impacted by the OPW drainage works.

5.3.1.4.1 Peatland

Over 120 sites in Ireland have been designated for the protection of peatland Habitats, i.e. *active raised bog*, *blanket bog*, *bog woodland*, *degraded raised bog*, *depression on peat substrates of the Rhynchosporin*, *transition mires & quaking bogs*. Drainage is listed as one of the threats to these habitats in the 'Status of EU Protected Habitats and Species in Ireland', (2008). According to this publication depression on peat substrates of the *Rhynchosporin*, has a good overall status, while all other peatland habitats have a poor to bad status.

Raised bogs and degraded raised bogs are concentrated in the lowlands of central Ireland, while blanket bogs are mainly along the Western half of the country with some addition areas in the South East.

5.3.1.4.2 Fens

Two types of fen habitat that occur in Ireland are listed on Annex I of the EU Habitat Directive, *alkaline fens (EU Code 7230)* and *calcareous fens with cladium mariscus (EU Code 7210)*. Sixty-two designated sites within the country have been designated for the protection of fen habitat (i.e. fen is listed as a qualifying interest for the designation). These habitats have good range across the country but are considered to have a bad overall status according to the publication 'The Status of EU Protected Habitats and Species in Ireland' (2008).

Geyer's whorl snail (*Vertigo geyeri*), narrow-mouthed whorl snail (*V. angustior*) and Desmoulin's Whorl Snail (*V. moulinsiana*) all occur in fen and other wetlands. These snails are listed on Annex II of the EU Habitat Directive and are particularly sensitive to changes in hydrology. 29 designated sites within the country have been designated for the protection of whorl snails.

5.3.1.4.3 Rivers

Twenty-two rivers within the country have been designated for the protection of habitats which they support i.e. watercourses of plain to montane levels with the *Ranunculus fluitantis* vegetation (*EU Code 3260*) and rivers with muddy banks with *Chenopodium rubri* p.p. and *Bidentium* p.p. vegetation (*EU Code 3270*). Stands of this latter habitat are typically small and fragmented in Ireland (Fossitt 2000) and only one designated area i.e. the Coole-Garryland Complex SAC in Galway has this habitat listed as a qualifying interest. Nevertheless this habitat has been given a good overall status (according to 'The Status of EU Protected Habitats and Species in Ireland 2008').

The former habitat (*EU Code 3260*) has good overall range and area but bad structure/function and future prospects (according to 'The Status of EU Protected Habitats and Species in Ireland, 2008'). This was attributed to the fact that 'two thirds of the rivers assessed by the EPA are at risk of failing to meet their environmental objectives'. This habitat is widespread in Irish rivers.

Many rivers have also been designated for the protection of species such as salmon, lamprey, freshwater pearl mussel and white-clawed crayfish. These species will be discussed below.

5.3.1.4.4 Lakes

Seventy-four sites within the Republic have been designated for the protection of lakes.

The following habitats have been listed as qualifying interests for the designation of lakes. All of these habitats are protected under Annex I of the EU Habitat Directive.

- Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. (*EU Code 3140*),
- Natural dystrophic lakes and ponds (*EU Code 3160*),
- Natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation (*EU Code 3150*)
- Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea (*EU Code 3130*).

Hard water lakes (EU Code 3140), have a good range and area in Ireland, being mainly widespread across the country, except in Donegal and in the southern counties. This habitat is listed as a qualifying interest for 20 designated areas nationwide. According to 'The Status of EU Protected Habitats and Species in Ireland, 2008', the overall status of this habitat is bad, despite having good range and area.

Natural dystrophic lakes (EU Code 3160) occur on peatland habitats and have brown water due to humic inputs. This habitat is listed as a qualifying Interest for ten designated areas nationwide. According to 'The Status of EU Protected Habitats and Species in Ireland, 2008', this habitat has a good range but a bad overall status in Ireland.

Natural Eutrophic Lakes (EU Code 3150) are naturally high in nutrients and are base rich. This habitat type is listed as a qualifying interest for 11 designated sites nationwide. According to 'The Status of EU Protected Habitats and Species in Ireland, 2008', the range, area and structure/function of this habitat is unknown, thus the overall status in Ireland was considered to be bad.

Oligotrophic Lakes (EU Code 3130) are acidic and low in nutrients; this habitat has been listed as a qualifying interest for ten designated sites nationwide. According to 'The Status of EU Protected Habitats and Species in Ireland, 2008', the overall status of this habitat is bad, despite having good range and area.

5.3.1.4.5 Turloughs

Turloughs are lakes that flood in winter and may disappear altogether during the summer. These lakes are present in limestone areas and are concentrated in Counties Galway, Clare, Roscommon and Mayo. Forty-four sites within the Republic have been designated for the protection of *turloughs (EU Code 3180)*. According to 'The Status of EU Protected Habitats and Species in Ireland, 2008', this habitat has a good range but poor overall status in Ireland.

Some birds (such as whooper swan, Greenland white-fronted geese and golden plover) mentioned on Annex I of the EU Bird Directive are known to use turloughs, especially during the winter months when water levels are high.

5.3.1.4.6 Estuaries

Twenty-one sites in Ireland have been designated for the protection of *estuarine habitats (EU Code 1130)*. Estuaries are coastal inlets, which are characterised by the mixture of saline and fresh water. The habitat has good range and area in Ireland, being present in every coastal county in Ireland except Leitrim.

Estuaries are of major conservation importance for many birds protected under Annex I

of the EU Bird Directive and many Animals such as Otters and Seals, which are protected under Annex II of The EU Habitat Directive.

5.3.1.4.7 Salmon

The protected areas for salmonid species are listed in the Salmonid Regulations (S.I. 293/1988), which designate “waters capable of supporting salmon (*Salmo salar*), trout (*Salmo trutta*), char (*Salvelinus*) and whitefish (*Coregonus*)” as protected. The Habitat Regulations (S.I. 94/1997) separately protect the habitats of Atlantic salmon. In total there are 12 salmonid designated waterbodies intersected by OPW Scheme channels, eleven rivers and one lake, as listed in **Table 5.4**. It should be remembered however, that salmon do occur outside these designated areas and may use habitats in the vicinity of other OPW channels. Salmon have a good geographical range in Ireland, but have a bad overall population status (NPWS Publication – ‘*The Status of Protected Habitats & Species in Ireland*’ 2008).

Table 5.4 Salmonid Designated Waterbodies with OPW Schemes

Salmonid Waterbody	OPW Scheme
River Boyne	Boyne
River Maine	Maine
River Corrib	Corrib Clare
Lough Corrib	Corrib Clare, Corrib Headford
River Swilly	Swilly Embankments
River Moy	Moy
Corry	Moy
Owengarve	Moy
Glore	Moy
Mullaghanoe	Moy
Spaddagh	Moy
Gweeston	Moy
Manulla	Moy
Castlebar	Moy
Deel River	Moy
Trimoge River	Moy
Yellow River	Moy
Nore River	Kilkenny FRS
Feale River	Feale

5.3.1.4.8 Freshwater Pearl Mussel

The freshwater pearl mussel (*Margaritifera margaritifera*) is a bivalve and can be up to 140mm with an oval-shaped, heavy, black shell. They are filter feeders associated with salmonid waters, but they require higher water quality than salmonids. They have a complex life cycle with a fish host usually required during the larval stages. In Ireland, native salmon (*Salmo salar*) and trout (*Salmo trutta*) are used as hosts. The fish provides the essential step in the mussel's life cycle and adult mussels are an indicator of good quality, clean water. Each mussel can filter up to 50 litres of water per day.

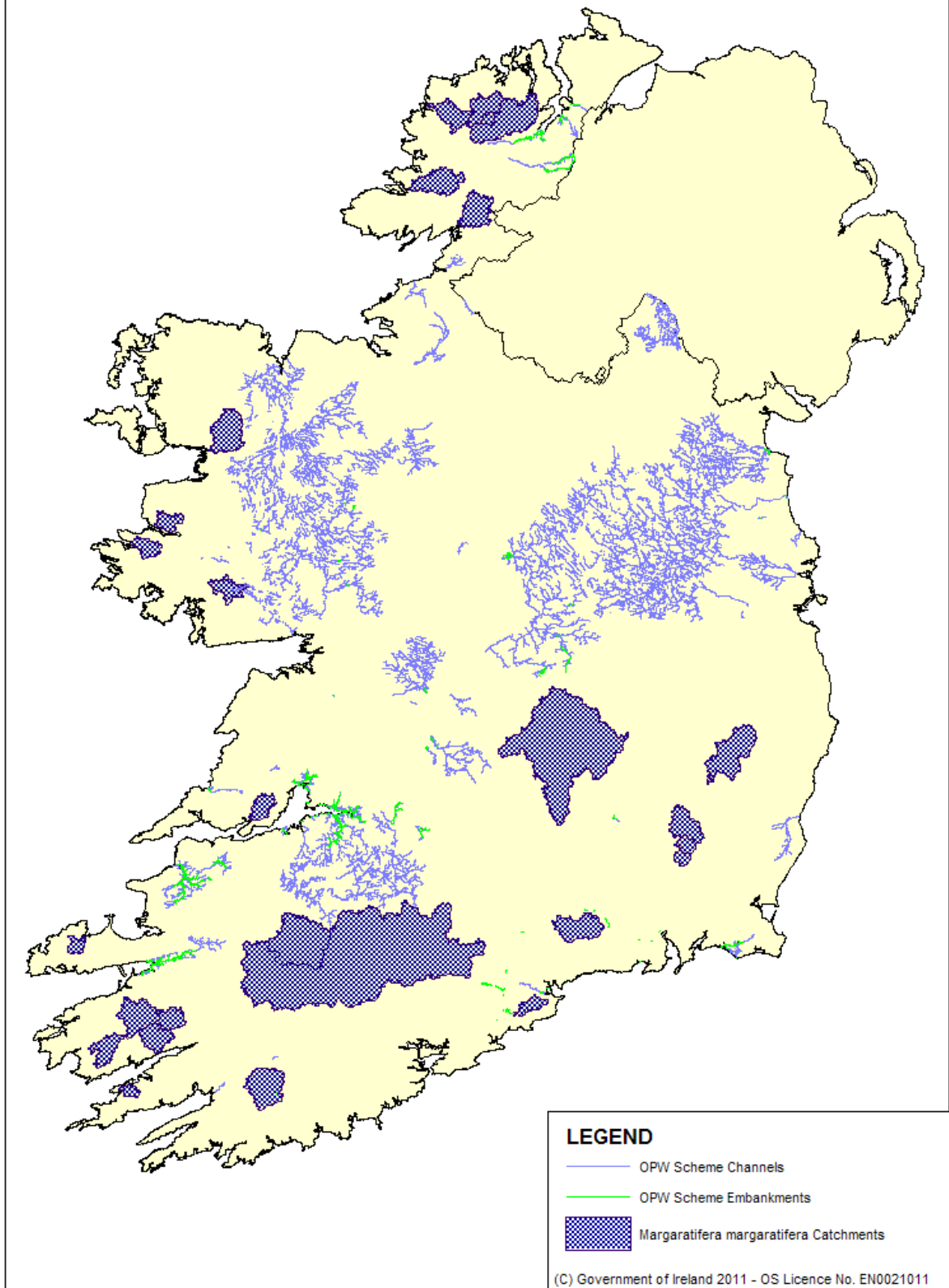
There has been a considerable decline in species distribution and numbers. There are 96 populations of pearl mussels in the Republic of Ireland, some of which include two or more rivers in close proximity to make them one single population (Moorkens et al. 2007). A total of 27 populations (26 of *M. margaritifera* and 1 of *M. durrovensis*) have been designated within 19 SAC areas for *Margaritifera margaritifera*, as listed in **Table 5.5** and illustrated in **Figure 5.5**. Although this species is considered to have a good

range in Ireland it has a bad overall status (according to 'The Status of EU Protected Habitats and Species in Ireland, 2008'). This bad status is attributed to the very low levels of recruitment and recent kills due to pollution events. Thus the mussel has a very top-heavy age structure, with sensitive juveniles being killed during episodes of poor water quality.

Table 5.5 27 Sub-basin Catchments Designated for Freshwater Pearl Mussel

Margaritifera margaritifera Populations	SAC Site Code	Intersected by OPW Channels (Yes/No)
Allow (Munster Blackwater)	2170	No
Aughavaud (Barrow)	2162	No
Ballymurphy (Barrow)	2162	No
Bandon	2171	Yes
Bundorragha	1932	No
Caragh	365	No
Clady	140	No
Clodiagh (Suir)	2137	No
Cloon (Shannon Estuary)	2165	No
Currane	365	No
Dawros	2031	No
Derreen (Slaney)	781	No
Eske	163	No
Gearhameen (Laune)	365	No
Glaskeelan (Leannan)	2047	No
Kerry Blackwater	2173, 365	No
Leannan	2176	No
Licky	2170	No
Mountain (Barrow)	2162	No
Munster Blackwater	2170	No
Newport	2144	No
Nore	2162	No
Owencarrow	2047	No
Owenea	197	No
Owenmore	375	No
Owenriff (Corrib)	297	Yes
Ownagappul	1879	No

Figure 5.5 OPW Scheme Channels & Embankments and *Margaritifera margaritifera* Catchments



5.3.1.4.9 White-clawed Crayfish

White –clawed crayfish (*Austropotamobius pallipes*) are protected under Annex II of the EU Habitat Directive. Crayfish are widely dispersed in central Ireland and occupy very few coastal areas. Many of the channels maintained by the OPW would be expected to

be inhabited by crayfish, as this species are known to inhabit a range of drainage channels in many catchments nationwide. Fifteen SACs nationwide have white-clawed crayfish listed as a qualifying interest. Nine of these SACs are intersected by and/or are encroached into by channels maintained by the OPW. These are Lough Corrib SAC (000297), Lough Owel SAC (000688), Lough Gill SAC (001976), Lough Bane & Lough Glass SAC (002120), the River Moy SAC (002298), White Lough, Ben Lough & Lough Doo SAC (1810), Lough Lene SAC (2121), Lower River Suir SAC (002137), and River Barrow and River Nore SAC (002162). In addition there are many records for this species within other designated and un-designated areas.

5.3.1.4.10 Lamprey

Three species of lamprey are present in Ireland. Those are brook lamprey (*Lampetra planeri*); river lamprey (*Lampetra fluviatilis*); and sea lamprey (*Petromyzon. marinus*), all of which are protected under Annex II of the EU Habitat Directive. Lamprey is mentioned as a qualifying interest for fourteen Special Areas of Conservation, as listed in **Table 5.6** below. Of the 14 SACs, ten are intersected by/encroached into by channels maintained by the OPW. These designated areas aim to protect the best areas for these species, it should be remembered however that lamprey are present in a wide range of channels outside these designated areas. River and brook lamprey are considered to have good range and population status, however sea lamprey's range and population status is considered to be poor.

Table 5.6 Designated sites with bas a qualifying interest and presence of absence of OPW drainage work on the same

Site Code	Site Name	Species	Intersected by OPW Channels
000297	Lough Corrib	<i>Petromyzon marinus</i>	Yes
		<i>Lampetra planeri</i>	
000343	Castlemaine Harbour	<i>Petromyzon marinus</i>	Yes
		<i>Lampetra fluviatilis</i>	
000365	Killarney National Park, Macgillicuddy's Reeks and Caragh River Catchment	<i>Petromyzon marinus</i>	No
		<i>Lampetra planeri</i>	
		<i>Lampetra fluviatilis</i>	
000458	Killala Bay / Moy Estuary	<i>Petromyzon marinus</i>	Yes
000627	Cummeen Strand / Drumcliff Bay (Sligo Bay)	<i>Petromyzon marinus</i>	No
		<i>Lampetra fluviatilis</i>	
000781	Slaney River Valley	<i>Lampetra fluviatilis</i>	No
		<i>Lampetra planeri</i>	
		<i>Petromyzon marinus</i>	
001976	Lough Gill	<i>Petromyzon marinus</i>	Yes
		<i>Lampetra planeri</i>	
		<i>Lampetra fluviatilis</i>	
002137	Lower River Suir	<i>Petromyzon marinus</i>	Yes
		<i>Lampetra planeri</i>	
		<i>Lampetra fluviatilis</i>	
002162	River Barrow and River Nore	<i>Petromyzon marinus</i>	Yes
		<i>Lampetra planeri</i>	
		<i>Lampetra fluviatilis</i>	
002165	Lower River Shannon	<i>Lampetra fluviatilis</i>	Yes
		<i>Lampetra planeri</i>	

Site Code	Site Name	Species	Intersected by OPW Channels
		<i>Petromyzon marinus</i>	
002170	Blackwater River (Cork/Waterford)	<i>Petromyzon marinus</i>	No
		<i>Lampetra planeri</i>	
		<i>Lampetra fluviatilis</i>	
002171	Bandon River	<i>Lampetra planeri</i>	Yes
002298	River Moy	<i>Petromyzon marinus</i>	Yes
		<i>Lampetra planeri</i>	
002299	River Boyne and River Blackwater	<i>Lampetra fluviatilis</i>	Yes

Information based on SAC datasheets September 2011, www.npws.ie

5.3.1.4.11 Otter

Otter are listed as a qualifying interest for 45 Special Areas of Conservation nationwide and occur in freshwater and coastal habitats. Otters are widespread across all drainage channels nationally and, further, that within a drained catchment, the network of small maintained drainage channels will hold the largest proportion of the population. Otter have a good geographical range in Ireland, but have poor overall population status (NPWS Publication 'The Status of Protected Habitats & Species in Ireland, 2008').

5.3.1.4.12 Birds

In the OPW research publication entitled – 'Screening of Natura 2000 Sites for Impacts of Arterial Drainage Maintenance' as published under International Standard Series Number (ISSN) 1649-9840, bird species were divided into three categories based on the likelihood of impact as a result of drainage maintenance.

- Category I – Realistic possibility that a significant effect will occur.
- Category II - Further analysis required, to assess possible impacts with particular focus on habitat impacts and disturbance.
- Category III – Significant impact highly unlikely.

Category I

Category I consists of birds that inhabit a maintained waterway for the predominant portion of their lifecycle, hence maintenance works has the potential to impact along a significant portion of the species habitat.

Kingfisher is the only species listed on Category I. Kingfisher are protected on Annex I of the EU Birds Directive and are the most likely species of bird to be impacted by drainage maintenance works due to their habitat requirements. Kingfisher nest on muddy vertical banks and require slow flowing fish rich watercourses for feeding.

Category II

Category II typifies birds that either inhabit a maintained waterway of adjoining areas for part of their lifecycle. Further analysis is required to delineate the relevant habitats of these species, identify their proximity to maintenance operations and make judgement as to what impacts could be significant.

Of the species mentioned in Category II, eleven are also mentioned on Annex I of the EU Bird Directive, these are Arctic tern (*Sterna paradisaea*), common tern (*S. hirundo*), little tern (*S. albifrons*), sandwich tern (*S. sandvicensis*), barnacle goose (*Branta leucopsis*), Greenland white-fronted goose (*Anser albifrons*), Bewick's swan (*Cygnus bewickii*), whooper swan (*C. Cygnus*) corncrake (*Crex crex*), golden plover (*Pluvialis*

apricaria), little egret (*Egretta garzetta*).

Twelve SPAs nationwide are known to support tern colonies and are also subject to OPW drainage maintenance. Common terns, sandwich terns, Arctic terns and little terns breed on shingle beaches, rocky islets, and sometimes nest inland on gravel pits or reservoirs or lakes. A tern colony would be expected to be loud and conspicuous and areas to avoid should be obvious to OPW maintenance crews, should any colonies be in the vicinity of works.

Barnacle Geese winter on agricultural pasture and salt marsh habitats in Ireland and may be found in the vicinity of the site of the proposed development. While Greenland White-fronted Geese forage on peatland, salt marsh and maritime grassland habitats. Nineteen SPAs (where OPW works take place) nationwide have mentioned Greenland White-fronted Goose in the NPWS Site Synopsis, while two SPAs (where OPW works take place) have mentioned barnacle goose. As these geese only winter in Ireland, timing of works could be important in order to prevent disturbance during OPW works.

Bewick swans and whooper swans use a variety of habitats from small lakes and ponds to agricultural land, turloughs and intertidal areas where they graze on grass and winter cereals. Eleven SPAs (where OPW works take place) nationwide have mentioned Bewick swan in the NPWS Site Synopsis while 19 SPAs (where OPW works take place) have mentioned whooper swan in the same. Again these swans are winter visitors to Ireland and thus will not be affected by works outside this period. Thus timing of works will be important to prevent disturbance to this species.

Corncrake distribution has declined dramatically throughout Ireland in recent times. The decline of this species is largely attributed to earlier cutting of hay, which is associated with modern farming practices, but they have also been affected by the loss of hay meadows where agriculture has been discontinued. This bird breeds in damp hay meadows and wet marshland. According to the Bird Watch Ireland/RSPB Corncrake Census Survey carried out in 1993 there has been an 80% decline in the population since the last atlas survey in 1988-91. The current populations are best represented as having three centres: Donegal Islands, (where they are most numerous), Mayo & Galway Islands and the Shannon Callows. Only one SPA where OPW works take place has mentioned Corncrake in the NPWS site synopsis; the Middle Shannon Callows (site code 004096).

Golden plover breed on peatland habitats and acid grasslands in the north and northwest of the country. These birds are found in large flocks on agricultural fields and rough pastures during the winter and are widespread in Ireland during this season. Golden plover occur in 20 SPAs nationwide that are managed by the OPW.

Little egret has recently colonised Ireland and first confirmed breeding records are from 1997. These birds are present year-round and use wetland habitats such as lakes, rivers, floods and estuaries. Thus due to their habitat they are at risk of being impacted by OPW drainage maintenance.

Category III

Category III consists of birds that rarely inhabit either a maintained waterway corridor or adjoining areas.

Species such as peregrine, hen harrier, bar-tailed godwit, common scoter, pintail and

ruff etc., are designated as Category III species and are deemed as highly unlikely to be significantly affected by drainage maintenance operations.

5.3.1.5 Shellfish Growing Areas

The following shellfish growing areas are found in Ireland, as delineated by the Sea-Fisheries Protection Authority (SFPA):

Table 5.7 Shellfish Growing Areas in Ireland

Shellfish Growing Areas		
Achill North	Dungarvan Bay	Mulroy Bay
Achill South	Dungloe	Oysterhaven
Askeaton	Dunmanus Bay	Poulnasharry
Ballinakill	Galway Bay	Roaringwater Bay
Ballylongford	Gormanston/Laytown	Sheephaven
Ballysodare Bay	Gweebarra	Sherkin Kinish
Ballyteigue Bay	Gweedore	Sherkin North
Baltimore Harbour	Inver Bay	Skerries
Bannon Bay	Kenmare River	Sligo Harbour
Bantry Bay	Killala Bay	Streamstown Bay
Blacksod Bay (Belmullet)	Killary Harbour	Trá Breaga
Carigaholt	Kinsale	Tralee Bay
Castlemaine Harbour	Lough Foyle	Traweenagh
Clew Bay	Lough Swilly	Valentia River
Clifden Bay Inner	Loughras Beg	Waterford Harbour
Cork Harbour	Malahide	Wexford Harbour
Donegal Harbour	Mannin Bay	Youghal Bay
Drumcliff Bay	McSwynes Bay	

5.3.1.6 Existing Environmental Pressures/Problems: Biodiversity, Flora and Fauna

Urban growth in Ireland has accelerated in recent years with the increased development and expansion of city and town limits into the countryside. Artificial land cover throughout Ireland remains relatively low.

Throughout the island of Ireland there has been a decline in many of the native species through habitat loss, competition, development and agriculture. Irish and European legislation protect some of these species. There are eighteen species of plant or animal recorded as endangered, 52 recorded as vulnerable, 75 recorded as rare and 8 classed as intermediate (www.epa.ie). In Northern Ireland, some 272 plant and animal species (identified as Priority Species) and 40 Priority Habitats require some conservation action. There are also 457 species on the Northern Ireland Species of Conservation Concern (SOCC) list.

‘The Status of EU Protected Habitats and Species in Ireland, (2008)’, assessed not only the status of protected habitats and species, but also the pressures and threats that they face in Ireland. The full list of major pressures identified for habitats and species is shown in **Appendix 3**. The most likely pressures and threats that could be associated with the OPW Drainage works are as follows.

- Drainage
- Nutrient Enrichment & Siltation
- Introduction of Invasive Species

The Significant Water Management Issues (SWMI) document for each River Basin District (RBD) highlighted the main pressures/problems facing the water environment within the river basins. These pressures are listed in **Section 5.3.3.5 Water**. Each of these pressures may potentially impact directly or indirectly on the biodiversity of water dependent habitats and species. Pressures on water quality can result in subsequent impacts to biodiversity.

Annex II species such as freshwater pearl mussel and salmon are sensitive to pollution. *Margaritifera* requires extremely oligotrophic conditions, preferably rivers with a biotic quality index of Q5 (Ireland). The EPA uses these Q-Values to indicate water quality status categories (Q5 being the highest). Salmon need very good water quality typical of that found in upland streams. The species needs riffle/glide/pool sequences.

Widespread development on shorelines and floodplains and the associated infilling of wetlands is a potential environmental problem in Ireland. This can have a direct effect on dependent habitats, such as machair and turloughs. There is the potential for impacts to occur related to the sustainability of water supplies in light of development and growing demand. Surface water abstraction can result in a direct impact on rivers and lakes and their associated flora and fauna. Indirect impacts may occur through abstraction of groundwater and the resultant effect on groundwater dependent habitats, such as alkaline fens and petrifying springs.

Invasive non-native plant and animal species are one of the greatest threats to biodiversity in Ireland. Invasive alien species negatively impact Irish biodiversity through competition, herbivory, predation, habitat alteration and introduction of parasites or pathogens and poses a risk to the genetic integrity of native species. Terrestrial and aquatic habitats can be negatively affected, resulting in severe damage to conservation and economic interests, such as agriculture, fisheries, forestry and various recreational activities. Despite this some invasive aquatic plant species continue to be imported onto the island for sale in garden centres.

Species of concern in Ireland include: the zebra mussel (*Dreissena polymorpha*); Japanese knotweed (*Fallopia japonica*); curly leaf pondweed (*Lagarosiphon major*); giant hogweed (*Heracleum mantegazzianum*); Himalayan balsam (*Impatiens glandulifera*); and many more.

5.3.1.7 Evolution in the Absence of the Programme: Biodiversity, Flora and Fauna

The drainage maintenance regime is designed to maintain the current drainage status. In the absence of drainage a dramatic change to the ecosystem within an enlarged flood plain would be expected, both positive and negative impacts on the flora and fauna would be associated with this change.

In the absence of Arterial Drainage Maintenance and High Risk Channel Designation activities being implemented, a dramatic change to the flora and fauna would be expected. The risk of flooding to the benefiting lands would increase significantly, with more wetlands therefore, expected to become established in flooded areas. Many areas of agricultural land would be expected to be less productive as flooding increases and wet grassland, swamp, fen habitats and riparian woodland become established through succession due to changes in the water table. It is likely that the altered hydrological regime would over time positively affect peatland habitats such as bogs, as drains become clogged with silt and aquatic vegetation over time.

An increase in the abundance of wetland habitats is likely to result in an increase in the species associated with those habitats; for example little egret, red grouse and snipe are known to use wetland habitats. Conversely species such as badgers and Irish hare, which are known to be associated with dry habitats such as dry meadows and agricultural grassland may decrease in abundance.

The absence of arterial drainage maintenance is likely to impact on aquatic species such as otter, crayfish, freshwater pearl mussel, salmon and lamprey. Siltation events associated with in-stream maintenance works would cease, however increased nutrient loading associated with flooding would be expected to increase eutrophication in some waterways. In the absence of drainage the build up of silt and aquatic vegetation may decrease the suitability of the habitat for species such as otter and crayfish.

Should arterial drainage maintenance works cease, the Environmental River Enhancement Programme (EREP) would also cease. This OPW funded project focuses on the enhancement of river corridors within the OPW maintenance programme. The project is coordinated and managed jointly with Inland Fisheries Ireland (IFI), and aims to enhance or increase the diversity of the physical and flow regimes within arterially drained channels, thereby leading to an increase in flora and fauna biodiversity within the channels.

5.3.1.8 Relevance in Context of the Programme: Biodiversity, Flora and Fauna

The OPW have introduced a number of measures in order to minimise damage to the environment while carrying out the necessary maintenance works. The measures of relevance to biodiversity, flora and fauna include:

- Environmental Management Protocols and Standard Operational Procedures (SOPs) in order to minimise damage to the flora and fauna of the receiving environment have been instigated (see Appendix 4). These measures include leaving sections of river unmanaged.
- The OPW work closely with the National Parks and Wildlife Service (NPWS) and with Inland Fisheries Ireland (IFI) to reduce impacts on high-risk channels.
- The Environmental River Enhancement Programme (EREP), carried out by the OPW in conjunction with IFI, aims to enhance the biodiversity and hydromorphology of arterially drained channels and river corridors.
- Where arterial drainage maintenance operations are proposed within, or where they could affect a Natura 2000 site, i.e. a Special Area of Conservation or Special Protection Area, an Appropriate Assessment in line with Article 6 of the Habitats Directive (92/43/EEC) is carried out.
- Research on targeted habitats (Such as turloughs) and species (such as kingfisher and otter) has been carried out to further inform decision making within the OPW.

5.3.2 Human Beings

5.3.2.1 Population

In the four years between the 2002 and the 2006 Censuses, the population of the Republic of Ireland increased by 8.2 per cent, which equates to an approximate two per cent growth per annum. The total population of the State recorded during the 2006 Census was 4,239,848 persons. The population of Northern Ireland recorded at this time was approximately 1.7 million persons. **Table 5.8** lists the population of each county within the study area for this report, as recorded during the 2006 Census.

Table 5.8 County Populations 2006

County	2006 Population	Largest Settlement
Cavan	64,003	Cavan Town
Clare	110,950	Ennis
Cork	481,295	Cork City
Donegal	147,264	Letterkenny
Dublin	118,7176	Dublin City
Galway	231,670	Galway City
Kerry	139,835	Tralee
Kildare	186,335	Naas
Kilkenny	87,558	Kilkenny Town
Laois	67,059	Portlaoise
Leitrim	28,950	Carrick-on-Shannon
Limerick	184,055	Limerick City
Longford	34,391	Longford Town
Louth	111,267	Dundalk
Mayo	123,839	Castlebar
Meath	162,831	Navan
Monaghan	55,997	Monaghan
Offaly	70,868	Tullamore
Roscommon	58,768	Roscommon Town
Sligo	60,894	Sligo
Tipperary North	66,023	Nenagh
Tipperary South	83,221	Clonmel
Waterford	107,961	Waterford City
Westmeath	79,346	Athlone
Wexford	131,749	Wexford Town
Total	4,063,305	

Source: Central Statistics Office- Census of Population 2006

5.3.2.2 Primary Land-use

The land area of Ireland is approximately 6.9 million hectares, of which about 4.2 million hectares or approximately 66% is used for agriculture. Approximately 853,000 hectares or 12% of the total land area of Ireland is used for forestry.

Irish agriculture is primarily a grass-based industry. Approximately 80% (3.36 million hectares) of Ireland's agricultural area is devoted to grass (silage, hay and pasture), 11% (0.46 million hectares) is in rough grazing and the remainder approximately 9% (0.38 million hectares) is allocated to crop production. Beef and milk production currently account for close on 60% of agricultural output at producer prices. (www.teagasc.ie)

There are 24 Counties located within the study area for this assessment. **Table 5.9** lists the percentage of the area of each County farmed, as recorded during the 2000 Census of Agriculture. In terms of economic significance, the Department of Agriculture, Fisheries and Food currently reports that the agri-food sector in Ireland contributes a value of €24 billion to the national economy, generates 6.3% of gross value added and provides 7.4% of national employment. When employment in inputs, processing and marketing is included, the agri-food sector accounts for almost 10% of employment.

Table 5.9 *Percentage of Each County Farmed*

County	% of Total Area Farmed
Cavan	70.8%
Clare	60.8%
Cork	70.7%
Donegal	47.3%
Dublin	33.6%
Galway	54.2%
Kerry	58.4%
Kildare	65.9%
Kilkenny	76.7%
Laois	69.3%
Leitrim	57.6%
Limerick	72.5%
Longford	67.4%
Louth	73.7%
Mayo	48.9%
Meath	76.9%
Monaghan	76.7%
Offaly	60.3%
Roscommon	62.5%
Sligo	59.9%
Tipperary North	72.3%
Tipperary South	69.8%
Waterford	65.9%
Westmeath	65.6%
Wexford	78.0%

Source: CSO Census of Agriculture 2000

Further details regarding land-use are provided in **Section 5.3.8 Soils, Geology & Land Cover** of this report.

5.3.2.3 Employment

The labour force consists of those who are able to work, i.e. those who are aged 15+, out of full-time education and not performing duties that prevent them from working. In 2006, there were 2,109,498 persons in the labour force in Ireland.

During the 2006 Census, over 90% of those recorded as being in the labour force were in employment. The national unemployment rate was approximately 7.1%. However, in assessing the 2006 Census data, the significant rise in unemployment that has taken place since then must be taken into consideration. The most recent figures published by the CSO show that the standardised unemployment rate in May 2011 was 14.1%.

Socio-economic grouping divides the population into categories depending on the level of skill or educational attainment required. The 'higher professional' category includes scientists, engineers, solicitors, town planners and psychologists. The 'lower professional' category includes teachers, lab technicians, nurses, journalists, actors and driving instructors. Skilled occupations are divided into manual skilled, such as bricklayers and building contractors; semi-skilled, e.g. roofers and gardeners; and unskilled, which includes construction labourers, refuse collectors and window cleaners.

Figure 5.6 shows the percentages of those employed in each socio-economic group in the State during the 2006 Census.

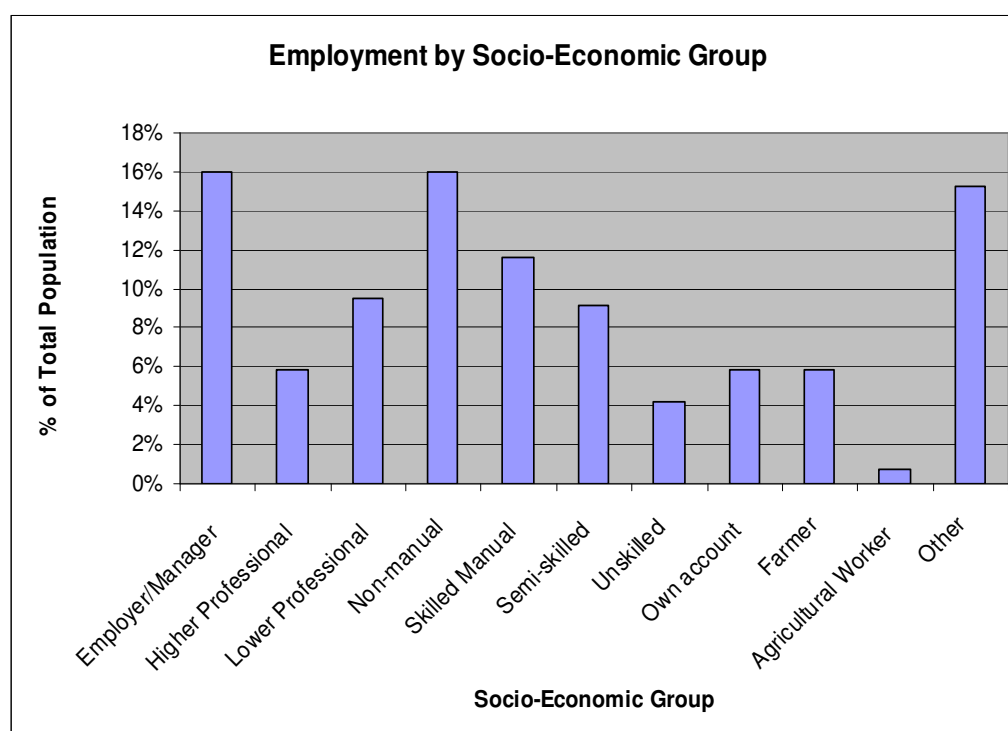


Figure 5.6 Employment by Socio-Economic Group in 2006

The CSO figures for socio-economic grouping have a limitation of including the entire population, rather than just those who are in the labour force. It is likely that this is what gives rise to the high proportion of the population shown to be in the 'other' category in **Figure 5.6**.

The 'Socio-Economic Group' data shows that the highest levels of employment recorded during the 2006 Census were within the 'employer/manager' and 'non-manual' categories.

5.3.2.4 Tourism

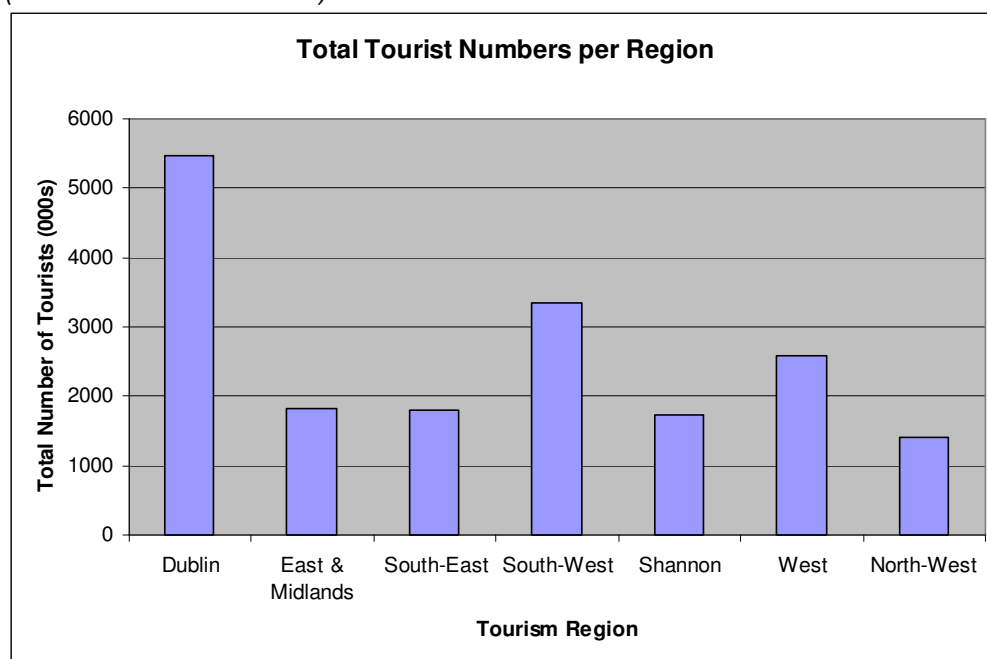
Tourism is one of the major contributors to the national economy and is a significant source of full-time and seasonal employment. During 2009 (the latest period for which complete Fáilte Ireland figures are available), total tourism revenue generated in Ireland was €5.3 billion, a decrease of almost 19% from €6.3 billion in 2008. Between 2008 and 2009, the number of overseas tourists to visit Ireland decreased by 12%, from 7.4 million to 6.6 million. According to Fáilte Ireland, the fall in tourist numbers in recent years is due to the global downturn and unfavourable exchange rates with the euro.

Ireland is divided into seven tourism regions. **Table 5.11** shows the total revenue and breakdown of overseas and domestic tourist numbers to each region in Ireland during 2009. **Figure 5.7** illustrates the total number of tourists per region in 2009. This data shows that the Dublin and South-West Regions had the highest tourist numbers and tourist revenue during this year.

Table 5.11 *Tourist Revenue and Numbers per Region in 2009*

Region	Total Revenue (€m)	Total Number of Tourists (000s)
Dublin	€1,512.3	5,476
East & Midlands	€407.0	1,812
South-East	€411.5	1,797
South-West	€1,002.0	3,336
Shannon	€390.6	1,730
West	€672.6	2,589
North-West	€318.6	1,411
Total	€4,714.6	18,151

(Source: Fáilte Ireland)

**Figure 5.7** *Total Tourists per Region in 2009* (Source: Fáilte Ireland)

5.3.2.5 Human Health

Human health has the potential to be impacted upon by environmental vectors, including water, soil and air. These factors are examined in appropriate detail under those environmental topic headings. This section of the report addresses existing water, air and soil conditions in terms of their link to human health.

5.3.2.5.1 Drinking Water and Human Health

An adequate secure water supply is a basic need of society; it is essential to ensure public health and sustain modern and appropriate social, environmental and economic conditions. The efficient supply of water to homes and industry is the responsibility of the 88 Local Authorities around Ireland. The European Communities (Drinking Water) No. 2, Regulations 2007 assign the Environmental Protection Agency (EPA) the role of supervisory authority over public drinking water supplies and provides powers of enforcement to ensure actions are taken where the quality of public drinking water is deficient. Each year the EPA collects and analyses over 250,000 Local Authority monitoring results for all drinking water supplies. The results are summarised in a 'Drinking Water Quality Report', which assesses the safety and security of drinking water supplies based on the results of local authority monitoring and enforcement by the EPA during the same period.

The most recently published EPA 'Drinking Water Quality Report' states that in Ireland the majority of drinking water comes from public water supplies (85%) with the remainder provided by group water schemes and private supplies (including wells serving single houses (*'The Provision and Quality of Drinking Water in Ireland: A Report for the Years 2008 - 2009'*, EPA, 2009). The findings of the 2008 – 2009 EPA 'Drinking Water Quality Report' include:

- E. coli was detected on at least one occasion in 2.9% of public water supplies (27) during 2009. The number of private group water schemes water E. coli was detected dropped from 134 (25%) in 2008 to 87 (17%) in 2009. In general, the microbiological quality of private group water schemes remains inferior to public water supplies.
- Compliance with chemical standards overall was 99.2% in 2009.
- Compliance with the indicator parameters such as aluminium (97%) and turbidity (92% at the water treatment plant) remains an area for improvement.

5.3.2.5.2 Air Quality and Human Health

Air quality is an important determinant of human health. The World Health Organisation (WHO) states that air pollution, both indoors and outdoors, is a major environmental health problem affecting everyone in developed and developing countries alike (*'Air Quality Guidelines'* WHO, 2005). The EPA publishes annual reports that provide an overview of air quality in Ireland, based on data obtained from 28 monitoring stations. These results are compared to limit values set out in EU legislation on ambient air quality (Clean Air For Europe Directive 2008 and 4th Daughter Directive 2007). The most recently published EPA air quality report, *'Air Quality in Ireland 2009'* (EPA, 2010) states that air quality in Ireland is generally of a high standard across the country due to prevailing Atlantic airflows, relatively few large cities and the lack of widespread heavy industries. However, levels of particulate matter and nitrogen dioxide remain of concern.

5.3.2.5.3 Soil Quality and Human Health

The EPA document *'Towards Setting Environmental Quality Objectives for Soil'* (EPA, 2002) highlights the issue of soil degradation and the need for soil protection. It states that the general consensus in Ireland is that soil quality is good overall. However, there is increasing pressure on soil, particularly from land-use changes, intensification of agriculture, erosion and overgrazing, disposal of organic wastes to soils, afforestation, industry and urbanisation. Chemical and microbial contaminants in soils can be transferred to humans via direct contact and through the food chain. The interactions and connectivity between all environmental media mean that soil protection should be considered on an equal footing with the protection of water and air in Ireland.

5.3.2.6 Existing Environmental Pressures/Problems: Human Beings

5.3.2.6.1 Population

Ireland's current population remains below that of the island in the early 19th Century but has been increasing steadily since the early 1960s. Overall however, the population densities of both the Republic and Northern Ireland remain low from a European perspective. The National Development Plan (NDP) 2007 – 2013 projects that Ireland's population will reach over five million people by 2021. It summaries the main challenges facing the population as:

- Removing the remaining infrastructure bottlenecks that constrain our economic development and inhibit balanced regional development and environmental sustainability;

- Further equipping our children and youth with the skills and education to grasp the opportunities presented to us;
- Creating and sustaining high value employment opportunities; and
- Redistributing the product of wealth to foster an inclusive society.

The five Investment Priorities of the NDP are Economic Infrastructure, Enterprise, Science and Innovation, Human Capital, Social Infrastructure and Social Inclusion.

5.3.2.6.2 Human Health

The World Health Organisation (WHO) states that waterborne disease remains one of the major health concerns in the world. The EPA report *'The Provision and Quality of Drinking Water in Ireland: A Report for the Years 2008 - 2009'* highlights the continuing downward trend of incidence of *E. coli* in drinking water in Ireland. However, the report also presents the following facts regarding security of water supplies:

- A remedial action list (RAL) of public water supplies was prepared by the EPA in 2008. Since then, 42% (i.e. 142) of supplies on the original RAL have been removed from the list because the necessary remedial actions have been completed. This includes the public water supplies in Limerick, Galway and Waterford, which were upgraded and removed from the RAL.
- At the end of 2010, 264 public water supplies remained on the RAL (67 new supplies have been added to the RAL since 2008). The list includes 73 supplies identified as high risk where appropriate barriers to *Cryptosporidium* need to be installed (50 supplies using surface water and 23 spring sources influenced by surface water). There has been a 41% increase in the provision of chlorine monitors and alarms at treatment plants. These are vital instruments to control the disinfection process and thus reduce the incidence of *E. coli* in drinking water. At the end of 2009, 81% of public water supply treatment plants had such equipment in place. The remaining work is scheduled for completion by Local Authorities.

Flooding poses a risk to human health and safety. The OPW document *'The Planning System and Flood Risk Management: Guidelines for Planning Authorities'* (OPW, 2009) states that flooding can cause physical injury, illness and loss of life. Deep, fast flowing or rapidly rising floodwaters can be particularly dangerous, with increased risk if the floodwater is carrying debris. Some of these impacts may be immediate, the most significant being drowning or physical injury due to being swept away by floods. Floodwater contaminated by sewage or other pollutants (e.g. chemicals stored in garages or commercial properties) is particularly likely to cause such illnesses, either directly as a result of contact with the polluted floodwater or indirectly as a result of sediments left behind. The published EPA Advice Note No. 6 provides advice on restoring public water supplies affected by flooding. Floodwater may also hide other hazards for wading pedestrians, such as manhole openings where the covers have been lifted by flood flows.

The impact on people and communities as a result of the stress and trauma of being flooded, or even of being under the threat of flooding, can be immense. Long-term impacts can arise due to chronic illnesses and the stress associated with being flooded and the lengthy recovery process. The ability of people to respond and recover from a flood can vary. Vulnerable people, such as those who are old, disabled or have a long-term illness, are less able to cope with floods than others. Some people may have difficulty in replacing household items damaged in a flood and may lack the financial means to recover and maintain acceptable living conditions after a flood.

With regards to air quality and human health, the most recently published EPA Air Quality report, '*Air Quality in Ireland 2009*' (EPA, 2010) states that traffic is the primary source of nitrogen dioxide and is also one of the main sources of particulate matter. Despite cleaner vehicle emissions technology decreasing the impact of individual vehicles, there has been an increase in the number of vehicles, which has offset any benefit in air quality. Domestic solid fuel use is the other main source of particulate matter in air in Ireland and particularly impacts air quality in areas where the sale of bituminous coal is permitted. As a result, levels of particulate matter in smaller towns are similar or worse than those in cities. During 2009, measured values of sulphur dioxide (SO₂), carbon monoxide (CO), ozone (O₃), particulate matter (PM₁₀ and PM_{2.5}), heavy metals, benzene and polycyclic aromatic hydrocarbons (PAHs) were all below limit and target values set out in the Clean Air For Europe (CAFÉ) Directive and 4th Daughter Directive.

5.3.2.7 Evolution in the Absence of the Programme: Human Beings

In the absence of Arterial Drainage Maintenance and High Risk Channel Designation activities being implemented, the risk of flooding to the benefiting lands would increase significantly. The impacts of flooding that can directly affect human beings include:

- Human health impacts, including loss of life, physical injury, illness, stress and trauma.
- Damage to residential properties.
- Damage to commercial and industrial premises and agricultural lands.
- Damage to transport infrastructure and electricity and water supply utilities.
- Knock-on effects due to soil erosion, bank erosion, landslides and damage to vegetation caused by flooding.
- Financial losses, e.g. due to loss of income, and increased costs.

Furthermore, under Section 37 of the Arterial Drainage Act 1945, the OPW is statutorily obliged to maintain all rivers, embankments and urban flood defences on which it has executed works since the 1945 Act in '*proper repair and effective condition*'. Failure to comply with this obligation would be contrary to the Drainage Act and could lead to compensatory claims for damage to the benefiting lands.

5.3.2.8 Relevance in Context of the Programme: Human Beings

The Arterial Drainage Maintenance and High Risk Channel Designation works form part of a series of OPW works programmes that aim to ensure effective management of flood risk. These works are carried out under the requirements of the Arterial Drainage Act 1945 and Arterial Drainage Amendment Act 1995, which shifted the emphasis of flood management activity from the improvement of agricultural land to the protection of urban areas subject to flooding. These works reduce the risk of flooding and its associated impacts on human health and safety, infrastructure and amenities, and the associated financial losses and costs.

5.3.3 Water

5.3.3.1 Introduction

All rivers, lakes, estuaries, coastal waters and groundwater in Ireland must achieve the standards of 'Good Ecological Status' (GES) and or 'Good Chemical Status' by 2015 to meet the requirements of the EU Water Framework Directive (WFD). The core objectives to be achieved by 2015 for all surface water bodies under the WFD are:

- Achieve protected areas objective

- Prevent deterioration (i.e. to maintain high or good status)
- Restore good status (i.e. by improving waters where less than good status)
- Reduce chemical pollution

The measures required to achieve these standards are set out in the River Basin Management Plans (RBMP) published in 2010. These include the basic measures required by law (i.e. actions required under 11 key EU Directives and other stipulated measures) that apply to all waters, and supplementary measures to be considered where basic measures will not achieve the stated objectives.

The basic measure recommended in the RBMPs specifically relating to flood risk management is '*Controls on physical modifications to surface waters*', which requires the implementation of controls to ensure that the physical condition of surface waters supporting ecological standards are not affected by new development. This will be in the form of new legislation where a system of prior authorisation for engineering activities on surface waters will be introduced. Whilst this new authorisation system will control future physical modification pressures, additional measures may be needed to restore good status to waters impacted by historical morphological schemes.

The Environmental River Enhancement Programme (EREP) is an OPW funded project, focusing on the enhancement of biodiversity and hydromorphology within OPW channels. The project is coordinated and managed jointly with Inland Fisheries Ireland (IFI). The main objective of the EREP is to assist in achieving 'Good Ecological Status' of OPW channel to comply with the requirement of the Water Framework Directive. OPW channels identified as "At Risk" of failing to achieve 'Good Ecological Status' by 2015 due to channelisation, will be enhanced through the EREP

5.3.3.2 Surface Water

Ireland is fortunate in having a relatively abundant supply of fresh water, which constitutes a key resource in economic, amenity and aesthetic terms. Approximately 50% of the land area of the State is drained by just nine river systems. The most recently published EPA water quality report, '*Water Quality in Ireland 2007 – 2009*' (EPA, 2010), presents a review of water quality in the State for the years 2007 to 2009. During this survey period, in excess of 1,550 river water bodies were directly assessed with regard to Water Framework Directive (WFD) status. The percentage of water bodies in each WFD category was calculated as follows: High 20.1%; Good 48.8%; Moderate 20.7%; Poor 10%; Bad 0.4%.

As part of the EPA 2007 – 2009 water quality assessment, measurements were carried out on more than 1,700 rivers and streams, representing over 13,000 kilometres of channel length. The 2007 – 2009 report lists the proportion of channel length in each pollution category within the seven RBDs in (or partly in) the Republic of Ireland. **Table 5.12** shows these results, with the corresponding results for the previous period, 2004 – 2006, shown in parentheses.

Table 5.12 EPA River Quality Results: 2007 – 2009 and 2004 – 2006 Surveys

RBD	Unpolluted	Slightly Polluted	Moderately Polluted	Seriously Polluted
South Western	92% (90%)	7% (8%)	2% (2%)	0% (0.2%)
Western	82% (%)	12% (%)	5% (%)	0.1% (%)
North	66% (71%)	20% (15%)	14% (13%)	0.4% (0.5%)

RBD	Unpolluted	Slightly Polluted	Moderately Polluted	Seriously Polluted
Western				
Shannon	58% (67%)	29% (22%)	12% (11%)	1.0% (0.7%)
South Eastern	64% (62%)	24% (26%)	12% (12%)	0% (0.4%)
Eastern	46% (52%)	34% (28%)	18% (19%)	1.0% (1.3%)
Neagh Bann	55% (49%)	22% (30%)	22% (20%)	0% (0.6%)

Source: *Water Quality in Ireland 2007 – 2009* (EPA, 2010)

There are over 12,000 lakes in Ireland. Due to past glacial activity these are primarily located along the Western seaboard and in the centre of Ireland, with relatively few in the East of the country. They are mostly shallow (< 5 metres mean depth), well-mixed lakes and, due to their proximity to the Atlantic Gulf Stream, they are not exposed to extremes of temperature.

Lake trophic status has traditionally been based on annual maximum chlorophyll values, according to a modified version of the OECD (Organisation for Economic Co-operation and Development) classification scheme. The number of lakes assessed using the modified OECD scheme in the period of 2007 – 2009 was 222, with a surface area of 988.4 square kilometres. The data in **Table 5.13** presents the EPA lake water quality classification results recorded during the 2007 – 2009 survey period.

Table 5.13 EPA Lake Water Quality Results: 2007 – 2009 Survey

Trophic Status	Number of Lakes	Surface Area (sq km)
Oligotrophic	98 (44.1%)	487.9
Mesotrophic	82 (36.9%)	422.1
Moderately Eutrophic	19 (8.6 %)	52.8
Highly Eutrophic	11 (5.0%)	15.3
Strongly Eutrophic	9 (4.1 %)	8.8
Hypertrophic	3 (1.4%)	1.5

The water quality of estuarine and coastal waters is assessed using the EPA's Trophic Status Assessment Scheme (TSAS). The scheme, which was designed to detect the occurrence of eutrophication in estuarine and nearshore waters, is based on relevant measures of water quality.

The trophic status of 89 water bodies from estuarine (transitional) and coastal areas around Ireland was assessed for the period of 2007 – 2009. Of these, 10.1% were classed as eutrophic, 5.6% as potentially eutrophic, 34.8% as intermediate and 49.5% as unpolluted.

The 'Water Status' assessment approach, as required by the Water Framework Directive, incorporates chemical and biological monitoring into a status grade for each water body. The EPA results for the water status assessment of surface water in Ireland recorded during the 2007 – 2009 survey period are summarised in **Table 5.14**.

Table 5.14 Surface Water Quality Status: 2007 – 2009 Survey

Surface Water Category	% of Total Area Surveyed: Status				
	High	Good	Moderate	Poor	Bad
Rivers	20.1%	48.8%	20.7%	10.0%	0.4%
Lakes	2.2%	32.8%	50.7%	12.8%	1.5%
Estuarine & Coastal	45.7%	17.7%	36.5%	0.1%	-

Source: *Water Quality in Ireland 2007 – 2009* (EPA, 2010)

5.3.3.3 Groundwater

In Ireland, groundwater quality is mainly of concern in relation to its suitability for use as a source of drinking water, in food processing and related industrial operations, and in the bottled water industry. The EPA's Water Quality Report for 2007 – 2009 states that approximately 26% of the public and private drinking water supply in Ireland is provided by groundwater. In certain counties, e.g. Roscommon, the percentage is significantly higher, with groundwater providing approximately 75% of the drinking water.

A large number of groundwater supplies exist nationally: It is estimated that there are at least 200,000 wells in the country, although many of these may no longer be in use.

Based on the hydrogeological characteristics and on the value of the groundwater resource, the land surface of the Republic of Ireland's is divided into aquifer categories (also described as resource protection areas). Eight aquifer categories are defined in 'Groundwater Protection Schemes' (DELG/EPA/GSI, 1999), and they are as follows:

Regionally Important (R) Aquifers:

- Karstified bedrock (Rk)
- Fissured bedrock (Rf)
- Extensive sand & gravel (Rg)

Locally Important (L) Aquifers:

- Bedrock which is Generally Moderately Productive (Lm)
- Bedrock which is Moderately Productive only in Local Zones (LI)
- Sand & gravel (Lg)

Poor (P) Aquifers:

- Bedrock which is Generally Unproductive except for Local Zones (PI)
- Bedrock which is Generally Unproductive (Pu)

During the course of National Aquifer Classification Programme (completed in 2004) undertaken for the Water Framework Directive, a further aquifer category was established: Lk – locally important karstified bedrock. Depending on the degree and nature of the karstification, Regionally important karstified bedrock aquifers (Rk) may be further characterised as either Rkc – dominated by conduit flow or Rkd – dominated by diffuse flow.

Groundwater is an important source of drinking water but also makes an important contribution to river flows and lake levels. **Figure 5.8** shows the aquifer distribution for the Republic of Ireland. Groundwater status based on the new water status classification (2008) is presented in **Table 5.15**.

Table 5.15 *Groundwater Status in Ireland: 2007 – 2009 Survey*

Status	% of Total Area	
	Good Status	Poor Status
Chemical Status	85.9%	14.1%
Quantitative Status	99.7%	0.3%

5.3.3.4 Important Water Resources

5.3.3.4.1 Register of Protected Areas

All of the areas requiring special protection in Ireland have been identified, mapped and listed in a register of protected areas. Article 6 of the WFD requires each Member State to establish a register of protected areas. This register has been split into 6 categories. **Table 5.16** summaries the existing protected areas throughout the country. Each of these categories is discussed in further detail in other related sections.

Table 5.16 *Areas Designated Under the Register of Protected Areas*

Protected Area	Total Designated Areas	Related Section in Chapter 5 of Report
Drinking Waters	1,631	5.3.2
Economically Significant Aquatic Species	585	5.3.7
Recreational and Bathing Waters	129	5.3.7
Nutrient Sensitive Waters	285	5.3.8
Protection of Habitats	33	5.3.1
Water Dependent SACs	472	5.3.1
Water Dependent SPAs	135	5.3.1

Source: River Basin Management Plans

5.3.3.4.2 Heavily Modified Water Bodies (HMWB)

Some surface waters have been designated as '*heavily modified*' under the WFD in recognition of the substantial changes in character that have occurred to these water bodies to allow uses such as navigation, water storage, public supply, flood defence and land drainage. These heavily modified water bodies (HMWBs) need to achieve an alternative, less stringent, standard of 'good ecological potential' (GEP), which recognises their important uses whilst seeking to improve their ecology as far as possible. The water bodies identified as HMWBs are listed in **Table 5.17**.

Figure 5.8 Aquifer Distribution for the Republic of Ireland

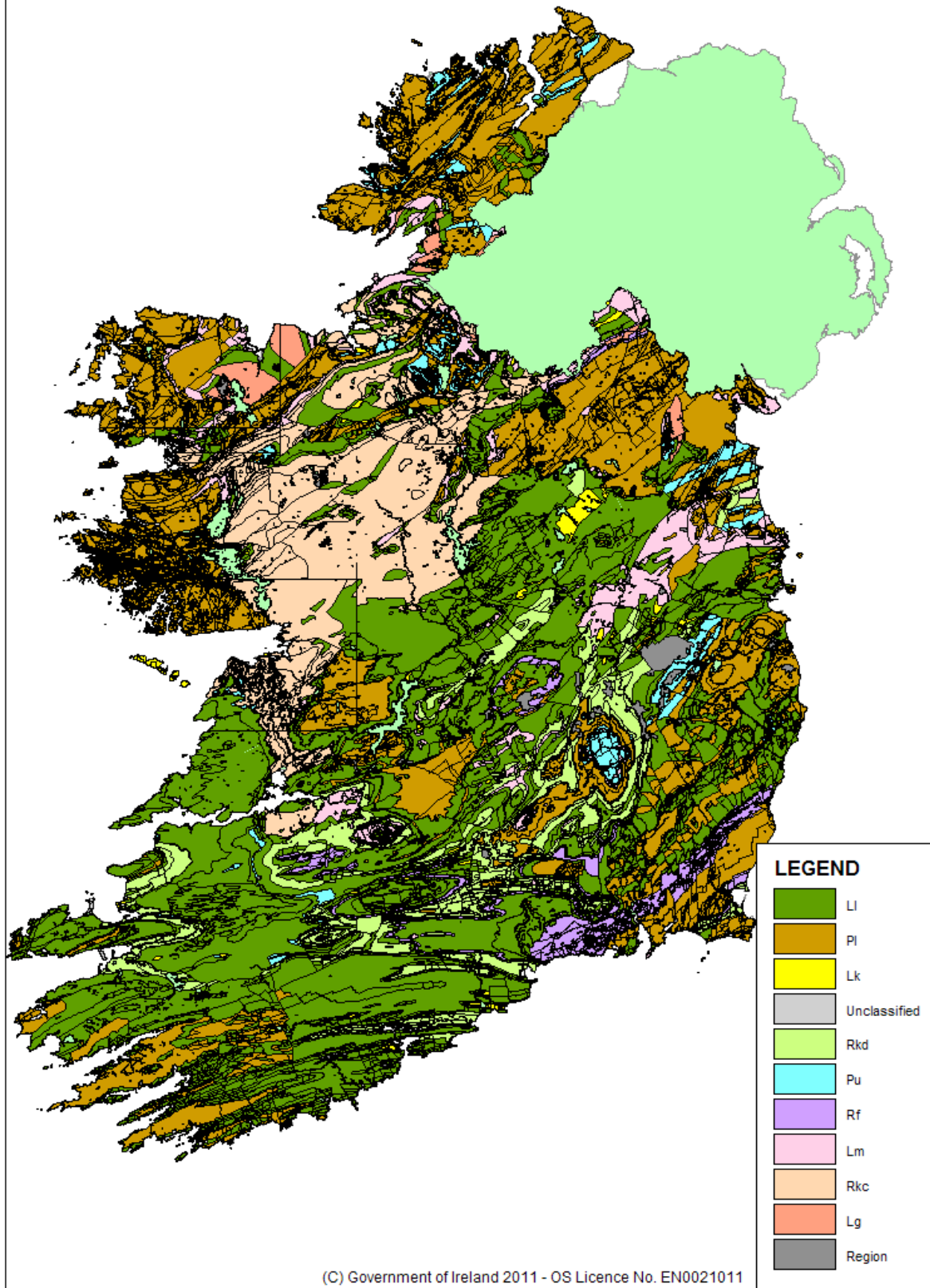


Table 5.17 *Heavily Modified Water Bodies in Ireland*

No.	RBD	Water Body Name	Final Ecological Potential Class
1	Eastern	Pollaphuca Reservoir	Moderate
2	Eastern	Golden Falls Reservoir	Moderate
3	Eastern	Leixlid Reservoir	Moderate
4	Eastern	Lough Nahanagan	Good
5	North Western	Assaroe Lake	Moderate
6	North Western	Erne d/s of Kathleen's Fall	Moderate
7	North Western	River Erne from Belleek to the dam (Cliff)	Moderate
8	North Western	Lough Nacung	Moderate
9	North Western	Lough Dunlewy	Good
10	South Western	Carrigadrohid Reservoir	Moderate
11	South Western	Inniscarra Reservoir	Moderate
12	Shannon	Lough Derg (lower)	Moderate
13	Eastern	Vartry Reservoir (lower)	Good
14	Eastern	Vartry Reservoir (upper)	Good
15	Eastern	EA_Vartry170_Vartry3	Good
16	Eastern	Glenasmole Reservoir (lower)	Good
17	Eastern	Glenasmole Reservoir (upper)	Good
18	Shannon	Doo Lough	Moderate
19	North Western	Lough Salt	Good
20	Shannon	River Fergus (main)	Poor
21	Shannon	River Fergus (Spancelhill)	Poor
22	Eastern	EA_Santry166_Santry1	Poor
23	Eastern	Liffy Estuary Lower	Moderate
24	South Eastern	Rosslare Harbour	Moderate
25	North Western	North Western Atlantic Ocean (Killybegs Harbour)	Moderate
26	South Eastern	Lower Suir Estuary (Little island to Cheekpoint)	Moderate
27	South Eastern	New Ross Port	Moderate
28	South Western	Lee (Cork) Estuary Lower	Moderate
29	South Western	Lough Mahon	Moderate
30	South Western	Cork Harbour	Moderate
31	Shannon	Limerick Dock	Moderate
32	Shannon	Foynes Harbour	Moderate
33	South	SE_NoreMain_Breagagh_Lower	Poor

	Eastern		
34	Eastern	Broadmeadow Water	Moderate

Source South Western RBD Programme of Measures - Overall Summary Report, 2008

5.3.3.5 Existing Environmental Pressures/Problems: Water

The main pressures on surface and groundwater quality are summarised by the headings set out below.

5.3.3.5.1 Eutrophication

Excessive nutrients in natural waters can lead to the accelerated growth of algae and weeds. This enrichment of water is called eutrophication and it is recognised as a major threat to the quality of Irish waters. Algal blooms and weeds can disrupt the normal functioning of an ecosystem, causing a variety of problems. They reduce the value of the affected waters for fishing, swimming and boating and can also interfere with the treatment of drinking water. In addition to this, excessive vegetation growth can reduce the flood capacity of drainage channels. In most cases where there are problems in freshwaters, the enrichment is caused by phosphorus inputs, whereas both nitrogen and phosphorus cause problems in estuaries. The sources of these nutrients and sewage, agricultural effluents, fertilisers and industrial wastes.

5.3.3.5.2 Wastewater and Industrial Discharges

Inadequately treated effluents and spills or leakage from sewerage networks can lead to unacceptable levels of pollutants in receiving waters. These pollutants can damage water quality and downstream uses (for example, bathing waters, shellfish waters or waters supporting sensitive species). There have been many cases of rivers and coastal areas that have been seriously polluted by this type of discharge and in response facility improvements are being put in place in many urban areas. The potential impacts of combined sewer overflow spillage and run-off from road networks are also potential water problems in Ireland.

5.3.3.5.3 Landfills, Mines, Quarries and Contaminated Sites

Waste disposal sites (including old unlined landfills), quarries, mines, gasworks sites and industrial lands produce lesser discharges to waters than wastewater plants and industries; however, subsurface residues or waste products from previous activities may continue to threaten groundwater and surface waters. Good records exist of today's engineered landfills and mines; however not of older sites. Of most concern are these older, unregistered sites that may still be affecting local groundwater and surface waters.

Another issue is the lowering of the water table at some mines and quarry sites, which can affect nearby wet areas and change water chemistry due to the transfer of groundwater to surface waters.

5.3.3.5.4 Agriculture

Two main water quality problems relating to agriculture have been identified; these are enrichment of water by nutrients (phosphorus and nitrogen) and organic pollution from animal slurry/manure and silage effluent. A third, pesticides, is covered under dangerous substances. In Ireland, agriculture is a very important activity, using about 64% of the land use (*www.teagasc.ie* 24/05/2010). Over 70% of phosphorus reaching inland water emanates from agriculture, and almost half of the eutrophication of rivers is due to agricultural sources. (*'EPA Viewpoint – Agriculture and the Environment'*, September 2006). The cumulative effect of nutrient loading is an issue along many Irish

rivers.

5.3.3.5.5 Wastewater from Unsewered Properties

In rural areas, many houses and businesses are not connected to public systems that collect, treat and dispose of wastewater, and they rely mainly on on-site systems (conventional septic tanks or proprietary systems) via soil percolation areas, which is not designed, installed or operated properly can results in water pollution. Throughout Ireland, more than 400,000 properties (20-30% of the total) are currently without public sewerage provision, representing over 1.3 million people (a third of the population), and generating around 230 million litres of wastewater a day. As many properties are spread over wide areas, provision of public sewerage systems, especially ahead of development, is very difficult and often very costly.

5.3.3.5.6 Forestry

Forest cover now accounts for just over 10% of Ireland's land area, with an objective to expand cover to 17% in the next 30 years. Forests can have both positive and negative impacts on the environment. Negative impacts are largely related to poor management or to planting on unsuitable soils. Some forests are located in sensitive catchments with habitat-protected species such as the freshwater pearl mussel, salmon and trout spawning areas. Many of the current water problems associated with afforestation are a legacy of old practices, which have subsequently been amended.

5.3.3.5.7 Peat Extraction

Peat extraction is an important industry in some areas of Ireland. Peat is harvested to fuel power stations and homes, and for gardening products. However peat extraction can give rise to certain localised water problems including silt nutrient release from milled areas. Peat harvesting activities typically require some drainage, which alters the local water table.

5.3.3.5.8 Discharge of Dangerous Substances

Some dangerous substances can be toxic to aquatic plants and animals. They can persist in waters and sediments, and slowly build up in the bodies of the aquatic organisms, poisoning them and causing problems higher up the food chain, or interfering with natural breeding processes.

A number of mines around the country are currently being assessed in terms of their remediation, rehabilitation and long-term management needs. The threat to water quality from discharge of dangerous substances from mining forms part of these assessments.

5.3.3.5.9 Physical Modifications and Other Built Development

Physical modifications can impact waterways by directly affecting habitats, or by indirectly changing natural processes through altering plant and animal communities, by reducing their variety or numbers. Land drainage, overgrazing, de-forestation and stock access can have an indirect effect, changing how much and how fast water drains off the land, resulting in an increased risk of property flooding.

There have been a number of large-scale schemes around the country involving physical modifications. Stretches of these drained river systems need to be maintained from time to time removing silt build up to keep them in '*proper repair and effective condition*', thus providing an outfall for land drainage, reducing flood risk and in certain areas ensuring the system is navigable. Localised drainage by landowners can also

lead to local flood problems.

Hard structures, such as ports and harbours, can replace or reduce natural habitats. In addition, widespread development on the floodplains, and in particular the potential effects on water quality and flooding behaviour as a result of the physical modifications to flood plains are of concern. In times of flood, rivers flow not only through their normal channel but also along the flood plains. Any constriction of the natural flow path can 'back-up' the river and lead to increased flood levels upstream. The *'Report of the Flood Policy Review Group'* (OPW, 2003) states that the construction of buildings or houses in or across a floodplain can not only put the development itself at risk of flooding, but can also increase the flood risk for land and properties upstream. The same is true of any form of construction or encroachment in the normal river channel. Undersized culverts or narrow openings between bridge piers carry the additional risk of causing a blockage of floating debris during high flows.

Covering natural or agricultural land, such as forests, woodland, pastures, crop fields or wetlands with buildings, tarmac (such as for parking areas or roads), or other impermeable materials without the inclusion of designed attenuation facilities, where appropriate, can significantly reduce the ability of this land to absorb rainfall, and will lead to increased land runoff. As a result large developments, including those away from major rivers, can increase river flows and the risk of flooding to land and property downstream. The *'Report of the Flood Policy Review Group'* (OPW, 2003) notes that while the impact of an individual development can be minor, a series of smaller developments built up over a period of time can have a significant effect on flood risk in areas downstream. Development that prevents floodwaters from accessing natural storage areas, such as can occur by constructing embankments around sections of a floodplain, reduces the attenuation of the river system. This in turn will increase flood flows and risk downstream.

5.3.3.5.10 Climate Change

It is widely predicted that the climate in Ireland will change in the future. Changes in climatic parameters are projected to have impacts on sea level, storm event magnitude and frequency, and rainfall depths, intensities and patterns. These impacts are likely to have significant implications for the degree of flood hazard, and hence flood risk, in Ireland. The average temperature of the global ocean has increased as deep as 3,000 metres. Such warming causes seawater to expand, contributing to sea level rise. The global average sea level rose at an average rate of 1.8mm per year over the period 1961 to 2003 with a rise of 3.1mm per year over the period 1993 to 2003, very likely due to thermal expansion and input of fresh water from melting of Greenland and Antarctic ice sheets (*'The National Climate Change Strategy 2007 – 2012'*, Department of Environment, Heritage and Local Government, 2007).

The exact impact of climate change is difficult to predict, however there is potential for heavier winter rainstorms to cause more flash flooding, resulting in an increase in diffuse pollution loads from soil run-off and increasing demands on flood controls. Summer droughts are considered likely and recent reports have indicated that the effects of climate change in Ireland will have serious consequences for water resources, resulting in a potential 40% reduction in drinking water supplies. Also, temperature changes may give invasive alien species a competitive advantage.

Changes in climatic parameters such as sea level and rainfall depths and intensities could have significant implications for flood risk to Ireland. The *'Report of the Flood*

Policy Review Group' (OPW, 2003) states that should climate change occur as currently predicted, the frequency and intensity of flood events will increase significantly, and so, with no influences from other sources (such as development), there will be an increase in flood damage.

5.3.3.5.11 Aquaculture

Aquaculture activities can potentially affect water quality, physical habitat, biodiversity and indigenous species populations. Finfish farming has a number of potential impacts such as increased nutrient loading and organic pollution around cages; use of authorised chemicals and medicines to control disease; and infection of wild fish with sea lice. Shellfish cultivation can cause morphological impacts mainly associated with shellfish harvesting activities.

5.3.3.5.12 Recreation

Cruising and boating activities can give rise to localised water problems, including discharge from on-board toilets, physical disturbance by boat wakes and potential engine oil spillage. Transfer of boats from one watercourse to another also has the potential to spread invasive species.

5.3.3.5.13 Shared Waters

A consistent approach to environmental policies and regulation in both Ireland and Northern Ireland is important to avoid imbalances that could inadvertently increase pressures, such as when waste from Ireland was illegally dumped in Northern Ireland after the introduction of waste charging in Ireland.

5.3.3.6 Evolution in the Absence of the Programme: Water

In the absence of Arterial Drainage Maintenance and High Risk Channel Designation activities being implemented, the risk of flooding to the benefiting lands would increase significantly. This section of the report addresses the potential impacts on water of an increased risk of flooding.

Ireland's increasing population will increase demand for clean drinking water and for wastewater treatment. The flooding of water distribution infrastructure, if it were to occur, could result in loss of water supply over large areas, which can magnify the impact of flooding well beyond the immediate community. In accordance with the Waste Water Discharge (Authorisation) regulations 2007, the licensing and certification authorisation process of wastewater treatment works will continue to regulate all discharges of waste water and consequently reduce or eliminate potential pollution of the aquatic environment. The flooding of wastewater treatment utilities could pose a significant pollution risk to water quality with consequent negative impacts on human health, habitats, flora and fauna due to bacteria and other pollutants carried by floodwater. Flood damage to water supply and wastewater treatment infrastructure can also have significant detrimental impacts on local and regional economies. (*'The Planning System and Flood Risk Management: Guidelines for Planning Authorities'*, OPW, 2009)

In relation to water quality, the aims of the Water Framework Directive (WFD) are to maintain high status of water where it exists, prevent any deterioration in the existing status of water and achieve at least good status in accordance with the targets set out in the River Basin Management Plans by 2015. The programme of measures required to achieve or maintain good status by 2015 and beyond will drive improvements in the water environment in the short-term and provide for the maintenance of this status into

future years. Flood events result in wash-off and leaching of pollutants, especially from more highly fertilised soils, causing increased phosphorus concentrations in rivers during flood events. This is particularly problematic if such floods occur during the growing season as eutrophication can result. The increased loading that results during flood events can deliver large quantities of nutrients to lakes and coastal waters (*Water Quality in Ireland 2007 – 2009*, EPA, 2010). The resulting potential negative impacts on water quality would be contrary to the aims of the Water Framework Directive and could lead to the failure of the affected waters to achieve or maintain high status.

The objective of the EREP is to assist in achieving 'Good Ecological Status' of OPW channel to comply with the requirement of the Water Framework Directive. Should arterial drainage maintenance works cease, the OPW's Environmental River Enhancement Programme (EREP) would also cease. OPW channels identified as "At Risk" of failing to achieve 'Good Ecological Status' by 2015, due to channelisation, would remain "At Risk" as Enhancement works required would therefore not be carried out.

5.3.3.7 Relevance in Context of the Programme: Water

The Arterial Drainage Maintenance and High Risk Channel Designation works form part of a series of OPW works programmes that aim to ensure effective management of flood risk. These works will assist in reducing the risk of flooding and its associated impacts on water quality, and water supply and wastewater infrastructure.

All rivers, lakes, estuaries, coastal waters and groundwater in Ireland must achieve the standards of 'Good Ecological Status' (GES)/'Good Ecological Potential' (GEP), and or 'Good Chemical Status' by 2015 to meet the requirements of the Water framework Directive (WFD).

The ecological status classification combines three factors:

- Biology;
- Supporting water quality conditions; and
- Supporting hydrology and morphology (physical condition)

The hydrology (i.e. river flows, lake levels and tidal patterns) and morphology (i.e. physical condition of surface waters) that support the ecology of waterbodies have the potential to be directly affected by changes in the flooding regime and the implementation of flood risk management measures. The WFD objectives, risks and measures have been taken into account, where relevant in the assessment of Arterial Drainage Maintenance and High Risk Channel Designation, by considering whether maintenance operations or 'Designation' proposals would adversely affect the implementation of proposed measures relating to hydromorphology. Furthermore, where arterial drainage maintenance operations are proposed within or where they could affect a Natura 2000 site, i.e. a Special Area of Conservation or Special Protection Area, an Appropriate Assessment in line with Article 6 of the Habitats Directive (92/43/EEC) is carried out.

The main objective of the EREP is to assist in achieving 'Good Ecological Status' of OPW channel to comply with the requirement of the Water Framework Directive. OPW Channels identified as "At Risk" of failing to achieve 'Good Ecological Status' by 2015 due to channelisation, will be enhanced through the EREP.

5.3.4 Air and Climate

5.3.4.1 Introduction

The EU has introduced several measures to address the issue of air quality management in Member States. The Air Quality Framework Directive (96/62/EC) set out the principles of the approach, and set out the limit values for pollutants in four “Daughter” directives.

The National Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002) transpose the first and second Daughter Directives 1999/30EC, which relate to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air and 2000/69/EC which relate to limit values for benzene and carbon monoxide in ambient air.

Under the respective Regulations, the EPA and Local Authorities are responsible for ambient air quality monitoring in Ireland. Continuous monitoring is carried out throughout Ireland, and the EPA compiles annual reports on air quality.

The Clean Air For Europe (CAFE) Directive (2008/50/EC) was published in 2008 and incorporates all the main air quality limits and measurement techniques into one Directive. It replaces the Air Framework Directive and first three Daughter Directives. It was transposed into Irish Law on 11th June 2010. In addition to the previous Directives, the CAFÉ Directive includes a target value for PM_{2.5}.

5.3.4.2 Air Quality

Air quality is assessed by monitoring the levels of various pollutants, including; particulate matter (PM₁₀); sulphur dioxide, nitrogen oxides, ground-level ozone and black smoke.

The EU Air Framework Directive requires that Member States divide their territory into zones for the assessment and management of air quality. For Ireland, four zones are defined in the Air Quality Regulations (2002), amended by the Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations (2009). The zones adopted in Ireland are as follows:

- Zone A – Dublin Conurbation.
- Zone B – Cork Conurbation.
- Zone C – 21 Urban areas with populations greater than 15,000.
- Zone D – Rural Ireland, i.e. the remainder of the state excluding Zones A,B and C.

Note: Zone C includes Galway, Limerick, Waterford, Clonmel, Kilkenny, Sligo, Drogheda, Wexford, Athlone, Bray, Carlow, Dundalk, Ennis, Naas, Tralee, Balbriggan, Celbridge, Letterkenny, Mullingar, Navan and Newbridge.

Air quality in Zone A is typical of major urban locations. In the city centre air pollution levels are higher primarily due to traffic-derived pollution. Results from the city centre monitoring stations indicated compliance with the Air Quality Standards with concentrations of nitrogen oxides and particulate matters compliant but more elevated. The EPA states that higher levels of nitrogen dioxide and particulate matters in urban areas have the potential to pose a threat to compliance with the limit values.

The most recent report on air quality from Cork City Council states that there is a slight

decrease in pollutant concentrations in Cork City (Zone B) year on year and compliance with the Air Quality Standards limit values.

Air quality in Zone C areas tends to be typical of towns and urban locations with the main sources of pollutants including traffic, commercial/domestic space heating and some industry. EPA monitoring results for 2006 at Zone C locations illustrate compliance with the Air Quality Standards limit values for all pollutants.

Air quality in Zone D areas is generally very good, with low concentrations of pollutants such as NO₂, PM₁₀, and CO. Concentrations of ozone are higher in rural areas than urban areas due to the absence of nitrogen oxide in rural areas as an ozone scavenger. Ozone is a transboundary pollutant, with location on the West Coast having the highest concentrations in Ireland.

In addition to the legislated air pollutants, nuisance such as dust deposition and odour can impact on amenity of the environment. Nuisance can occur at a local level in the vicinity of industrial, waste and wastewater treatment facilities. The EPA records all complaints in relation to IPPC and Waste licensed facilities. The European Communities (Waste Water Treatment)(Prevention of Odours and Noise) Regulations 2005 (S.I. 787 of 2005) require that waste water treatment plants and designed, constructed and maintained to avoid causing nuisance through odours and noise. The EPA audits the facilities to assess compliance with the Regulations.

5.3.4.3 Baseline Climatic Factors

The existing climate of Ireland is dominated by the Atlantic Ocean. Consequently, Ireland does not suffer from the extremes of temperature experienced by many other countries at similar latitude. According to Met Éireann, average annual temperature is about 9°C. In the midlands and East of the country, temperatures tend to be somewhat more extreme than in other parts of the country. For example, summer mean daily maximum is about 19°C and winter mean daily minimum is about 2.5°C in these areas.

Mean annual wind speed varies between about 4m/sec in the East midlands and 7m/s in the Northwest. Strong winds tend to be more frequent in winter than in summer. Sunshine duration is highest in the Southeast of the country. Average rainfall varies between about 800mm and 2,800mm. With Southwesterly winds from the Atlantic dominating, rainfall figures are highest in the Northwest, West and Southwest of the country, especially over higher ground. Rainfall accumulation tends to be highest in winter and lowest in early summer.

Greenhouse gases in the atmosphere (including carbon dioxide, methane, nitrous oxides and a number of gases that arise from industrial processes) are rising, as a result of human activity.

Under the Kyoto Protocol, Ireland's target is to limit emissions to 13% above 1990 levels over the five-year period from 2008 to 2012, within the overall EU target to reduce emissions to 8% in the same timeframe. For the period beyond 2012, the EU Council of Ministers has recently committed to achieving at least a 20% reduction of greenhouse gas emissions by 2020, compared to 1990 levels. The Council also agreed to extend this target to a 30% reduction if other developed countries commit to comparable reductions. Ireland's share of the reduction target has yet to be agreed.

5.3.4.4 Existing Environmental Pressures/Problems: Air and Climate

Currently there are no significant concerns with regard to air quality in at a national level. Poor wastewater treatment infrastructure can lead to odour nuisance issues at specific plants. Dust and PM₁₀ can also be an issue locally during construction and operation.

5.3.4.4.1 Air Emissions

Emissions of pollutants from vehicles, power stations, industry, domestic fuel burning and agriculture can have local, international or global effects. Air emissions from one country can give rise to problems in other countries notably acid rain and increased ground level ozone. Emissions of carbon dioxide and other greenhouse gases are enhancing the greenhouse effect, changing the global climate system.

The National Emissions Ceilings (NEC) Directive (2001/81/EC) sets upper limits for each Member State for the total emissions in 2010 of the four pollutants responsible for acidification, eutrophication and ground-level ozone pollution (sulphur dioxide, nitrogen oxides, volatile organic compounds and ammonia).

Power stations are the main source of sulphur dioxide (SO₂) emission. Ireland's national emission ceiling for sulphur dioxide, under the NEC Directive is 42 kilo-tonnes (kt) to be achieved by 2010. This equates to a 77% reduction from the 1990 baseline level. A 76% reduction was recorded by 2008.

Road transport is the principal source of nitrogen oxides (NO_x) emissions. Ireland's national emission ceiling for nitrogen oxides, under the NEC Directive is 65 kilotonnes (kt) to be achieved by 2010. This equates to a 48.4% reduction from the 1990 baseline level. An 11.2% reduction was recorded by 2008. Achieving the NEC target has been limited as improvements in NO_x emission from individual vehicles has been offset by the significant increase in vehicles and fuel use on the road.

Volatile organic compounds (VOCs) are emitted as gases from the use of a wide array of products including paints, adhesives and cleaning agents. Transport and solvent use accounted for 81% of the total non-methane volatile organic compounds (NMVOCs) emissions in 2008. Ireland's national emission ceiling for volatile organic compounds, under the NEC Directive is 55 kilotonnes (kt) to be achieved by 2010. This equates to a 32.9% reduction from the 1990 baseline level. A 69% reduction in NMVOC emissions was recorded by 2008.

Agriculture accounts for virtually all ammonia (NH₃) emissions. Ireland's national emission ceiling for ammonia, under the NEC Directive is 116 kilo-tonnes (kt) to be achieved by 2010. This equates to a 6% permitted increase from the 1990 baseline level. The emissions of ammonia are already compliant with the NEC limits due to a reduction in national herd numbers and a decrease in fertiliser use.

5.3.4.4.2 Climate Change

Inputs of greenhouse gases from water management activities around the country, which require the use of fossil fuels, add to the carbon dioxide emissions produced on the island. The emission of greenhouse gases in general is currently the focus of emission reduction programmes under Ireland's Kyoto Protocol agreements. In addition, the potential changes in climate predicted as a result of anthropogenic greenhouse gas emissions are expected to result in pressures on water quantity and precipitation regimes.

5.3.4.5 Evolution in the Absence of the Programme: Air & Climate

In the absence of the Arterial Drainage Maintenance and High Risk Channels Designation works being implemented air quality in Ireland is expected to remain good overall, due largely to the prevailing clean westerly airflow from the Atlantic and the relative absence of large cities and heavy industry. Ambient concentrations of nitrogen dioxide are likely to remain high in Dublin and Cork regardless of the proposed works, due to emissions from traffic. Levels of particulate matter are highest at traffic-influenced sites in cities, and in towns with no ban on bituminous coal (www.epa.ie).

Arterial drainage maintenance works, like other water management activities, require the use of fossil fuels, which add to the carbon dioxide emissions. In the absence of these works, this source of carbon dioxide emissions would be omitted.

5.3.4.6 Relevance in Context of the Programme: Air & Climate

Future changes in climate and the associated impacts on river flows and tide levels are likely to change the frequency, extent, distribution and pattern of flooding. Higher sea levels and wetter winters, with more intense rainstorms, together with possible increases in storminess could significantly increase both the frequency and intensity of flooding. For example, floods which currently have a 1 in 100 chance (1% probability) of occurring in any one year could occur much more frequently (*'The Planning System and Flood Risk Management: Guidelines for Planning Authorities'*, OPW, 2009). In addition to the ongoing maintenance of Arterial Drainage schemes, which aims to reduce flood risk, the High Risk Channel Designation scheme will identify high-risk channels and give permissive powers of maintenance to the OPW. This will ensure that new and previously unidentified potentially high-risk channels or defences that pose a significant flood risk or are of strategic importance are maintained to reduce the flood risk that may occur.

Arterial drainage maintenance works, like other water management activities, require the use of fossil fuels, which add to the carbon dioxide emissions. However the impacts of arterial drainage maintenance on air quality are not considered to be significant at a national level.

5.3.5 Cultural Heritage (Architectural and Archaeological Heritage)

5.3.5.1 Introduction

The sites, structures and features considered as part of the cultural heritage baseline description include water-related features (sites or features of which the water and water body is an essential part of the site, for example, water mills or canals) and non-water related features (sites or features in close proximity to existing water bodies, where although water is not part of the site, they could be adversely affected by alterations or changes in the existing water body). Coastal and marine heritage is also considered.

5.3.5.2 Record of Monuments and Places

The Record of Monuments and Places is a statutory list of all known national monuments in Ireland. Within the six River Basin Districts in the Republic of Ireland there are 2,290 recorded sites, both water and non-water related, within ten metres of rivers. These sites generally consist of megalithic tombs, ring forts, ritual sites and bridges. The proximity of these features to water means that these sites are at greatest risk of potential impacts from Arterial Drainage Maintenance and High Risk Channel Designation.

5.3.5.3 Engineering Heritage

In addition to the Record of Monuments and Places referred to above, there are a number of water-related sites listed for their engineering importance within the National Industrial Engineering Heritage (NIEH) record maintained by the Engineering Department of Trinity College. **Table 5.18** details the most notable of these sites in each River Basin District in the Republic of Ireland.

Table 5.18 *Sites of Engineering Heritage*

River Basin District	Sites
Eastern	Engineering Complexes of Grand and Royal Canals, and the Boyne Navigation. Structures, lighthouses and breakwaters of Dublin Port and Dún Laoghaire.
Neagh Bann	Bridges, fords, etc.
North Western	Lough Erne Hydroelectric power station. Aquaducts
Shannon	Pump houses and quays Canals associated with the Shannon Navigation Bridges and weirs
South Eastern	60 watermills, 2 tidal mills 70 bridges, 12 fords Causeway to Lady's Island
South Western	197 mills and milling complexes 96 mines, 6 millstone quarries Waterworks at Shanakeil. Seawall at Dunboy Dam at Greenville
Western	Watermills, bridges and weirs

Source: River Basin Management Plans

5.3.5.4 Marine Heritage

The Underwater Heritage Database is currently being compiled for Ireland. Hydrographical charts mark numerous wrecks and seabed obstructions; however, these are primarily for navigational rather than cultural heritage importance.

Much of Ireland's inshore cultural marine heritage is unrecorded. There are estimated to be thousands of wrecks in Ireland's inshore waters. Most of these are currently unknown and difficult to detect, especially those of wooden construction, though most of these wrecks and structures are thought to be associated with historic ports and harbours and their approaches.

5.3.5.5 Sites and Properties

In addition to the monument registers, there are a number of properties and areas managed by cultural heritage groups. These are structures or areas that have been passed to the care of responsible bodies for restoration, public access and amenity value. **Table 5.19** provides examples of some of these sites found in each of the River Basin Districts in the Republic of Ireland.

Table 5.19 *Sites Maintained by Cultural Heritage Groups*

River Basin District	Sites
Eastern	Battle of the Boyne Site,

River Basin District	Sites
	18 th Century Oldbridge House Boyne Visitor Center Bru na Boinne Visitor Center, Newgrange Knowth Neolithic monuments of Newgrange, Knowth and Dowth
Neagh Bann	Gilford Castle, Banbridge Parkanaur, Dungannon Gosford Castle, Armagh
North Western	Crom, Upper Lough Erne Parkes Castle, Sligo Glenveagh National Park, Letterkenny Gull & Rough Islands
Shannon	Roscrea Heritage Centre Scattery Island Centre Corlea Trackway Visitor Centre
South Eastern	Dungarvan Castle Wexford Wildfowl Reserve
South Western	Barryscourt Castle, Carrigtwohill, Co. Cork Charles Fort, Kinsale
Western	Connemara National Park Aughnanure Castle

Source: River Basin Management Plans

5.3.5.6 International

Ireland contains numerous cultural heritage sites of international importance, many of these are UNESCO (United Nations Educational, Scientific & Cultural Organisation) World Heritage and Biodiversity Sites. **Table 5.20** lists some of the sites of international cultural heritage importance found in each of the River Basin Districts in the Republic of Ireland.

Table 5.20 Sites of International Cultural Heritage Importance

River Basin District	Sites
Eastern	Bull Island Archaeological Ensemble of Bend of the Boyne
Neagh Bann	Gilford Castle Gasford Castle
North Western	Céide Fields Western Stone Forts Northwest Mayo Bog Complex
Shannon	Burren Conmacnoise
South Eastern	Cashel, including Rock of Cashel
South Western	Skellig Michael, Co. Kerry Killarney National Park
Western	Céide Fields Northwest Mayo Bog Complex

Source: River Basin Management Plans

5.3.5.7 Existing Environmental Pressures/Problems: Cultural Heritage

Ireland's archaeological and historic architectural heritage is a finite resource. This resource is increasingly threatened by urbanisation although the excavations required to

facilitate this development have, somewhat contradictorily, revealed much of previously unknown archaeological heritage. In general terms, development resulting from economic growth and increasing population is placing pressure on sites and features of known or previously unknown cultural heritage interest. Individually, these developments and their associated infrastructure can increase the potential to impact on sites and features of archaeological and architectural heritage. Cumulatively, this results in increased pressure on the overall cultural heritage resource.

5.3.5.8 Evolution in the Absence of the Programme: Cultural Heritage

In the absence of Arterial Drainage Maintenance and High Risk Channel Designation activities being implemented, the risk of flooding to the benefiting lands would increase significantly. The risk of flood damage to features of architectural or archaeological heritage located within these lands would therefore also increase.

5.3.5.9 Relevance in Context of the Programme: Cultural Heritage

During the course of the original Arterial Drainage Scheme excavations following the 1945 Act, approximately 18,500 accommodation bridges were modified or replaced as required. These bridges provide riparian farmers with farm vehicular/foot access. In general, as channel maintenance work proceeds, the bridges are inspected by supervisory industrial staff, and if required, repairs or replacements are carried out. On many occasions, it is not necessary to fully replace the structure, and repairs such as under-pinning foundations or replacement of wind walls, parapets or deck are carried out to extend the bridge life. Failure to maintain these structures could lead to failure of the structure due to erosion, scouring or collapse. Approximately 170 bridges, some of which may be of architectural heritage interest, are repaired or replaced each year. Ancillary structures such as sluice gates, tidal barrages and pumping stations - some of which may also be of architectural heritage interest - are repaired or replaced as necessary to maintain their respective operating function.

In more general terms, the OPW works reduce the flood risk to benefiting lands, thereby also reducing the flood risk to sites and features of archaeological and architectural heritage located within these lands.

For High Risk Channel Designations, archaeological assessments may be required prior to works commencing.

5.3.6 Landscape

5.3.6.1 Introduction

Due to the nature of drainage maintenance operations, it is not envisaged that landscapes would be of major concern. However this subject will be considered for High Risk Channel Designation projects. Landscape Character Assessments have been completed for a number of counties to date. These along with the County Development Plans will be consulted to determine the landscape designations at the planning stages of any High Risk Channel Designation projects. The National Landscape Strategy has not been published to date, therefore was not consulted during this study.

5.3.6.2 Scenic Landscape Areas and Routes

The study area for this assessment encompasses a wide range of landscapes. In terms of landscape and visual amenity, the Local Authorities in Ireland conserve and protect scenic value as Areas of High Amenity, Areas of Outstanding Natural Beauty, Scenic

Routes and Protected Views, etc. Each Local Authority is responsible for the designation of such features within their individual jurisdictions, with the respective Development Plan providing objectives to protect them. Specific landscape features are often not listed within these plans; as such it is difficult to provide a list of these within this baseline.

Table 5.21 sets out the approach to Landscape Character Assessment taken by the Local Authority of each County located within the Study Area for this assessment. It also summarises the types of scenic landscape or route classified by each Local Authority.

Table 5.21 *Landscape Character Assessment*

County	Local Authority Approach to Landscape Character Assessment
Cavan	County Development Plan (CDP) 2008 – 2014 identifies Areas of High Landscape Value and Areas of Special Landscape Interest. A number of Scenic Viewing Points and Scenic Routes are also identified.
Clare	Landscape Character Assessment (LCA) document prepared in 2003. The LCA divides the county into 21 Landscape Character Areas and 26 Landscape Character Types. County Development Plan identifies 31 Scenic Routes and divides the county into Settled Landscapes, Working Landscapes and Heritage Landscapes.
Cork	Landscape Character Assessment document prepared in 2003, identifies 76 Landscape Character Areas (LCAs), which are amalgamated into a set of 16 generic Landscape Types based on similar physical and visual characteristics. County Development Plan 2009 identifies Scenic Routes and Scenic Landscapes.
Donegal	County Development Plan 2006 – 2012 identifies Areas of Especially High Scenic Amenity and protected Views and Prospects.
Dublin	No specific Landscape Character Assessment carried out by Dublin City Council. Fingal Development Plan 2007 – 2017 identifies six Landscape Character Types (LCTs). The sensitivity of each LCT is described using a scale ranging from Low to High. The value of each LCT is described using a scale ranging from Modest to Exceptional. Dun Laoghaire/Rathdown Development Plan 2010 – 2016 identifies 14 Landscape Character Areas and lists 14 Views and Prospects for protection. South Dublin County Council Development Plan 2010 – 2016 divides the non-urban areas of the county into six landscape groups. It also lists 14 protected Views and Prospects.
Galway	Landscape Character Assessment document prepared in 2002; divides county into 25 Landscape Character Areas. Landscape Sensitivity Map classifies areas of the county on a scale ranging from 1 (Low sensitivity) to 5 (Unique Sensitivity). LCA document also lists 122 focal points and views within the county.
Kerry	County Development Plan 2009 – 2015 identifies areas of Prime Special Amenity and Areas of Secondary Special Amenity. Map 12.1 of CDP shows protected Views and Prospects.
Kildare	Landscape Character Assessment carried out in 2002; identifies 14 Landscape Character Areas, including the River Liffey, River Barrow, the Grand Canal Water Corridor and the Royal Canal Water Corridor. Landscape Character Assessment also identifies 40 Scenic Routes and Viewpoints and 5 Areas of High Amenity. County is divided into Landscape Sensitivity Areas of High, Medium or Low sensitivity.

County	Local Authority Approach to Landscape Character Assessment
Kilkenny	Landscape Character Assessment (LCA) 2008 – 2014 identifies 23 Landscape Character Areas and classifies landscape sensitivity on a scale ranging from 1 (Degraded) to 5 (Vulnerable). County Development Plan also identifies Areas of High Amenity and protected Views and Prospects.
Laois	County Development Plan 2006 – 2012 identifies protected Amenity Views and Prospects, and Special Areas of Development Control. A Landscape Character Assessment has recently been carried out and is included as an Appendix to the Draft County Development Plan 2012 – 2018.
Leitrim	County Development Plan 2009 – 2015 identifies seven Areas of Outstanding Natural Beauty, 14 Areas of High Visual Amenity and 29 Protected Views and Prospects.
Limerick	Landscape Character Assessment of County Limerick divides the county into ten Landscape Character Areas (LCAs). County Development Plan identifies protected Scenic Views and Prospects.
Longford	Appendix 7 of County Development Plan 2009 – 2015 identifies protected Views and Prospects and Scenic Routes within the county. Separate Landscape Character Assessment presented as Annex 4 to the CDP; identifies 7 Landscape Character Units.
Louth	County Development Plan 2009 – 2015 identifies 9 Landscape Character Areas, 22 Scenic Routes and 34 Views and Prospects of Special Amenity Value. Appendix 9 of the CDP also shows the Areas of Outstanding Natural Beauty and Areas of High Scenic Quality within the county.
Mayo	Landscape Appraisal of County Mayo included as an Appendix to County Development Plan 2008 – 2014; subdivides county into 16 character units. Character units with similar visual landscape elements are grouped into four Policy Areas. Landscape Appraisal also lists roads designated as Scenic Routes.
Meath	Landscape Character Assessment presented as Appendix to County Development Plan 2007 – 2013; identifies four Landscape Character Types, which are subdivided into 20 Landscape Character Areas (LCAs). Each LCA is described in terms of value, importance and sensitivity. Landscape Character Assessment also identifies 41 Views and Prospects for protection.
Monaghan	Landscape Character Assessment published in 2008; identifies 13 Landscape Character Types, which are grouped into 9 Landscape Character Areas.
Offaly	County Development Plan 2009 – 2015 classifies areas of the county according to sensitivity, on scale ranging from Low to High Sensitivity. CDP also identifies Areas of High Amenity and Views and Prospects of Special Amenity Value or Special Interest.
Roscommon	Landscape Character Assessment published in 2008; identifies seven Landscape Character Types, which are sub-divided into 36 Landscape Character Areas (LCAs). Landscape value of each LCA is described on a scale ranging from Moderate to Exceptional.
Sligo	County Development Plan 2005 – 2011 identifies Sensitive Rural Landscapes or Visually Vulnerable Areas. It also identifies 65 Scenic Routes within the county.
Tipperary	County Development Plan 2010 – 2016 identifies areas of Visually

County	Local Authority Approach to Landscape Character Assessment
North	Vulnerable Landscape. It also lists 15 Protected Views within the county.
Tipperary South	County Development Plan 2009 – 2015 identifies Special Sensitivity Areas and High Sensitivity Areas. Appendix 6 of CDP lists Protected Views.
Waterford	County Development Plan 2011 – 2017 presents a Scenic Landscape Evaluation; classifies Landscape Sensitivity on scale ranging from 1 (Degraded) to 5 (Vulnerable). Also lists 15 Scenic Routes within the county.
Westmeath	County Development Plan 2008 – 2014 identifies 11 Landscape Character Areas. High Amenity Areas and Protected Views also mapped.
Wexford	County Development Plan 2007 – 2013 groups landscapes into three main policy areas, subdivided into nine Landscape Character Areas.

5.3.6.3 Existing Environmental Pressures/Problems: Landscape and Visual

Existing pressures on landscapes and visual resources are primarily related to visual impacts resulting from the siting of developments. Many of these developments, which individually do not have significant adverse impact, have the potential to cumulatively and adversely significantly impact upon sensitive landscapes. However, the sensitivity of a landscape to development and therefore to change varies according to its character and to the importance which is attached to any combination of landscape values. The sensitivity of a particular landscape is derived from the evaluation of indicators such as visual amenity, cultural heritage, uniqueness, popularity, distinctiveness, and the quality of the elements of the area, the consideration of designations such as Special Protection Areas (SPAs), Special Areas of Conservation (SACs), Natural Heritage Areas (NHAs) and National Parks, and from information such as tourist maps, guidebooks and brochures.

5.3.6.4 Evolution in the Absence of the Programme: Landscape and Visual

The existing landscape, currently under pressure, is expected to change even more significantly over the next 20 years due to urban expansion, housing and building generally, tourism and recreation and infrastructure provision. However, the need for landscape protection is likely to become more significant as landscapes become more vulnerable to increasing development. In the absence of the Arterial Drainage Maintenance and High Risk Channels Designation works being implemented, the predicted changes in the existing landscape are expected to continue regardless. At a more localised scale, the absence of works being carried out at the relevant channel or structure would result in the associated visual impact not occurring.

5.3.6.5 Relevance in Context of the Programme: Landscape and Visual

The landscape and visual impacts associated with arterial drainage maintenance in most cases will be negligible. These temporary impacts are limited to the immediate vicinity of the works and are carried out where the arterially drained channels are already part of the existing landscape. The works that could potentially give rise to localised landscape or visual impacts include tree removal (where the tree is impinging on channel capacity), the spreading of material that has been removed in maintenance operations along the bank or on top of existing spoil heaps where present, and repair works to embankments, in the form of topping up with clay to design height.

5.3.7 Material Assets

5.3.7.1 Introduction

This section presents a summary description of the baseline environment in relation to material assets, including wastewater treatment works, coastal defences, harbours and ports, as well as non water-related material assets, such as road and rail infrastructure. The purpose of including water and non water-related material assets is to characterise those facilities whose operations may be affected either by measures in the Programme or who need measures implemented to alleviate impacts occurring in the absence of the Programme.

5.3.7.2 Water-Related Material Assets

5.3.7.2.1 Water Supply

Across the island of Ireland public and private water supplies are obtained from abstractions taken from groundwater, river and lake sources. There are 2,458 known water abstraction points in the Republic of Ireland and 176 registered impoundments. There are also 431 water treatment works.

5.3.7.2.2 Wastewater Treatment Plants

There are currently 487 wastewater treatment plants (WWTP) in the Republic of Ireland. The highest level of wastewater treatment in the Republic of Ireland is secondary with a minute number operating tertiary treatment systems. The vast majority of these WWTP discharge to rivers with a small percentage discharging to lakes, transitional and coastal waters.

5.3.7.2.3 Coastal Defences

Coastal defences in Ireland generally consist of seawalls, embankments, revetments, rock armour and breakwaters. The general locations of the coastal defences in each River Basin District (RBD) are detailed in **Table 5.22**.

Table 5.22 Coastal Defences

River Basin District	Coastal Defences
Eastern	Dublin Bay, Boyne Estuary, Arklow & the coast between Greystones & Wicklow.
Neagh Bann	3km network
North Western	Concentrated in the northern portion of the IRBD.
Shannon	24km network concentrated in the western, coastal portion of the IRBD: around Tralee bay & near Ballybunion, also in the Shannon estuary.
South Eastern	58km network concentrated around the coastal & transitional waterbodies in Waterford & Wexford.
South Western	29km network concentrated around the coastal & transitional waterbodies in Cork & Kerry.
Western	20km network mainly located around Galway Bay & the Aran Islands.

Source: River Basin Management Plans

5.3.7.2.4 Flood Defence

Flood defences in Ireland, include all Arterial Drainage Schemes, Flood Relief

Schemes, and Estuarine Embankment Schemes carried out under the Arterial Drainage Acts 1945 and 1995. The full list of these schemes can be seen in **Section 3.3.2.6.2** of this report.

5.3.7.2.5 Dams, Weirs & Hydroelectric Power

A summary of the dams, weirs and hydroelectric facilities located within each RBD is presented in **Table 5.23**.

Table 5.23 *Dams, Weirs & Hydroelectric Power*

River Basin District	Dams, Weirs & Hydroelectric Power
Eastern	16 Weirs, 5 with fish passes. No data available on dams or hydroelectric power.
Neagh Bann	40 Dams, 72 Fords, 221 Weirs & 54 Sluices within the NI side of the RBD.
North Western	Artificial lake level controls on Lough Alton, Hydroelectric power generation at Clady Headrace in north Donegal.
Shannon	21 Locks, 566 Sluices, & 97 Weirs. Also hydroelectric power station at Ardnacrusha Dam near Limerick.
South Eastern	No data available on dams, weirs or hydroelectric power.
South Western	127 Sluices & 121 Weirs, No data available on dams, impounds other than on the River Lee or hydroelectric power.
Western	44 Weirs, No data available on dams or hydroelectric power.

Source: River Basin Management Plans.

5.3.7.2.6 Navigable Waters & Canals

There are hundreds of kilometres of navigable waters and canals located in Ireland. **Table 5.24** presents a summary of the main navigation systems located within each RBD.

Table 5.24 *Navigable Waters & Canals*

River Basin District	Navigable Waters & Canals
Eastern	Royal Canal, Grand Canal. The Naas Branch of the Grand Canal & a short section of the River Boyne.
Neagh Bann	Lower Bann & Lough Neagh Navigation System, Newry Canal, Ulster Canal, Lagan Navigation.
North Western	The approach to Killybegs Harbour, Lough Swilly, stretches of Lough Foyle. Jamestown Canal & The Ballinamore-Ballyconnell Canal (Shannon-Erne Navigation).
Shannon	Shannon Navigation, Shannon-Erne Navigation, Royal Canal & Grand Canal.
South Eastern	Grand Canal, Barrow Line, Barrow River, Barrow, Nore & Suir Tidal Waters & The Slaney Navigation.
South Western	No significant Navigation Systems.
Western	Lough Corrib & River Corrib

Source: River Basin Management Plans

5.3.7.2.7 Fisheries & Shellfish Waters

In addition to the requirement to protect fisheries detailed in **Section 5.3.1.4.7**, the Shellfish Waters Directive (2006/113/EC) also requires Member States to designate waters that need protection in order to support shellfish life and growth. It also provides

for the establishment of pollution reduction programmes (PRPs) for the designated waters. The Shellfish Waters Directive is implemented in Ireland by the EC (Quality of Shellfish Waters) Regulations 2006 (S.I. 268 of 2006). PRPs were established for 14 sites already designated under these Regulations. The EC (Quality of Shellfish Waters) (Amendment) Regulation 2009, adopted in 2009, provide for the designation of 49 additional areas for protection.

The locations of the main fisheries and shellfish waters within each RBD are summarised in **Table 5.25**.

Table 5.25 Fisheries & Shellfish Waters

River Basin District	Fisheries & Shellfish Waters
Eastern	There are 4 operations for shellfish beds at Howth & Dublin Bay, 18 main fisheries are located off the eastern RBD coastline, including whelk & crustacean pots around Dublin Bay and mussel & scallop dredging off the Wicklow Coast.
Neagh Bann	22 inland aquaculture sites (mostly north of Lough Neagh), 77 commercial aquaculture operations (mainly for oysters & mussels, and almost all within Carlingford Lough. Fisheries & aquaculture operations are also carried out in Donegal Bay.
North Western	Commercial aquaculture activities are located in Mulroy, Trawbreaga & Donegal Bays, Lough Foyle, Lough Swilly & Gweebarra Bay. Scallop Dredging & trawling are carried out further offshore.
Shannon	32 commercial aquaculture operations (mainly for oysters, scallops & mussels) located mainly in the Lower Shannon Estuary. 46 commercial fisheries within the Shannon Estuary & along the west coast, (these fisheries include crustacean pots, drift netting, nephrop & pelagic trawling).
South Eastern	118 commercial aquaculture activities located mainly at Dungarvan, Waterford & Wexford Harbours and Fethard Bay. 24 main fisheries (ranging from whelk pots off the east & south east of Wexford to Drift, tangle and Gill nets off the south coast of Waterford.
South Western	363 commercial aquaculture activities (mainly for scallops, oysters, mussels, seaweed & clams) located mainly in the inlets at Bantry & Roaringwater Bays & Castlemain Harbour. Also 103 main fisheries (ranging from large crustacean & shrimp pots which are generally closer to shore to Whitefish & Nephrop trawling further offshore).
Western	Off the west coast there are 450 commercial aquaculture activities (mainly for abalone, oysters, mussels & clams) located in bays and inlets & 103 main fisheries (ranging from large crustacean & shrimp pots which are generally closer to shore to pelagic trawling further offshore).

Source: River Basin Management Plans

5.3.7.2.8 Harbours & Ports

Table 5.26 presents a summary of the main commercial and fishing harbours and ports within each RBD.

Table 5.26 Commercial and Fishing Harbours and Ports

River Basin District	Commercial	Fishing
Eastern	Dun Laoghaire, Drogheda & Dublin	Balbriggan, Skerries, Howth, Dun Laoghaire, Wicklow & Arcklow
Neagh Bann	Greenore, Warrenpoint & Dundalk Harbour	Clogherhead
North Western	Killybegs, Derry City, & Greencastle	
Shannon	Shannon Foynes, Kilrush & Tralee Fenit	Castlegregory, Fenit & Carrigholt
South Eastern	New Ross, Rosslare & Waterford	Helvick, Dunmore East, Duncannon, Kilmore Quay, Wexford & Courtown.
South Western	Cork, Youghal, Kinsale, Bantry Bay & Castletownbere	Dingle, Cromane, Castletownbere, Valentia, Port Magee, Union Hall, Crosshaven, Cobh & Ballycotton
Western	Galway & Sligo	Carna, Achill & Belmullet

Source: River Basin Management Plans

5.3.7.2.9 Recreational Use of Waters

There are currently 131 designated bathing waters in Ireland, 122 of which are seawater and the remaining 9 are freshwater. ‘*The Quality of Bathing Water in Ireland – an Overview for 2010*’, (EPA, 2011) states that in 2010, the quality of Ireland’s bathing waters remained high, with 97% of them complying with the minimum mandatory values and achieving sufficient water quality status. In 2010, 74 of the 131 designated bathing waters achieved Blue Flag status. **Table 5.27** presents a summary of the recreational use of waters in each of the RBDs.

Table 5.27 Recreational Use of Waters

River Basin District	Recreational Use of Waters
Eastern	20 protected bathing waters. Recreational sailing is very popular around Dublin Bay & off the coast of Bray. Arklow & Greystones. Lough Ramor is popular for salmon, trout and coarse fishing & Lough Lene is popular for sailing & windsurfing.
Neagh Bann	7 protected bathing waters, 3, which are Blue Flag beaches, Lough Neagh & Carlingford Lough, are popular for water sports.
North Western	20 Blue Flag Beaches, Some of the best surfing beaches in the world, this combined with the remote beauty of the region and the numerous other water based activities that are available attracts many tourists.
Shannon	Navigation on the Shannon is a very important for tourism, 14 protected bathing water areas all located along the west coast, (including well known beaches such as Lahinch & Spanish Point). Fishing is also important in the Shannon region.
South Eastern	12 protected bathing waters, 6 received Blue Flag in 2008. The region is popular for fishing, sailing, surfing & windsurfing.
South Western	21 protected bathing waters, 16 received Blue Flag in 2008. The region is popular for angling, sea & shore fishing, sailing, surfing & windsurfing.
Western	30 protected bathing waters, 20 received Blue Flag in 2008, Lough

	Ree also received Blue Flag status in 2008. The region is popular for angling, sea & shore fishing, sailing & windsurfing, world-class surfing breaks occur in Co. Sligo.
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Source: River Basin Management Plans

5.3.7.3 Non Water Related Material Assets

5.3.7.3.1 Roads & Rail Infrastructure

Table 5.28 summarises the existing road and rail infrastructure within each of the RBDs.

Table 5.28 Roads and Rail Infrastructure

River Basin District	Roads	Rail
Eastern	7,000km of roads: 2% = Motorway, 6% = National Primary, 3% = National Secondary, 25% = Regional, Remainder = minor or unclassified urban roads.	500km of existing rail with 310km still in active use. The LUAS light rail network is present in Dublin City, this is to be expanded in the future along with the provision of a fully segregated Metro mass transit system.
Neagh Bann	10,800km of roads: 1% = Motorway, 7% = National Primary, 4% = National Secondary, 17% = Regional, Remainder = minor or unclassified urban roads.	380km of existing rail with 230km still in active use.
North Western	12,800km of roads: 4.1% = National Primary, 3.3% = National Secondary, 16.4% = Regional, Remainder = minor or unclassified urban roads.	227km of existing rail with 45km still in active use.
Shannon	17,700km of roads: 3% = National Primary, 5% = National Secondary, 17% = Regional, Remainder = minor or unclassified urban roads.	960km of existing rail with 490km still in active use.
South Eastern	14,000km of roads: 0.4% = Motorway, 4% = National Primary, 3% = National Secondary, 18% = Regional, Remainder = minor or unclassified urban roads.	800km of existing rail with 490km still in active use.
South Western	11,050km of roads: 3% = National Primary, 5% = National Secondary, 16% = Regional, Remainder = minor or unclassified urban roads.	492km of existing rail with 325km still in active use.
Western	8500km of roads: 5% = National Primary, 7% = National Secondary, 17% = Regional, Remainder = minor or unclassified urban roads.	530km of existing rail with 180km still in active use.

5.3.7.3.2 Landfills, Mines & Quarries

Table 5.29 presents a summary of the landfills, mines and quarries located within each of the RBDs.

Table 5.29 *Landfills, Mines and Quarries*

River Basin District	Landfills, Mines & Quarries
Eastern	There are 90 landfills some of which are closed or non-active and most of which are unlined. There are also a number of pits and quarries & one mine present.
Neagh Bann	There are a number of mines and quarries present, 2 landfills are located in the Ireland portion of the NBIRBD, both of which are lined, and 12 in the NI portion of the IRBD.
North Western	There are a number of mines and quarries present, 8 landfills are located in the Ireland portion of the NWIRBD and 5 in the NI portion of the IRBD.
Shannon	There are a number of mines and quarries present, 115 landfills are located in the Ireland portion of the Shannon IRBD, most of these are in Limerick & Longford; 22 of these are registered as illegal dumps.
South Eastern	There are 33 licensed waste facilities, including 12 landfills, some of these are closed or non-active. Only 3 landfills in the district are lined. There are also a number of pits and quarries & one mine present.
South Western	There are 31 licensed waste facilities, including some active landfills. In total there are 58 most of which are closes or non-active, many of the old landfills are unlined. There are also a number of pits and quarries present.
Western	There are a number of pits and quarries present; there are also 12 licensed waste facilities, 4 of which are landfills.

The potential for mineral and sand and gravel resources in Ireland is discussed in **Section 5.3.8 Soil, Geology and Land Use**.

5.3.7.4 Existing Environmental Pressures/Problems: Material Assets

Ireland's growing population has created an increasing demand for residential, commercial and industrial development and associated infrastructure. This increased rate of development continues to put pressure on existing material assets, for example, transport infrastructure and water supply and wastewater treatment facilities and associated infrastructure. Water quality issues are resulting in pressures on economic shellfish and aquaculture activities, along with fisheries used for recreational purposes. Some of the physical modifications identified as material assets, such as dams and weirs, may also be resulting in pressures on fisheries used for recreational and commercial purposes. Programmes of wastewater treatment plants and networks, water supply infrastructure, transport infrastructure and powerlines etc. are required to be implemented in several areas in order to accommodate recent and future growth.

5.3.7.5 Evolution in the Absence of the Programme: Material Assets

In the absence of Arterial Drainage Maintenance and High Risk Channel Designation activities being implemented, the risk of flooding to the benefiting lands would increase significantly, with resulting potential negative impacts for material assets located on

these lands, including agricultural land, commercial and industrial premises, transport and communications infrastructure, water supply and wastewater treatment facilities and infrastructure. Flood damage to these material assets could have potential knock-on negative impacts on human beings, flora and fauna and air and soil quality.

The flood defences maintained by the OPW works are themselves a material asset. In the absence of maintenance works being carried out, such defences would not be kept in proper repair and effective condition, thereby resulting in the loss of a valuable material asset.

5.3.7.6 Relevance in Context of the Programme: Material Assets

Flood defences are a material asset. The Arterial Drainage Maintenance and High Risk Channel Designation works entail the maintenance of watercourses and their associated flood defences to ensure effective management of flood risk into the future. This management of flood risk provides protection for other material assets from flooding.

5.3.8 Soil, Geology and Land Cover

5.3.8.1 Soils

Soils vary considerably in their characteristics, depending on the kinds of rocks from which they were formed, the conditions under which they were formed and the length of time which has subsequently elapsed. Soils differ in depth, physical structure, water content, organic matter content and in their chemistry. These differences affect the fertility of the soil, its ability to retain and release substances, its influence on surface waters and groundwater chemistry and the kinds of flora and fauna it supports and contains. A great variety of soils are found in Ireland and this diversity arises from many factors (*'Towards Setting Environmental Quality Objectives for Soil'*, EPA, 2002). The General Soil Map of Ireland, published by An Foras Talúntais (forerunner organisation to Teagasc) in 1980 following the National Soil Survey, shows the soil types occurring throughout the country. **Table 5.30** summaries the main soil types within the River Basin Districts in the Study Area for this assessment.

Table 5.30 *Soils Types in Ireland*

River Basin District	Soil Types
Eastern	Mostly grey brown podsoles, gleys, acid brown earths & brown podsoles in lowlands these are naturally fertile and allow for productive agriculture. Basin peats are widespread, while brown podsoles & peaty podsoles are found on upper flanks. Mountain top ridge zones contain high-level blanket peats and lithosols. Soils in this region have good drainage properties, 65% of the area has low risk of runoff.
Neagh Bann	Most predominant soil types are gleys, acid brown earths, small areas of brown earths, grey brown podsoles & peats are present. The poorly & imperfectly drained gley soils are mainly in the north east and south west and the well drained acid brown earths are in the south east. Small areas of blanket peat are found in the Northeast. Poorly drained basin peat is found in some areas around Lough Neagh.
North Western	Blanket peat, peaty podzols and lithosols, all which tend to be persistently wet, are present in the north west, the north east

	consists mainly of drown podsols and peaty gleys and the south & centre is composed mainly of gleys with low to moderate conductivity.
Shannon	The south west, west and far north of the region is composed mainly of poorly drained gley soils. The north, north-east and centre of the region consists of well-drained grey brown podzols, there are also small areas of poorly drained peats and well drained brown earths in the RBD.
South Eastern	Lowland areas consist of well-drained soils, with good moisture holding capacities, (minimal grey brown podzolics with associated brown earths, basin peat & acid brown podzolics with associated gleys, regosols & podzols). Upland areas have poorly drained soils, (brown peaty podzolics with associated gleys).
South Western	Mainly peats, gleys & podsols, the southwest of the district is dominated by excessively drained peaty podsols and lithosols, along with poorly drained blanket peats. The northwest is poorly drained gleys and some blanket peats. The east is mainly well-drained acid brown earths & brown podsols.
Western	Dominated by poorly drained blanket peats and excessively drained lithosols in the west, the rest of the region consists mostly of well-drained brown earths & grey brown podsols with smaller areas of blanket and basin peats.

5.3.8.1.1 Soil Suitability

Soil suitability classification essentially consists of outlining the range of uses to which a given soil is adaptable, including determining the production potential of each soil for the normal range of farm or forest crops. This classification provides the essential link between the physical and economic aspects of the use of soils. An evaluation of soil suitability was carried out as part of the National Soil Survey of Ireland (Teagasc) for many of the counties in Ireland.

Agricultural land classification is held by the Agri-Food and Biosciences Institute (ABFI) in Northern Ireland. The highest agricultural class (Class 1) does not occur in Northern Ireland and Classes 2-3A (31% of the total) represent the best and most versatile agricultural soils

5.3.8.1.2 Nitrate Vulnerable Zones

Within Ireland, a Nitrates Action Programme has been prepared in accordance with Article 5 of the Nitrates Directive and is to be applied to the State as a whole.

The Waste Management (Use of Sewage Sludge in Agriculture) Amendment Regulations 2001, requires that where sludge is reused in agriculture, Local Authorities ensure that the testing and management of the sludge, is compliant with the requirements of the Regulations, and in particular that a nutrient management plan is used.

In 2004 Northern Ireland adopted a “total territory” approach to protection waters under the Nitrates Directive. The Nitrates Action Programme Regulations (NI) 2006 & the Phosphorous (Use in Agriculture) Regulations (NI) 2006 bring into operation, measures to improve the use of nutrients on farms.

5.3.8.1.3 Soil Contamination

In April 2007, the EPA published a Code of Practice that provides a framework for the

identification of contaminated sites, the assessment of the potential risks associated with them and the identification of the appropriate remedial measures or corrective actions required to minimise risk to the environment and human health.

In Northern Ireland, Part III of the Waste and Contaminated Land (NI) Order 1997, the provisions of which are yet to be implemented, covers the management of contaminated land. The regulations and guidance for its implementation, when published, will bring into force a framework for the identification and remediation of land where contamination causes unacceptable risks. The Department of the Environment has proposed the implementation of a contaminated land regime to cover the determination and remediation of contaminated land.

5.3.8.1.4 Slope Stability & Landslide Potential

Although severe landslides have occurred in Ireland they are not common and Ireland is not considered to be a high-risk location. The majority of landslides that have occurred in the past have been confined to uplands, peat bogs and coastal areas.

The GSI Landslides Working Group (ILWG) is currently working on compiling a landslide database, which is key to allowing for sustainable development of the landscape and will play an important role in the planning process. The national landslide database is not currently complete, though information on specific areas is available.

In Northern Ireland it is planned to extend the UK landslide database to include known events in Northern Ireland.

5.3.8.2 Geology

The geology of Ireland is quite complex. To date, sites of geological interest have not been comprehensively covered by the existing nature conservation designations. This is currently being addressed by the DEHLG and the GSI who are drawing up a list of sites of geological interest that will be proposed as Natural Heritage Areas (NHAs).

5.3.8.2.1 Groundwater Vulnerability & Protection Zones

The vulnerability of groundwater to pollution is directly related to soil permeability and depth, i.e. the thicker and less permeable the overlying subsoil layer the lower the risk of pollution. Groundwater vulnerability zones are being mapped in Ireland by the GSI and in Northern Ireland by the GSNI. The entire country has not been mapped to date, and such areas are classed as areas of high/low vulnerability until mapping is complete.

Source protection zones have been established around groundwater sources such as wells, boreholes and springs that are used for public drinking water supply, which show the risk of contamination from any activities that might cause pollution in the area, i.e. the closer the activity the higher the risk. It should be noted that the entire island of Ireland has been designated as a Protected Area for Groundwater under the WFD.

5.3.8.3 Land Cover

Land cover in Ireland, based on data from the European Corine Land Cover (CLC) database for 2006. According to the CLC Ireland Land Cover Update for 2006 report, published by the European Environment Agency, Ireland is characterised by thirty-three of the forty-four Corine land cover classes. The main land cover in Ireland is agriculture (66.4%) with class 231 (Pasture) occupying over 50%. Peat bog and wetlands cover 18.69%. Land classified as forest areas occupies around 12% of the country. The

surface area occupied by artificial areas is 2.28%. Areas with low vegetative classes, including beaches, dunes and sand; bare rocks and sparsely vegetated areas cover less than 1% of the country. **Table 5.31** shows the percentage land coverage across the country. **Table 5.32** details the ten most frequent land cover classes in the CLC database 2006.

Table 5.31 *Percentage Land Coverage*

Cover	Area (ha)	% of Total
Agriculture	4,729,064.42	66.4
Bog & Wetlands	1,330,915.35	18.69
Forestry	853,659.38	11.99
Artificial	162,314.62	2.28
Low Vegetation	46,313.12	0.65
Total	7,122,266.88	100

Source: CLC Ireland- Land Cover Update for 2006

Table 5.32 *Most frequent land cover classes in CLC 2006.*

Class	Cover	Area (ha)	% of Total Area
231	Pastures	3598887.65	50.53
412	Peat Bogs	1094436.02	15.37
211	Non-Irrigated arable land	536638.22	7.53
243	Land principally occupied by agriculture with areas of natural vegetation	446504.74	6.27
324	Transitional woodland-shrub	419156.12	5.89
312	Coniferous forest	230202.54	3.23
242	Complex cultivation	147033.82	2.06
512	Water bodies	119236.46	1.67
112	Discontinuous Urban Fabric	108011.4	1.52
321	Natural grassland	89582.09	1.26

Source: CLC Ireland- Land Cover Update for 2006

Many farmers participate in the Rural Environmental Protection Scheme (REPS), run by the Department of Agriculture, Fisheries and Food, which reward those who farm in an environmentally friendly manner and promote environmental improvement.

As mentioned above, forestry covers approximately 12 % of the country. These forests are predominantly coniferous, harvested on a 40-50 year cycle. Forestry operations in Ireland are recommended to be carried out in accordance with the principles of sustainable forestry management (SFM) to meet high environmental, social and economic standards, as set out in national standards, guidelines and a Code of Best Forest Practice (Forest Service, 2000).

5.3.8.4 Existing Environmental Pressures/Problems: Soil, Geology & Land Use

Changes in soils result from both natural processes and human activities that contribute to their dynamic and evolving nature. Such changes are matters of concern if they result in the physical, biological or chemical degradation of soils. This can lead to the impairment of essential soil processes, the reduction in productive capacity, the depletion of soil quality and biodiversity and the direct loss of soil. Many of the changes arise as a result of pressures from human activities that can affect the physical, biological and chemical components of soils. The EPA document '*Towards Setting Environmental Quality Objectives for Soil*' (EPA, 2002) highlights the issue of soil

degradation and the need for soil protection. It states that the general consensus in Ireland is that soil quality is good overall. However, there is increasing pressure on soil particularly from land-use changes, intensification of agriculture, erosion and overgrazing, disposal of organic wastes to soils, afforestation, industry and urbanisation. These activities can lead to soil degradation including loss of organic matter, decline in soil fertility, acidification, loss of soil stability, increasing soil erosion, soil compaction, contamination, loss of biodiversity and loss of soil to buildings and infrastructure. Many of these activities, which affect soil functions, also have the potential to cause deleterious effects on air and water environments.

Weather patterns in Ireland are expected to change significantly in the coming years due to the influence of climate change. Predictions for the future are for wetter winters and drier summers along with an increase in the frequency of high intensity rainfall events. It is possible that such changes could seriously compromise slope stability resulting in landslides, this would have major implications for water quality in affected waterbodies.

Eutrophication of rivers and lakes can occur when large amounts of soil are washed into the water-bodies following heavy rainfall. If contaminated soils are eroded and they make their way to the marine environment then the marine ecosystem can be severely damaged.

Extraction activities if not managed correctly can cause problems for water quality. Peat cutting on a commercial scale causes long-term damage to the vegetation, hydrology and landscape in vicinity of the cutting activity.

5.3.8.5 Evolution in the Absence of the Programme: Soil, Geology& Land Use

In the absence of Arterial Drainage Maintenance and High Risk Channel Designation activities being implemented, the risk of flooding to the benefiting lands would increase significantly. The flooding of agricultural land could result in damage to the valuable soil resource within the relevant lands, with knock-on effects including loss of production and the associated financial losses and costs. The environmental effects of flooding to soil also include soil erosion, bank erosion and land sliding.

Under Section 37 of the Arterial Drainage Act 1945, the OPW is statutorily obliged to maintain all rivers, embankments and urban flood defences on which it has executed works since the 1945 Act in '*proper repair and effective condition*'. Failure to comply with this obligation would be contrary to the Drainage Act and could lead to compensatory claims for damage to the benefiting lands.

In the absence of Arterial Drainage Maintenance and High Risk Channel Designation activities being implemented, pasture is likely to remain the dominant land-use in Ireland, regardless. The pattern of increasing afforestation will continue at the potential expense of pasture, mixed farmland and wetlands in order to meet the Government target for forestry to compromise 17% of national land cover by 2030. Although few areas of suitable upland wetland habitat remain unplanted; these remaining areas will be unaffected in line with Government policy. Any new forest will be managed in accordance with Sustainable Forest Management (SFM) principles, including a requirement that broadleaf buffer strips be planted in commercial forests adjacent to streams and rivers to slow runoff and enhance the riparian environment (Forest Service, 2000). The Forest Environment Protection Scheme (FEPS), introduced in the 2007 National Rural Development Plan, will continue to encourage the establishment of high

nature value on farms that participate in REPS.

5.3.8.6 Relevance in Context of the Programme: Soil, Geology & Land Use

Channel maintenance operations involve removing the build up of foreign or natural material that impedes the free flow of water. The material removed in the maintenance operations is normally spread along the bank or on top of existing spoil heaps where present. Restrictions in channels due to bank slippage or damage are regarded to the original profile. Channel breaches due to bank erosion are resolved by re-profiling the bank in-situ or in some cases by importing protection material such as rock armour or log poles.

The Arterial Drainage Maintenance and High Risk Channel Designation works form part of group of work programmes that aim to ensure effective management of flood risk. These works reduce the risk of flooding to the benefiting lands, thereby protecting the soil and geology resources within these lands.

5.3.9 Interrelationships

This chapter has presented details of environmental features separately in terms of each environmental topic. However it is also important to recognise that there are a number of inter-relationships between topics, which means that, for example, changes to one environmental feature has direct or indirect effects on other features, for example, changes in water quality can have effects on human health and flora/fauna.

In carrying out the assessment these important direct and indirect relationships have been taken into account fully to ensure a robust and complete assessment. **Figure 5.9** highlights the key interrelationships identified in this SEA. The potential interrelationships will be taken into account in the assessment of the different alternatives.

Biodiversity, Flora & Fauna	√							
Population & Human Health	√	√						
Soils/ Geology	√	√	√					
Water	√	√	√	√				
Air & Climatic	√	√	√	√	√			
Material Assets	√	√	√	√	X	√		
Cultural Heritage	X	√	√	√	X	√	√	
Landscape	X	√	√	√	√	√	√	√
	Biodiversity, Flora & Fauna	Population & Human Health	Soils/ Geology	Water	Air & Climatic	Material Assets	Cultural Heritage	Landscape

Figure 5.9 Potential Inter-Relationships Between SEA Topics

Of particular note is the primary interrelationship between water (quality and quantity) and biodiversity, flora and fauna, soils, human health and population. Flora and fauna rely directly on the aquatic environment as a habitat but the terrestrial environment can also be strongly impacted by the aquatic environment. Habitats such as callows and turloughs rely on the aquatic environment for their formation and terrestrial fauna and birds can rely on it as a source of food. Water quality is also of particular importance

with regard to human health as it provides a source of drinking water and it yields foodstuffs (e.g. fish and shellfish). Water is also used for leisure and recreational purposes, providing a material asset both for local populations and as part of the tourism economy.

Another key interrelationship is between water and climate. Energy use during water management activities such as treatment of drinking water and wastewater, of arterial drainage maintenance works have the potential to negatively impact on climate through increased contribution to Ireland's greenhouse gas emissions. This in turn can result in more frequent and more intense flooding and drought conditions affecting material assets and human health, as well as biodiversity. However the greenhouse gases associated with Arterial Drainage Maintenance and High Risk Channel Designation works would not be a significant contribution compared to other activities such as water treatment and wastewater treatment.

5.4 Summary of Environmental Aspects Relevant to Programme

Flora and Fauna

The OPW have introduced a number of measures in order to minimise damage to the environment while carrying out the necessary maintenance works. The measures of relevance to biodiversity, flora and fauna include:

- Environmental Management Protocols and Standard Operational Procedures (SOPs) in order to minimise damage to the flora and fauna of the receiving environment have been instigated (see **Appendix 4**). These measures include leaving sections of river unmanaged.
- The OPW work closely with the National Parks and Wildlife Service (NPWS) and with Inland Fisheries Ireland (IFI) to reduce impacts on high-risk channels.
- The Environmental River Enhancement Programme (EREP), carried out by the OPW in conjunction with IFI, aims to enhance the biodiversity and hydromorphology of arterially drained channels and river corridors.
- Where arterial drainage maintenance operations are proposed within, or where they could affect a Natura 2000 site, i.e. a Special Area of Conservation or Special Protection Area, an Appropriate Assessment in line with Article 6 of the Habitats Directive (92/43/EEC) is carried out.

Research on targeted habitats (such as Turloughs) and species (such as Kingfisher and Otter) has been carried out to further inform decision making within the OPW.

Humans

The Arterial Drainage Maintenance and High Risk Channel Designation works form part of a series of OPW works programmes that aim to ensure effective management of flood risk. These works are carried out under the requirements of the Arterial Drainage Act 1945 and Arterial Drainage Amendment Act 1995, which shifted the emphasis of flood management activity from the improvement of agricultural land to the protection of urban areas subject to flooding. These works reduce the risk of flooding and its associated impacts on human health and safety, infrastructure and amenities, and the associated financial losses and costs.

Water

The Arterial Drainage Maintenance and High Risk Channel Designation works form part of a series of OPW works programmes that aim to ensure effective management of

flood risk. These works will assist in reducing the risk of flooding and its associated impacts on water quality, and water supply and wastewater infrastructure. All rivers, lakes, estuaries, coastal waters and groundwater in Ireland must achieve the standards of 'Good Ecological Status' (GES)/'Good Ecological Potential' (GEP), and or 'Good Chemical Status' by 2015 to meet the requirements of the Water framework Directive (WFD).

The ecological status classification combines three factors:

- Biology;
- Supporting water quality conditions; and
- Supporting hydrology and morphology (physical condition)

The hydrology (i.e. river flows, lake levels and tidal patterns) and morphology (i.e. physical condition of surface waters) that support the ecology of waterbodies have the potential to be directly affected by changes in the flooding regime and the implementation of flood risk management measures. The WFD objectives, risks and measures have been taken into account, where relevant in the assessment of Arterial Drainage Maintenance and High Risk Channel Designation, by considering whether maintenance operations or 'Designation' proposals would adversely affect the implementation of proposed measures relating to hydromorphology.

The main objective of the OPW's EREP is to assist in achieving 'Good Ecological Status' of OPW channel to comply with the requirement of the Water Framework Directive. OPW channels identified as "At Risk" of failing to achieve 'Good Ecological Status' by 2015 due to channelisation, will be enhanced through the EREP.

Air & Climate

Future changes in climate and the associated impacts on river flows and tide levels are likely to change the frequency, extent, distribution and pattern of flooding. Higher sea levels and wetter winters, with more intense rainstorms, together with possible increases in storminess could significantly increase both the frequency and intensity of flooding.

In addition to the ongoing maintenance of Arterial Drainage Schemes, which aims to reduce flood risk, the High Risk Channel Designation programme will identify high-risk channels and give permissive powers of maintenance to the OPW. This will ensure that new and previously unidentified potentially high-risk channels or defences that pose a significant flood risk or are of strategic importance are maintained to reduce the flood risk that may occur.

Arterial drainage maintenance works, like other water management activities, require the use of fossil fuels, which add to the carbon dioxide emissions. However the impacts of arterial drainage maintenance on air quality are not considered to be significant at a national level.

Cultural Heritage

During the course of the original Arterial Drainage Scheme excavations following the 1945 Act, approximately 18,500 accommodation bridges were modified or replaced as required. These bridges provide riparian farmers with farm vehicular/foot access. In general, as channel maintenance work proceeds, the bridges are inspected by supervisory industrial staff, and if required, repairs or replacements are carried out. Failure to maintain these structures could lead to failure of the structure due to erosion,

scouring or collapse. Approximately 170 bridges, some of which may be of architectural heritage interest, are repaired or replaced each year. Ancillary structures such as sluice gates, tidal barrages and pumping stations - some of which may also be of architectural heritage interest - are repaired or replaced as necessary to maintain their respective operating function.

In more general terms, the OPW works reduce the flood risk to benefiting lands, thereby also reducing the flood risk to sites and features of archaeological and architectural heritage located within these lands.

For High Risk Channel Designations, archaeological assessments may be required prior to works commencing.

Landscape and Visual

The landscape and visual impacts associated with arterial drainage maintenance in most cases will be negligible. These temporary impacts are limited to the immediate vicinity of the works and are carried out where the arterially drained channels are already part of the existing landscape. The works that could potentially give rise to localised landscape or visual impacts include tree removal (where the tree is impinging on channel capacity), the spreading of material that has been removed in maintenance operations along the bank or on top of existing spoil heaps where present, and repair works to embankments, in the form of topping up with clay to design height.

Material Assets

Flood defences are a material asset. The Arterial Drainage Maintenance and High Risk Channel Designation works entail the maintenance of watercourses and their associated flood defences to ensure effective management of flood risk into the future. This management of flood risk provides protection for other material assets from flooding.

Soil, Geology & Land Use

Channel maintenance operations involve removing the build up of foreign or natural material that impedes the free flow of water. The material removed in the maintenance operations is normally spread along the bank or on top of existing spoil heaps where present. Restrictions in channels due to bank slippage or damage are regarded to the original profile. Channel breaches due to bank erosion are resolved by re-profiling the bank in-situ or in some cases by importing protection material such as rock armour or log poles.

The Arterial Drainage Maintenance and High Risk Channel Designation works form part of group of work programmes that aim to ensure effective management of flood risk. These works reduce the risk of flooding to the benefiting lands, thereby protecting the soil and geology resources within these lands.

6.0 Review of Relevant Plans, Policies and Programmes

6.1 Introduction

The objective of the SEA Directive is *“to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations in the preparation and adoption of plans and programmes with a view to promoting sustainable development”*. In order to meet the requirements of the Directive in this respect, the Strategic Environmental Assessment must *“identify the environmental protection objectives, established at International, Community or Member State level, which are relevant to the plan or programme and the way those objectives and any environmental considerations have been taken into account during its preparation”*.

This section of the report addresses the relationship between the Arterial Drainage Maintenance and High Risk Channel Designation Programme with other relevant Plans, Policies and Programmes, at international, national, regional and local level.

Table 6.1 *Relevant Plans, Policies and Programmes*

Title	Summary of Main Objectives	Relevance to the Programme
International		
UN Convention on Biological Diversity (1992)	<ul style="list-style-type: none"> • Maintain and enhance biodiversity. • Promote sustainable development. 	<ul style="list-style-type: none"> • The Programme includes actions aimed at maintaining the quality of water available for aquatic habitats and species, as well as maintaining the required morphological conditions. • Enhancement of channels under the EREP will improve biodiversity of drained salmonid rivers
Ramsar Convention on Wetlands of International Importance (1971 and amendments)	<ul style="list-style-type: none"> • Protect and conserve wetlands, particularly those of importance to waterfowl as waterfowl Habitat. 	<ul style="list-style-type: none"> • The Programme includes actions aimed at maintaining the quality of water available for aquatic habitats and species as well as maintaining the required morphological conditions.
UN Framework Convention on Climate Change: The Kyoto Protocol (1997)	<ul style="list-style-type: none"> • Alleviate the impacts of climate change and reduce global emissions of greenhouse gases. 	<ul style="list-style-type: none"> • Mitigation measures included in the Strategic Environmental Assessment (SEA) recommend mechanisms to reduce the greenhouse gases associated with water management. These are consistent with the objectives of the Kyoto Protocol.
European Union		
EU Floods Directive (2007/60/EC)	<ul style="list-style-type: none"> • Protection of river basins and coastal areas at risk of flooding. • Reduce and manage the risks that floods pose to human health, the environment, cultural heritage and economic activity. • Establish a framework for the assessment and management of flood risks. 	<ul style="list-style-type: none"> • Arterial Drainage Maintenance encompasses the maintenance of river channels in a condition that ensures they are free-flowing, thus reducing flood risk and providing adequate outfall for land drainage. • Arterial Drainage Maintenance also entails the maintenance of river and coastal embankments in a condition that protects benefiting land from the risk of flooding. • The OPW is the body through which Central Government exercises its statutory responsibility in respect of river drainage and flood relief. High Risk Channel Designation programme will identify high risk channels and give permissive powers of maintenance to the OPW. The general objective of the 'Designation' is to ensure that potentially high-risk channels or defenses are maintained to reduce the flood risk that may otherwise arise.
EU Water Framework	<ul style="list-style-type: none"> • Establish a framework for the protection 	<ul style="list-style-type: none"> • Arterial Drainage Maintenance encompasses the

Title	Summary of Main Objectives	Relevance to the Programme
Directive (2000/60/EC)	<p>of inland surface waters, transitional waters, coastal waters and groundwater.</p> <ul style="list-style-type: none"> • Maintain and enhance the quality of all surface waters in the EU. • Provides for water management on the basis of River Basin Districts (RBDs). • All surface and groundwater bodies to achieve good status by 2015. 	<p>maintenance of river channels in a condition that ensures they are free-flowing, thus reducing flood risk and providing adequate outfall for land drainage.</p> <ul style="list-style-type: none"> • Arterial Drainage Maintenance also entails the maintenance of river and coastal embankments in a condition that protects benefiting land from the risk of flooding. • OPW Channels identified as “At Risk” of failing to achieve ‘Good Ecological Status’ by 2015 due to channelisation, will be enhanced through the EREP
EU Habitats Directive (92/43/EEC)	<ul style="list-style-type: none"> • Contribute towards ensuring bio-diversity through the conservation of natural habitats and of wild fauna and flora. • Prevent and eliminate the causes of habitat loss and maintain and restore, at favorable conservation status, natural habitats and species of wild fauna and flora of Community interest. 	<ul style="list-style-type: none"> • In developing the works programme, special consideration is given to potential impacts on fisheries, Natura 2000 Sites and the environment. This includes the assessment of all works with the potential to impact on Natura 2000 Sites by external ecological consultants, specific timing of works and consultation with Inland Fisheries Ireland and the National Parks & Wildlife Service. • An Appropriate Assessment will be carried out where works are required within Natura 2000 Sites.
EU Birds Directive (2009/147/EC)	<ul style="list-style-type: none"> • Protect all wild bird species naturally occurring in the Union. • Protect habitats for endangered as well as migratory species (listed in Annex I), especially through the establishment of a network of Special Protection Areas (SPAs) comprising all the most suitable territories for these species. • Prevent and eliminate the causes of bird species loss and maintain and enhance current levels of biodiversity 	<ul style="list-style-type: none"> • In developing the works programme, special consideration is given to potential impacts on Natura 2000 Sites and the environment. This includes the assessment of all works in Natura 2000 Sites by external ecological consultants, specific timing of works and consultation with the National Parks & Wildlife Service. • An Appropriate Assessment will be carried out where works are required within Natura 2000 Sites.
EU Freshwater Fish Directive (78/659/EEC)	<ul style="list-style-type: none"> • Protect freshwater bodies identified by Member States as waters suitable for sustaining fish populations. • Sets physical and chemical water 	<ul style="list-style-type: none"> • In developing the works programme, special consideration is given to potential impacts on fisheries, Natura 2000 Sites and the environment. This includes the assessment of all works in Natura 2000 Sites by external ecological consultants,

Title	Summary of Main Objectives	Relevance to the Programme
	quality objectives for salmonid and cyprinid waters.	specific timing of works and consultation with Inland Fisheries Ireland and the National Parks & Wildlife Service. <ul style="list-style-type: none"> Enhancement of channels under the EREP will improve biodiversity of drained salmonid rivers.
EU Groundwater Directive (2006/118/EC)	<ul style="list-style-type: none"> Establishes a regime, which sets underground water quality standards and introduces measures to prevent or limit inputs of pollutants into groundwater. 	<ul style="list-style-type: none"> The Programme includes actions aimed at improving and/or preserving water quality, including groundwater.
EU SEA Directive (2001/42/EC)	<ul style="list-style-type: none"> Provide for a high level of protection of the environment. Integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development. Ensure that an environmental assessment is carried out of certain plans and programmes with potential to have significant effects on the environment. 	<ul style="list-style-type: none"> The Programme requires a Strategic Environmental Assessment (SEA). The Programme must take account of protection of the environment and integration into the sustainable planning of Ireland.
EU EIA Directive (85/337/EEC)	<ul style="list-style-type: none"> Require an Environmental Impact Assessment of the environmental effects of public and private projects that are likely to have significant effects on the environment. 	<ul style="list-style-type: none"> Where a project requires an Environmental Impact Assessment (EIA) under the provisions of the EIA Directive, this will be carried out.
EU Biodiversity Strategy to 2020	<ul style="list-style-type: none"> Enhancement and conservation of biodiversity. Safeguard the EU's most important habitats and species. Integrate biodiversity into land-use planning and development. Reduce the impact of invasive alien species. 	<ul style="list-style-type: none"> In developing the works programme, special consideration is given to potential impacts on fisheries, Natura 2000 Sites and the environment. This includes the assessment of all works in Natura 2000 Sites by external ecological consultants, specific timing of works and consultation with Inland Fisheries Ireland and the National Parks & Wildlife Service. An Appropriate Assessment will be carried out where works are required within Natura 2000 Sites. Enhancement of channels under the EREP will improve

Title	Summary of Main Objectives	Relevance to the Programme
European Convention on Protection of the Archaeological Heritage: The Valletta Convention (1992)	<ul style="list-style-type: none"> Requires that appropriate consideration be given to archaeological issues at all stages of the planning and development process. 	biodiversity of drained salmonid rivers <ul style="list-style-type: none"> The Programme includes the maintenance, repair and/or replacement of all structures forming part of a scheme, including accommodation bridges, weirs, sluice barrages, sluices, pumping stations and tidal flap gates.
National		
National Spatial Strategy 2002-2020	<ul style="list-style-type: none"> Delivery of more balanced social, economic and physical development between regions. 	<ul style="list-style-type: none"> Water services and quality are seen as a key element of service infrastructure in the National Spatial Strategy (NSS). Objectives and actions identified within the NSS used to inform the development of appropriate and sustainable flood risk management solutions.
National Development Plan 2007-2013	<ul style="list-style-type: none"> Promote more balanced spatial and economic development. With reference to flood control, structural measures are to be implemented in order to (a) provide relief from flooding where such occurs, (b) prevent the creation of new problem areas and (c) maintain existing defenses. This will be achieved through structural works involving the construction of Flood Relief Schemes. 	<ul style="list-style-type: none"> Structural measures to be implemented in line with the National Development Plan (NDP) include provision of relief from flooding where it occurs, prevention of the creation of new problem areas and maintenance of existing flood defenses. Objectives and actions identified within the NDP used to inform the development of appropriate and sustainable flood risk management solutions.
Wildlife Act 1976 and Amendment Act 2000	<ul style="list-style-type: none"> Provide for the protection of wildlife (both flora and fauna) and the control of activities, which may impact adversely on the conservation of wildlife. 	<ul style="list-style-type: none"> In developing the works programme, special consideration is given to potential impacts on fisheries, Natura 2000 Sites and the environment. This includes the assessment of all works in Natura 2000 Sites by external ecological consultants, specific timing of works and consultation with Inland Fisheries Ireland and the National Parks & Wildlife Service.
National Biodiversity Plan (2011)	<ul style="list-style-type: none"> Enhancement and conservation of biodiversity. 	<ul style="list-style-type: none"> In developing the works programme, special consideration is given to potential impacts on fisheries, Natura 2000 Sites and the environment. This includes the assessment of all works in Natura 2000 Sites by external ecological consultants,

Title	Summary of Main Objectives	Relevance to the Programme
		<p>specific timing of works and consultation with Inland Fisheries Ireland and the National Parks & Wildlife Service.</p> <ul style="list-style-type: none"> • Enhancement of channels under the EREP will improve biodiversity of drained salmonid rivers.
European Communities (Natural Habitats) Regulations, SI 94/1997, as amended SI 233/1998 and SI 378/2005	<ul style="list-style-type: none"> • The Regulations give effect to Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (Habitats Directive). • Allow for the designation of Special Areas of Conservation (SACs) as a contribution to the NATURA 2000 network. 	<ul style="list-style-type: none"> • In developing the works programme, special consideration is given to potential impacts on fisheries, Natura 2000 Sites and the environment. This includes the assessment of all works in Natura 2000 Sites by external ecological consultants, specific timing of works and consultation with Inland Fisheries Ireland and the National Parks & Wildlife Service. • An Appropriate Assessment will be carried out where works are required within Natura 2000 Sites.
Regional		
Regional Planning Guidelines	<ul style="list-style-type: none"> • Linkage of National Strategic Spatial planning policies to the planning process at City and County Council level by co-ordinating the Development Plans of the 34 Local Authorities through the Regional Planning Guidelines. 	<ul style="list-style-type: none"> • Objectives and actions identified within the Regional Planning Guidelines were used to inform the development of appropriate and sustainable flood risk management solutions.
River Basin Management Plans	<ul style="list-style-type: none"> • Maintain the 'high status' of waters where it exists, prevent deterioration in existing status of waters and achieve at least 'good status' in relation to all waters by 2015. • Identify overall environmental objectives to be achieved within the Programme period (by end 2015). 	<ul style="list-style-type: none"> • The River Basin Management Plans set specific objectives for each water body and provide a Programme of Measures to be implemented in order to achieve the objectives. These measures are an important consideration for implementation of the OPW activities.
Flood Risk Management Plans	<ul style="list-style-type: none"> • Management of flood risk in a catchment-based manner. • Identify and map the existing and potential future flood hazard and risk areas within each relevant Study Area. • Build the strategic information base 	<ul style="list-style-type: none"> • Arterial Drainage Maintenance encompasses the maintenance of river channels in a condition that ensures they are free-flowing, thus reducing flood risk and providing adequate outfall for land drainage. • Arterial Drainage Maintenance also entails the maintenance of river and coastal embankments in a condition that protects

Title	Summary of Main Objectives	Relevance to the Programme
	<p>necessary for making informed decisions in relation to managing flood risk</p> <ul style="list-style-type: none"> Identify viable structural and non-structural measures and options for managing the flood risks for localised high-risk areas and within the catchment as a whole. 	<p>benefiting land from the risk of flooding.</p> <ul style="list-style-type: none"> High Risk Channel Designation programme will identify high risk channels and give permissive powers of maintenance to the OPW. The general objective of the 'Designation' is to ensure that potentially high-risk channels or defenses are maintained to reduce the flood risk that may otherwise arise.
Local		
County and City Development Plans	<ul style="list-style-type: none"> Promote the proper planning and sustainable development of each Local Authority Area. 	<ul style="list-style-type: none"> Development Plans include policies and objectives in relation to the identification of appropriate and sustainable flood risk management solutions.
County and City Heritage Plans	<ul style="list-style-type: none"> Identify the natural and built heritage. Conserve and promote awareness of all aspects of heritage. Integrate protection and enhancement of heritage into development process. 	<ul style="list-style-type: none"> OPW works reduce the flood risk to sites and features of archaeological and architectural heritage.
County and City Biodiversity Action Plans	<ul style="list-style-type: none"> Identify measures to protect and enhance biodiversity. Research and disseminate information on biodiversity. Raise awareness of biodiversity, its value and issues facing it, and encourage participation and partnership. 	<ul style="list-style-type: none"> In developing the works programme, special consideration is given to potential impacts on biodiversity. This includes the assessment of all works in Natura 2000 Sites by external ecological consultants, specific timing of works and consultation with Inland Fisheries Ireland and the National Parks & Wildlife Service. Enhancement of channels under the EREP will improve biodiversity of drained salmonid rivers
Local Area Plans	<ul style="list-style-type: none"> Provide the framework for local development decisions, in line with the policies and provisions of the County/City Development Plan and the Regional Planning Guidelines. 	<ul style="list-style-type: none"> Local Area Plans include policies and objectives in relation to the identification of appropriate and sustainable flood risk management solutions.

7.0 STRATEGIC ENVIRONMENTAL OBJECTIVES, TARGETS and INDICATORS

7.1 Introduction

Because Strategic Environmental Assessment is, as its name suggests, set at a strategic level, it is not possible for the baseline environment to be described (and assessed) in as much detail as could be done for a project-level environmental impact assessment. Instead SEA uses a system of objectives, targets and indicators to rationalise information for the purposes of assessment.

In order to streamline the assessment process, this report uses broad themes based on the environmental topics listed in the SEA Directive, to group large environmental datasets, e.g., human health, cultural heritage and climate. Assigned to each of these themes is at least one high-level Strategic Environmental Objective that specifies a desired direction for change, e.g. reduce carbon dioxide emissions. These high-level Strategic Environmental Objectives (SEOs) are then paired with specific Targets. The progress towards achieving these Targets is monitored using Indicators, which are measures of identified variables over time.

7.2 Development of Strategic Environmental Objectives, Targets and Indicators

7.2.1 Strategic Environmental Objectives

An initial suite of objectives was identified during the scoping process, based on an understanding of the issues, constraints and opportunities relating to Arterial Drainage Maintenance and High Risk Channels Designation, **Table 7.1**. These have been subsequently refined, through stakeholder consultation, for use as appraisal criteria, both within the option assessment process, and the subsequent SEA evaluation of Arterial Drainage Maintenance and High Risk Channels Designation.

Each of the SEA objectives, where appropriate, is divided into more specific sub-objectives relating to each topic. For each objective, and associated sub-objective(s), a framework of associated indicators and targets was established; thus enabling the use of the objectives as appraisal criteria within the option assessment process.

During this process, the performance of each option was measured, quantitatively where appropriate, for each sub-objective relative to baseline conditions (defined in terms of each of the specified indicators). In order to determine whether this performance is acceptable, two levels of targets have been set for each objective and associated sub-objective(s).

The first target sets a minimum requirement that needs to be met for an option to be acceptable; or at least, could be acceptable through the implementation of appropriate mitigation strategies to offset any potential adverse effects. The second, more demanding and environmentally beneficial, aspirational target does not need to be met for the acceptance of options; although options meeting these higher targets will achieve a higher score and are likely to be favoured.

The objectives address issues relating to all of the topics required for consideration under the SEA Directive.

7.2.2 Strategic Environmental Indicators and Targets

The overall purpose of environmental indicators in the SEA is to provide a way of measuring the environmental effect of implementing the Programme. Environmental Indicators are also used to track the progress in achieving targets set in the SEA as well as the Programme itself. The proposed indicators have been selected bearing in mind the availability of data and the feasibility of making direct links between any changes in the environment and the implementation of the Programme.

Targets were considered over the duration of the baseline data collection and assessment, and throughout the consultation process, in order to meet the Strategic Environmental Objectives as well as the objectives of the Programme. In each case, any target that is set is attributable to the implementation of the Programme.

The SEA objectives for Arterial Drainage Maintenance and High Risk Channels Designation, and their associated sub-objectives, indicators and targets are presented in **Table 7.1**.

Table 7.1 *SEA Objectives, Sub-objectives, Indicators and Targets*

Core Criteria	Objective	Sub-objective	Aspirational sub-objective (if appropriate)	Target (Minimum)	Indicator	SEA Topic
Flora, Fauna and Biodiversity	Support the achievement Of Good Ecological Status/Potential (GES/GEP) under the Water Framework Directive (WFD).	Maintain existing and, where feasible, enhance natural fluvial processes in support of proposed WFD measures.	Support other relevant proposed WFD measures to improve ecological quality in surface and ground waters.	Measurable contributions to achievement of GES/GEP by 2015 through environmental drainage maintenance measures and enhancement measures.	Numbers of water bodies relevant to Programme failing to achieve GES/GEP due to hydromorphology.	Flora, Fauna & Biodiversity, Water (Hydromorphology)
		Avoid conflicts with the aim for all water bodies to achieve good status by 2015.			Increase in number of water bodies achieving GES/GEP as a result of EREP works.	
	Protect the flora and fauna within the river, river corridor and along vehicular access points and where possible enhance biodiversity.	Avoid damage to internationally and nationally designated sites of nature conservation importance.	Assist in the achievement of conservation objectives of internationally and nationally designated sites of nature conservation importance.	No detrimental effects on designated sites and, where possible, an improvement in conservation status.	Changes in reported conservation status and designated sites due to implementation of Programme.	Flora, Fauna & Biodiversity
		Avoid damage to habitats supporting legally protected species and other known species of conservation concern.	Create suitable conditions to support species of conservation concern and where possible enhance existing conditions.	No decrease in existing populations sizes and/or areas of suitable habitat for target species.	Reported changes in population sizes and/or areas of suitable habitat maintained or created for target species.	Flora, Fauna & Biodiversity, Water (Hydromorphology)

Core Criteria	Objective	Sub-objective	Aspirational sub-objective (if appropriate)	Target (Minimum)	Indicator	SEA Topic
		Protect existing riverine and wetland habitats to maintain naturally functioning ecosystems	Protect and, where possible, enhance areas of riverine habitat to improve biodiversity and hydromorphological conditions.	Protection or enhancement of existing habitats.	Area of habitat/length of river & river corridor enhanced through implementation of Programme. Measure of biodiversity gain and positive hydromorphological change.	Flora, Fauna & Biodiversity, Water (Hydromorphology)
		Minimise the risk of spread of any invasive aquatic species.	Reduce the spread of invasive aquatic species.	No increase in the spread of invasive aquatic species.	Area of habitat/length of relevant river corridor affected by invasive species.	Flora, Fauna and Biodiversity (Fisheries)
	Protect and, where possible, enhance the integrity of fisheries within the Arterially Drained catchments, Flood Relief Scheme channels and Designated channels.	Maintain existing habitat supporting salmonid fisheries and carry out enhancement where possible.	Increase extent of suitable habitat for fisheries and improve existing upstream access.	No decrease and where possible increase the area of salmonid habitat and reduction in barriers to upstream migration.	Areas of suitable habitat supporting salmonid fisheries. IFI assessments on biodiversity and hydromorphological improvements following river enhancement works.	Flora, Fauna and Biodiversity (Fisheries)
		Expand salmonid habitat where feasible due to barrier removal.	Removal of all barriers to salmonid migration.	No creation of new barriers as a result of maintenance operations	Length of salmonid habitat opened due to barrier removal.	Flora, Fauna and Biodiversity (Fisheries)
		Ensure no adverse effects on commercial shellfisheries.	Improve existing classification.	No deterioration in existing EPA classification due to upstream works.	EPA classification of shellfish waters.	Flora, Fauna and Biodiversity (Fisheries)

Core Criteria	Objective	Sub-objective	Aspirational sub-objective (if appropriate)	Target (Minimum)	Indicator	SEA Topic
Social	Protect existing waterside access for recreational and community facilities during Scheme Maintenance and 'Designation' operations.	-	Improve level of waterside access for recreational and community facilities during new 'Designation' projects.	Maintain existing historical machine access routes along waterways.	Level of compliments/ complaints from Community Councils and concerned residents or their spokesperson.	Material Assets (Tourism & Recreation)
	Protect public health, safety and employment (including physical, psychological and economic aspects of flooding).	Maintain the level of flood protection provided under the original Arterial Drainage Schemes & Flood Relief Schemes.	Mitigate flood risk in other areas through channel and embankment 'Designation'.	Reduction in number of people and properties at risk from flooding.	Extent and frequency of flooding in drained catchments and flood relief schemes.	Population & Human Health
	Avoid negative impacts to existing water-based leisure activities.	Maintain the level of flood protection provided under the original Arterial Drainage Schemes & Flood Relief Schemes.	Improve scope for water-based leisure activities.	Maintain level of existing water-based leisure activities.	Level of compliments/ complaints from Community Councils and concerned residents or their spokesperson.	Material Assets (Tourism & Recreation)
Economic	Reduce vulnerability to the impacts of climate change and maintain flexibility for future responses.	Reduce frequency and level of flooding on Arterial Drained catchments, Flood Relief Schemes and on Designated channels and embankments.	-	Designed Flood Relief Schemes to provide protection up to the 1 in 100 year event. Arterial Drainage Schemes to provide protection up min. 1 in 3 year event.	Number of new flood events (previously unrecorded).	Air and Climate
	Avoid damage to the function and quality of the soil resource.	Maintain soil quality and function for productivity on agricultural lands.	-	Completion of Annual Maintenance and 'Designation' works.	Length of Channel maintained and No. of 'Designation' projects carried out annually.	Soil & Land-use

Core Criteria	Objective	Sub-objective	Aspirational sub-objective (if appropriate)	Target (Minimum)	Indicator	SEA Topic
	Support economic activities without conflicting with environmental objectives.	Maintain lands available for economic activity and no change as to render existing economic activity unviable.	-	Maintain benefiting lands at current economic activity potential.	Change in land-use of Benefiting lands.	Material Assets
	Reduce inappropriate floodplain development, through advice and guidance to Local Authorities.	-	-	Reduce numbers of new properties/ developments/ infrastructure at risk from flooding.	Reports of flooding of newly constructed developments (Flood Hazard Mapping database).	Material Assets
	Mitigate the risk of flooding to existing developments, infrastructure and material assets.	-	-	Reduction in the level of flood risk to developments, infrastructure and material assets.	Lists of channel/embankment maintenance and 'Designation' works carried out to mitigate flood risk.	Material Assets
New 'Designation' Projects Only:						
Cultural Heritage	Protect known features of cultural heritage.	Protect architectural buildings and structures listed on the Record of Protected Structures (RPS) and designated areas of architectural importance such as Architectural Conservation Areas (ACAs).	-	Reduction in the numbers of listed architectural buildings and structures listed on the RPS and ACA's at risk from flooding.	Numbers of architectural buildings and structures listed on the RPS and ACAs at risk from flooding.	Cultural Heritage (Architectural and Archaeological Heritage)

Core Criteria	Objective	Sub-objective	Aspirational sub-objective (if appropriate)	Target (Minimum)	Indicator	SEA Topic
		Protect archaeological features listed on the Record of Monuments and Places (RMP) or other listed National Monument and Archaeological Sites that are at risk from flooding.	Reduction in the numbers of listed archaeological features at risk from flooding.	No damage to or loss of features listed on the RMP as a result of 'Designation' Project.	Numbers of archaeological features at risk from flooding.	Cultural Heritage (Architectural and Archaeological Heritage)
Social	Protect and where possible enhance landscape character and visual amenity for new 'Designation' projects.	Protect the character of designated landscape protection areas such as Scenic Views and Scenic Routes within urban and rural areas.	Contribute to the development and maintenance of attractive, accessible and safe waterway corridors of designated landscape areas.	No adverse changes in character of length of waterway corridor qualifying as a Landscape Protection Zone within urban areas as a result of 'Designation' project.	Length of waterway corridor maintaining landscape Designation post 'Designation' works.	Landscape

8.0 Alternatives

8.1 Introduction

One of the critical roles of Strategic Environmental Assessment is to assess the reasonable alternative options, taking into account the objectives and geographical scope of the proposed plan or programme and the significant environmental effects of these alternatives.

The following alternative options, which represent potential strategies that could be adopted by the OPW with regards to flood management, have been assessed as part of this SEA:

- Do-nothing scenario;
- Do absolute minimum;
- Continue statutory maintenance;
- Proactive approach to mitigate flood risk;
- Proactive approach to mitigate flood risk with heightened environmental enhancement.

Each alternative has been considered in terms of the significant environmental impacts that would result from its adoption and implementation by the OPW. The economic and social impacts of each alternative have also been considered. **Table 8.1** lists the potential measures that would be carried out under each of the alternatives listed above, and summarises each scenario in terms of whether it would be economically viable, socially acceptable, environmentally appropriate and/or sustainable.

Sections 8.2 - 8.4 below provides further details on the environmental, economic and social considerations that have been taken into account in assessing the suitability and sustainability of the alternative flood management options. **Section 8.5** provides further details regarding each alternative and the associated impacts.

Table 8.1 *Summary of Alternatives Considered*

Management Option	Potential Measures	Environmentally Appropriate	Economically Viable	Socially Acceptable	Sustainability
1. Do-nothing scenario (Section 8.5.1)	<ul style="list-style-type: none"> Revoke statutory requirement and cease maintenance of channels, embankments and associated structures. 'Designation' works not carried out. 	- + (Section 8.5.1.1)	-- (Section 8.5.1.2)	-- (Section 8.5.1.3)	--
2. Do absolute minimum (Section 8.5.2)	<ul style="list-style-type: none"> Revoke statutory requirement and carry out maintenance of channels, embankments and associated structures on a reactive basis. Ad-hoc 'Designation' works carried out on a reactive basis. 	- + (Section 8.5.2.1)	-- (Section 8.5.2.2)	- (Section 8.5.2.3)	-
3. Continue statutory maintenance (Section 8.5.3)	<ul style="list-style-type: none"> Continue statutory maintenance of channels, embankments and associated structures. Implement a criteria-based 'Designation' process as per Flood Policy. 	-+ (Section 8.5.3.1)	+ (Section 8.5.3.2)	+ (Section 8.5.3.3)	-+
4. Proactive approach to mitigate flood risk (Section 8.5.4)	<ul style="list-style-type: none"> Continue statutory maintenance of channels, embankments and associated structures. Propose a series of 'Designation's for channels or defenses of strategic importance. 	-+ (Section 8.5.4.1)	++ (Section 8.5.4.2)	+ (Section 8.5.4.3)	+
5. Proactive approach to mitigate flood risk with heightened environmental enhancement. (Section 8.5.5)	<ul style="list-style-type: none"> Continue statutory maintenance of channels, embankments and associated structures. Integrate environmental enhancement opportunities under OPW's Environmental River Enhancement Programme. Propose a series of 'Designation's for channels or defenses of strategic importance. Integrate environmental enhancement opportunities under OPW's Environmental River Enhancement Programme. 	+ (Section 8.5.5.1)	++ (Section 8.5.5.2)	++ (Section 8.5.5.3)	++

Key

- ++ Very positive/beneficial option
- + Positive/beneficial option
- + Mixed positive and negative/negligible
- Negative option
- Very negative option

8.2 Environmental Considerations

The environmental effects of flooding are considered in terms of flora, fauna and biodiversity, water quality, soil quality, air quality and climate change.

8.2.1 Biodiversity, Flora and Fauna

The implementation of flood management and maintenance works reduces the flood risk to benefiting lands. In the absence of these works, the subsequent increase in flooding would create a dramatic change in the ecosystem of the benefiting lands, with both positive and negative impacts on flora, fauna and biodiversity associated with this change. Increased levels of flooding would lead to many areas of agricultural land becoming less productive as wet grassland; swamp, fen habitats and riparian woodland become established through succession due to changes in the water table. It is also likely that the altered hydrological regime would positively affect peatland habitats such as bogs, as drains become clogged with silt and aquatic vegetation over time.

An increase in the abundance of wetland habitats is likely to result in an increase in the species associated with those habitats; for example little egret, red grouse and snipe. Conversely, species such as badgers and Irish hare, which are known to be associated with dry habitats such as, dry meadows and agricultural grassland may decrease in abundance.

The absence of arterial drainage maintenance is likely to impact on aquatic species such as otter, crayfish, freshwater pearl mussel, salmon and lamprey. In the absence of drainage, the build up of silt and aquatic vegetation may decrease the suitability of the habitat for protected species such as otter, crayfish and lamprey, although in other scenarios, habitat diversity would increase which would benefit some species. Siltation events associated with in-stream maintenance works would cease, however increased nutrient loading associated with flooding would be expected to increase eutrophication in some waterways.

8.2.2 Soil and Water Quality

The flooding of agricultural land could result in damage to the valuable soil resource within the benefiting lands, with knock-on effects including loss of production and the associated financial losses and costs. The environmental effects of flooding on soil also include soil erosion, bank erosion and land sliding. With regards to water quality, flood events can result in wash-off and leaching of pollutants, especially from more highly fertilised soils, causing increased phosphorus concentrations in rivers during flood events. This is particularly problematic if such floods occur during the growing season as eutrophication can result. The increased loading that results during flood events can deliver large quantities of nutrients to lakes and coastal waters (*'Water Quality in Ireland 2007 – 2009'*, EPA, 2010). The resulting potential negative impacts on water quality would be contrary to the aims of the Water Framework Directive and could lead to the failure of the affected waters to achieve or maintain high status. Furthermore, the flooding of wastewater treatment utilities could pose a significant pollution risk to water quality with consequent negative impacts on human health, habitats, flora and fauna due to bacteria and other pollutants carried by floodwater. However, in some cases the extra flooding will increase retention times allowing sedimentation on the lands with the removal of silt and resultant water quality improvements.

8.2.3 Air Quality and Climate Change

Future changes in climate and the associated impacts on river flows and tide levels are likely to change the frequency, extent, distribution and pattern of flooding. Higher sea

levels and wetter winters, with more intense rainstorms, together with possible increases in storminess could significantly increase both the frequency and intensity of flooding. In addition to the ongoing maintenance of Arterial Drainage Schemes, which aims to reduce flood risk, the High Risk Channel Designation Programme will identify high-risk channels and give permissive powers of maintenance to the OPW. This will ensure that new and previously unidentified potentially high-risk channels or defenses that pose a significant flood risk or are of strategic importance are maintained to reduce the flood risk that may occur.

8.2.4 Environmental Management Protocols

The flood maintenance works carried out by the OPW encompass a range of Environmental Management Protocols, which aim to ensure no negative impacts on flora, fauna, biodiversity or water quality. The protocols include:

- The implementation of Standard Operational Procedures (SOPs) in order to minimise damage to the flora and fauna of the receiving environment. These measures include leaving sections of river unmanaged.
- Working closely with the National Parks and Wildlife Service (NPWS) and Inland Fisheries Ireland (IFI) to reduce impacts on high-risk channels.
- The Environmental River Enhancement Program (EREP), carried out by the OPW in conjunction with IFI, aims to enhance the biodiversity of arterially drained channels and river corridors.
- Where Arterial Drainage Maintenance operations are proposed within or where they could affect a Natura 2000 site, an Appropriate Assessment.
- Research on targeted habitats (such as turloughs) and species (such as kingfisher and otter) has been carried out to further inform decision making within the OPW.

8.2.5 Environmental River Enhancement Programme (EREP)

8.2.5.1 Background to EREP

The Environmental River Enhancement Programme (EREP), which commenced in 2008, is an OPW funded project, coordinated and managed jointly with Inland Fisheries Ireland (IFI). The annual budget for the project is in the order of €1.1 million, which equates to a substantial environmental investment of over 6% of the Arterial Drainage Maintenance vote. This includes consultancy fees, materials, plant and labour. The initial five year cycle (2008-2012) focuses primarily on the enhancement of selected drained salmonid channels, building on the knowledge and experience that has been developed with previous Fisheries and OPW works. It is to improve the channel's hydromorphology and biodiversity while maintaining its drainage function. The EREP has been set up to strategically align with the OPW's obligations under EU Water Framework Directive and the National Biodiversity Plan, and is a proactive approach to improve the ecology of drained rivers in Ireland.

The original excavations of the Arterial Drainage Schemes completed under the 1945 Arterial Drainage Act, required hard engineering works. Works generally involved both the widening and deepening of existing channels, and in some cases the excavation of new channels. In most cases all bank-side vegetation was removed. While the creation of these Schemes brought much benefit to agricultural land and substantially reduced flooding in many areas, there were many negative impacts on the river corridor habitat. The EREP works are designed to maximise the ecological gain in the channel while still retaining the drainage and flood flow capacity of the channel. Enhancement works typically involve altering the channel form at a low level, and any new structures being

inserted at a low flow level where the large floods will drown out and have little impact on the conveyance capacity at these high flows. It includes construction of a selection of in-stream low level structures such as vortex weirs, deflectors, rubble mats, creating pools, spawning beds combined where appropriate with bank stabilisation, riparian fencing and tree planting. The enhancement works introduce more in-stream physical diversity, mimicking a more natural channel form with a resultant positive ecological impact. Fisheries research over many years has shown that this approach to river enhancement is highly effective and can achieve a multiple increase in fish populations and other aquatic life.

EREP works are applicable to a subset of arterial drainage channels and in terms of technical feasibility of enhancement schemes, a screening process is required to address the following issues:

- River steeper than 3% (30m/km) will not exhibit productive results in terms of fish if enhanced as it is too steep to retain gravels placed on the bed, and the energy levels are too high.
- Stream gradient lower than 0.2% (2m/km) is not suitable for enhancement as energy levels are too low and instream structures and pools will not create the flow variation and will be silted up rapidly.
- River with biological Q value less than Q3 are unsuitable (moderately polluted or worse).
- In OPW channels, a minimum flow conveyance of 1 in 3 year flood must be maintained, therefore all enhancement features must be at a low level within the river so as not to reduce channel capacity at high flows.
- Enhancement programmes are not as effective in channels with catchment areas less than 4.5km².

8.2.5.2 Enhancement Works

Natural recovery of channels is not always possible, as many rivers lack sufficient energy to reorganise bed materials into a natural series of riffles, glides and pools. The EREP assists this recovery using two different approaches, including capital enhancement and enhanced maintenance.

- Capital enhancement typically involves the importation of materials such as gravels to increase spawning habitat, rock to create in-stream structures, and fencing to improve riparian habitat. This is combined with the excavation of pools to create a more natural physical form. **Figure 8.1** shows an extract from a sample EREP capital enhancement plan.
- Enhanced maintenance differs in that on-site materials are utilised and capital investment is not required. These works are carried out on channels scheduled for routine maintenance, and typically involve returning boulders from old spoil heaps, raking gravels and excavating pools.

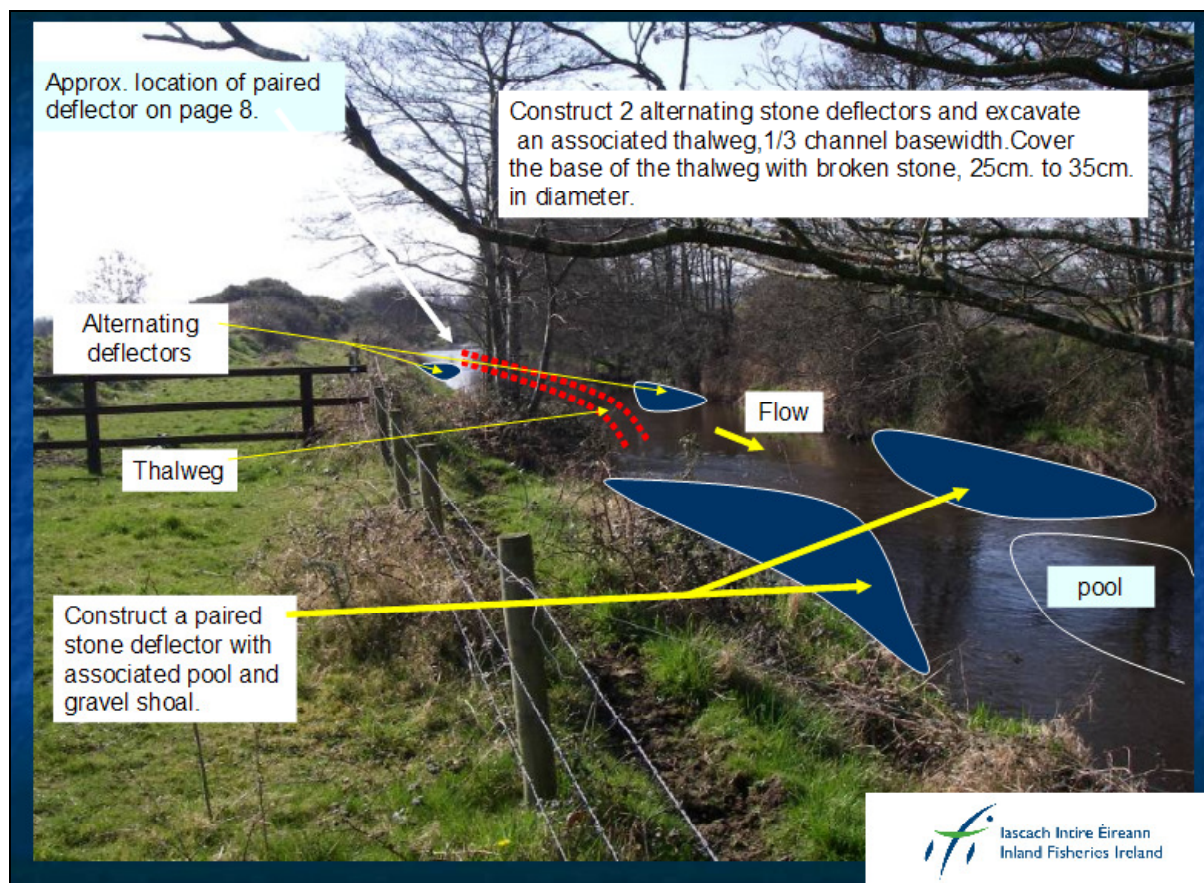


Figure 8.1 Extract from sample EREP capital enhancement plan

All enhancement designs are prepared by Inland Fisheries Ireland, in consultation with OPW. The enhancement works, both capital and enhanced maintenance, are implemented through the use of OPW's direct labour force and mechanical fleet.

8.2.6 WFD Programme Of Measures

The WFD has set out a wide range of measures, some of which OPW flood risk management activities will have part of a role in implementation, primarily through the Flood Risk Management Plans (FRMPs) as they are developed over the coming years. In terms of arterial drainage maintenance, the primary measure for implementation is under Hydromorphology. In accordance with Ireland's WFD Article 5 Report, of the circa 4,690 freshwater surface waterbodies nationally, 1048 waterbodies were identified as having a possible morphological pressure due to channelisation, which includes any altered waterway due to Arterial Drainage Schemes, Drainage Districts, or other activities such as navigational waterway maintenance. The competent authorities in relation to the establishment of environmental objectives and programmes of measures under the WFD are the relevant local authorities and the Environmental Protection Agency.

8.2.6.1 Hydromorphology Programme Of Measures (POMS)

The WFD presented the need for a management framework for freshwater morphology in Ireland and the necessary elements of classification and monitoring, risk assessment, and programmes of measures have been developed through the National Freshwater Morphology POMS Study in 2007 – 2008. A risk assessment carried out by the National Freshwater Morphology POM Study concluded that circa 470 waterbodies were not at risk due to channelisation with a further circa 580 waterbodies were possibly

at risk from channelisation pressure as presented and require further investigations as in **Figure 8.2**.

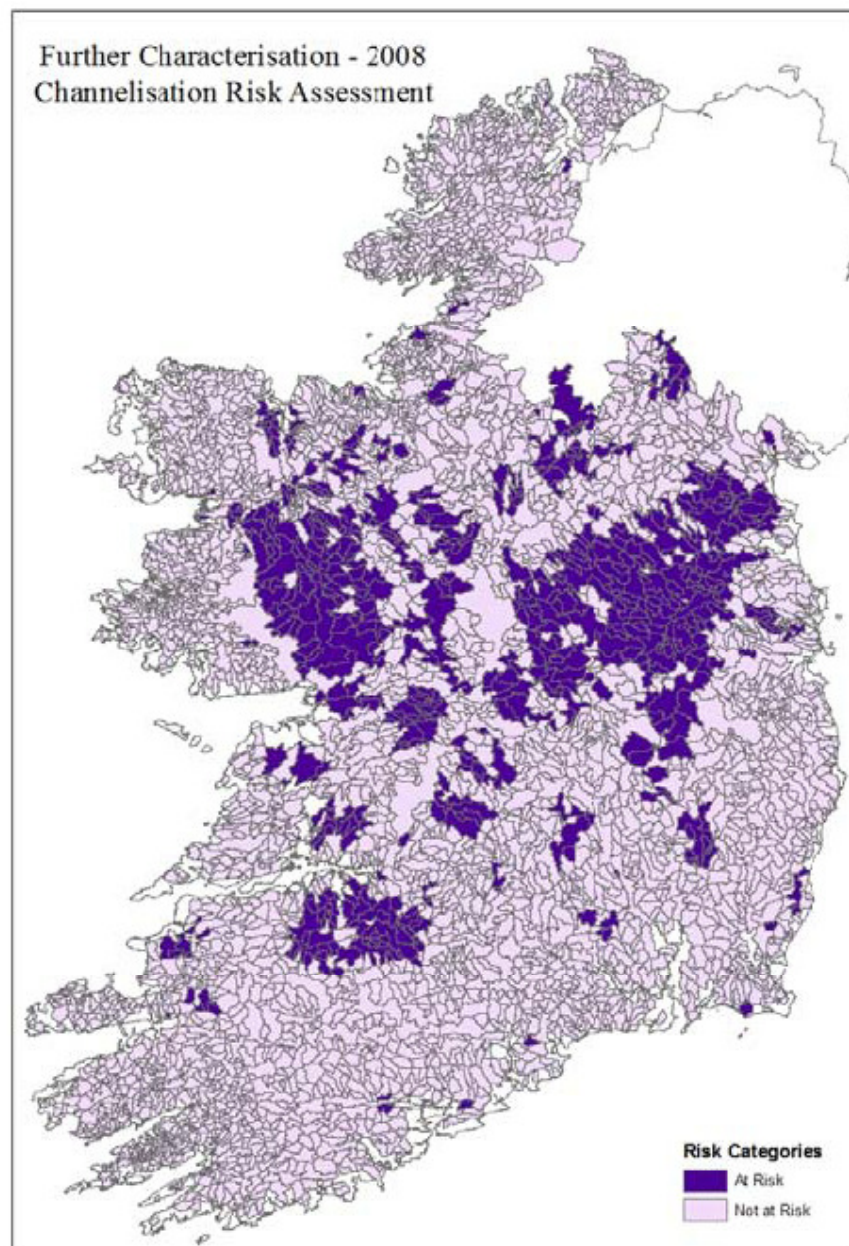


Figure 8.2: Channelisation Risk Assessment (Source: Freshwater Morphology POM Study Final Report 2008)

The Freshwater Morphology POMS Study identified a number of basic measures and supplementary measures to address the issue of channelisation in Irish waters. Basic measures will consist of a new regulatory framework to manage hydromorphological activities in waterways and this legislation has yet to be drafted and enacted. This legislation will introduce a form of binding codes of practice, formal authorisation and licensing, depending on the scale of the hydromorphological activity. It's envisaged that with OPW having developed an extensive list of environmental procedures and protocols for works in waterways, these OPW standards will become a main component of legally binding rules for any operator in waterways. River enhancement schemes were considered the most appropriate supplementary measure in assisting recovery

from channelisation. **Table 8.2** indicates the number of waterbodies per supplementary measure in each RBD.

Table 8.2 *Supplementary Morphology Measures.*

Class	NWRBD	NBRBD	ShRBD	SERBD	SWRBD	WRBD	ERBD	Total
S3	0	0	2	0	0	10	4	16
S4	25	36	208	33	8	132	85	527

Source: Freshwater Morphology POMS Study Final Report 2008 (waterbody numbers changed slightly in intervening years)

S3 – Impact on status due to channelisation/embankments confirmed, enhancement schemes to be considered.

S4 – Impact on status due to channelisation/embankments not confirmed, further investigation required.

Only waterbodies with channelisation risks and good Q ratings but known poor fish status are included. Where impact is suspected but fish status is not available to confirm this, investigation is required. Of the waterbodies at risk due to channelisation and embankments, 11 waterbodies were confirmed as impacted using available fish status and Q status information. The remaining 'at risk' waterbodies require investigation by the WFD competent authorities, to confirm morphology status, fish status and/or Q Status before appropriate supplementary measures can be assigned.

These enhancement supplementary measures would be investigated by the WFD competent authorities, and detailed during the period 2010 – 2012. The primary technical feasibility criteria are sufficient water quality and gradient. Current expertise shows that project success requires a gradient of >0.2% (2m/km) which will be a key limiting factor for the applicability of this approach as a significant portion of drainage channels are of lower gradients. Water bodies found to be technically feasible will have enhancement works implemented during 2012 – 2015. Recovery timescales are in the order of 5 – 10 years (depending on the river system) and consequently to objectives may require further review in 2015.

8.2.6.2 Supplementary Measures

OPW is responsible for Water Bodies (WB) relevant to Arterial Drainage Schemes (ADS) i.e. 11 WBs wholly and a portion of 2 WBs. Local Authorities are responsible for WBs relevant to Drainage Districts (DDs) i.e. 3 WBs wholly and a portion of 2 WBs as set out in **Table 8.3**. OPW will undertake works to assist recovery in the Arterial Drainage Scheme waterbodies and these works will be commenced under the current Environmental River Enhancement Programme (EREP) 2008 – 2012.

Table 8.3 *Authorities responsible to implement Supplementary Measures.*

Water Body	Drainage Name	Responsible Authority
WE_34_1187	Moy ADS	OPW
WE_30_2401	Corrib ADS & Meelick-Pollshask DD	OPW & Galway Co. Co.
WE_30_3370_1	Corrib ADS	OPW
WE_30_1922	Corrib ADS	OPW
WE_30_1898	Corrib ADS	OPW

WE_29_263	Dunkellin DD	Galway Co. Co.
WE_29_635	Dunkellin DD	Galway Co. Co.
SH_27_287	Sixmilebridge-Kilkeshen DD	Clare Co. Co.
SH_24_776	Maigue ADS	OPW
EA_07_990	Boyne ADS & Garr DD	OPW, Kildare Co. Co. & Offaly Co. Co.
EA_07_1894_1	Boyne ADS	OPW
EA_07_1894_2	Boyne ADS	OPW
EA_07_1894_3	Boyne ADS	OPW
WE_30_3370_2	Corrib ADS	OPW
WE_30_3370_3	Corrib ADS	OPW
WE_30_3370_4	Corrib ADS	OPW

8.2.6.3 RBMP Extended Deadlines

Relevant RBMPs have applied an extended deadline to 2021 for the waterbodies scheduled for enhancement as the scientific data indicates that the time for physical recovery and an improvement in status will take longer than 2015. These extensions will allow the measures to be implemented and recovery time to take place. Subject to resources, it is envisaged that the EREP will continue past 2012 and will be the primary mechanism to implement feasible hydromorphological measures on a long-term basis for Arterial Drainage Scheme catchments. Local Authorities are responsible to undertake works to assist recovery in the Drainage District waterbodies.

8.2.6.4 Further Characterisation

It was recommended that WFD monitoring should focus on the waterbodies under S4 so that the necessary data can be gathered to confirm status, particularly fish status. This will enable more waterbodies to be considered under S3 i.e. be designated for river enhancement works subject to the technical feasibility criteria.

The POMS study also concluded that the relationship between morphology and the effect it has on ecological status is not fully understood across Member States. The need for research into this area remains. Similarly, there is a need for research by the WFD competent authorities, into an appropriate intensive land use GIS based risk assessment, and further refinement of the channelisation risk assessment, accounting for factors such as watercourse maintenance, and channel typology. It is important that the morphological assessment framework developed through this Study is continuously reviewed and refined through research and data collection. To this end, the EREP uses the River Hydromorphology Assessment Technique (RHAT) which is a newly devised methodology recommended by the POM study, and it's envisaged as OPW information builds up on the practical application of this measurement system, this information will be very useful for future channelisation national risk assessments.

8.3 Economic Considerations

8.3.1 Agriculture

Agriculture is vitally important to the Irish economy and to the rural communities where it is the main source of employment. Agriculture supports farm suppliers and provides the raw materials for the agri-food sector, which makes a substantial contribution to

Ireland's income through exports. A large portion of the lands benefiting from the OPW maintenance programme is agricultural land.

8.3.2 Flood Protection

Many of the major Drainage Schemes carried out under the 1945 Act, have provided a substantial amount of protection to housing, industrial and commercial areas, roads and other services and infrastructure. Following these Schemes, further development has taken place on land considered to be suitable as a result of these drainage works. Flood protection is also provided by sea and river embankments. Extensive areas of land would in time be inundated by water should the maintenance of these embankments cease, leading to flood damage to agricultural land, residential, commercial and industrial premises, transport and communications infrastructure, and water supply and treatment infrastructure. Homeowners and businesses impacted by flooding may be unable to obtain flood protection as part of their property insurance cover following a flood event.

8.3.3 Financial Cost of Arterial Drainage Maintenance

Significant investment in drainage works and maintenance has been made by both the government and the farming community since the adoption of the Arterial Drainage Act in 1945. In the absence of such works continuing, maintenance expenditure would reduce but economic losses would increase significantly due to flood-related structural damage and loss in land productivity. A "Report on Measurement of Return of Investment" conducted in 1999 by Pricewaterhouse Coopers calculated a 1:14 cost benefit ratio and concluded that the arterial drainage maintenance programme has a very high return on investment. A further economic cost is that the Commissioners of Public Works could also be left liable to extensive claims for compensation. Such claims would be of a significant scale due to the expectations and investments of the agricultural industry.

8.4 Social Considerations

The social considerations of flooding refer primarily to the direct impact on human health as a result of a flood event. This includes the threat to human life and potential for injury and illness, as well as the distress and trauma experience by people before during and after flood events.

The impact on people and communities as a result of the stress and trauma of being flooded, or even of being under the threat of flooding, can be immense. Long-term impacts can arise due to chronic illnesses and the stress associated with being flooded and the lengthy recovery process. The ability of people to respond and recover from a flood can vary. Vulnerable people, such as those who are old, disabled or have a long-term illness, are less able to cope with floods than others. Some people may have difficulty in replacing household items damaged in a flood and may lack the financial means to recover and maintain acceptable living conditions after a flood. As mentioned above, homeowners and businesses impacted by flooding may be unable to obtain flood protection as part of their property insurance cover following a flood event, thus adding to the distress and trauma.

8.5 Assessment of Options

8.5.1 Option 1: Do-Nothing Scenario

Under the 'Do-Nothing' Scenario, all current arterial drainage maintenance works would cease and no future maintenance or 'Designation' works would be carried out.

8.5.1.1 Environmental Considerations

In the absence of Arterial Drainage Maintenance and High Risk Channel Designation activities being implemented, the risk of flooding to the benefiting lands would increase significantly, resulting in some positive and negative impacts on the environment, as described in **Section 8.2** above.

Increased flooding would lead to a likely increase in the abundance of habitats such as wet grassland, swamp, fen habitats and riparian woodland, thereby having a positive impact in terms of biodiversity. However, the absence of arterial drainage maintenance would allow channels to become clogged with silt and aquatic vegetation over time. This build-up of silt and aquatic vegetation would change the suitability of the existing habitat for protected species such as otter, crayfish and lamprey, although if left untouched, sufficient niches would evolve for these species.

Flooding can cause the leaching of pollutants from fertilised soils, leading to increased phosphorus concentrations and eutrophication in rivers. The resulting potential negative impacts on water quality would be contrary to the aims of the Water Framework Directive and could lead to the failure of the affected waters to achieve or maintain high status. Eutrophication also results in a negative impact on biodiversity. Furthermore, the flooding of wastewater treatment utilities could pose a significant pollution risk to water quality and soil quality, with consequent negative impacts on human health, habitats, flora and fauna due to bacteria and other pollutants carried by flood water, as described in **Section 8.2** above.

If the OPW were to cease or reduce drainage maintenance works, it is possible that landowners would take it upon themselves to carry out maintenance of channels so as to avoid or reduce flood risk. These works would not be carried out in accordance with OPW environmental protocols, as described in **Section 8.2.4** above, leading to potential negative impacts on flora, fauna, biodiversity and/or water quality.

This option would also contravene the requirements of the Floods Directive.

8.5.1.2 Economic Considerations

Under the 'Do-Nothing' scenario, expenditure on channel maintenance and High Risk Channel Designation would no longer be required. However, the risk of flood damage to benefiting lands would increase significantly, leading to significant economic losses. Increased costs would arise from damage to agricultural land, residential, commercial and industrial premises, transport and communications infrastructure, and water supply and treatment infrastructure. The flooding of agricultural land could result in damage to the valuable soil resource within the benefiting lands, with knock-on financial effects due to loss of production.

Under Section 37 of the Arterial Drainage Act 1945, the OPW is statutorily obliged to maintain all rivers, embankments and urban flood defenses on which it has executed works since the 1945 Act in '*proper repair and effective condition*'. Under the Do-Nothing Scenario, such maintenance works would cease to be carried out. Failure to comply with the legislation would be contrary to the Drainage Act and could lead to compensatory claims to the OPW for damage to the benefiting lands. Such claims would be of a significant scale due to the expectations and investments in capital drainage works and maintenance made by the agricultural industry and the Government since the implementation of the Acts.

8.5.1.3 Social Considerations

In the absence of Arterial Drainage Maintenance and High Risk Channel Designation activities being implemented, the risk of flooding to the benefiting lands would increase significantly. In addition to the significant health and safety impacts associated with flooding, this would increase the occurrence of stress and trauma for individuals and communities. This flood management option would therefore be socially unacceptable.

8.5.2 Option 2: Do Absolute Minimum

Under the 'Do Absolute Minimum' scenario, the maintenance of channels, embankments and associated structures would be carried out on a reactive basis only. Ad-hoc 'Designation' works would also be carried out on a reactive basis.

As stated under 'Option 1', the Commissioners of Public Works derive their powers to prepare and execute a drainage scheme for the *'purpose of preventing or substantially reducing the periodic flooding of lands in that area or of improving by drainage the said area'* from the Arterial Drainage Acts 1945 and 1995. They have a statutory obligation under this legislation to maintain these schemes in *'proper repair and effective condition'*. In order that the function of maintaining drainage works might be carried out only on a reactive basis, as per the 'Do Absolute Minimum' scenario, changes would be required to this legislation.

8.5.2.1 Environmental Considerations

Under the 'Do Absolute Minimum' scenario, channels, embankments and associated structures would be maintained on a reactive basis only. This implies that flood management works would be carried out only when flooding has already occurred or is in danger of soon occurring. This management option therefore has a limited effect in terms of avoiding flood risk. The increased occurrence of flooding, which would potentially arise as a result of the implementation of this flood management option, would result in positive and negative impacts on flora, fauna, biodiversity, water quality and soil quality, as described in **Sections 8.2 and 8.3.1.1** above.

This option would also contravene the requirements of the Floods Directive.

8.5.2.2 Economic Considerations

Under the 'Do Absolute Minimum' scenario, State expenditure on maintenance would be reduced but economic losses would increase significantly due to the loss in agricultural land productivity and damage to homes, businesses and infrastructure caused by flooding.

Under Section 37 of the Arterial Drainage Act 1945, the OPW is statutorily obliged to maintain all rivers, embankments and urban flood defenses on which it has executed works since the 1945 Act in *'proper repair and effective condition'*. Under the Do Absolute Minimum Scenario, the capacity for carrying out these maintenance works would be greatly restricted. Failure to comply with the legislation would be contrary to the Drainage Act and could lead to compensatory claims to the OPW for damage to the benefiting lands. Such claims would be of a significant scale due to the expectations and investments in capital drainage works and maintenance made by the agricultural industry and the Government since the implementation of the Acts.

8.5.2.3 Social Considerations

The carrying out of Arterial Drainage Maintenance and High Risk Channel Designation

works on an 'Absolute Minimum' basis would increase the flood risk to the benefiting lands. This flood management option would therefore be unacceptable to the agricultural sector and other parties affected by flood risk issues, including those living and/or working within or near to the benefiting lands.

8.5.3 Option 3: Continue Statutory Maintenance

The 'Continue Statutory Maintenance' option would uphold the Commissioner of Public Work's statutory requirements under the 1945 and 1995 Arterial Drainage Acts to maintain all rivers, embankments and flood defenses on which it has executed works since the 1945 Act in '*proper repair and effective condition*'. Under this option, the statutory maintenance of channels, embankments and associated structures would continue, and a criteria-based 'Designation' process for High Risk Channels would be implemented.

8.5.3.1 Environmental Considerations

Under the 'Continue Statutory Maintenance' option, a programme of effective flood risk management would continue to be carried out. However, while this option would result in the prevention or reduction of the negative environmental impacts of flooding, it encompasses little or no scope for the improvement of environmental conditions, in terms of biodiversity or water quality.

8.5.3.2 Economic Considerations

The works proposed under 'Option 4' represent cost-effective expenditure by the State. This flood management option would continue to significantly reduce the flood risk to benefiting lands, and therefore the potential for the financial losses and costs associated with flooding.

8.5.3.3 Social Considerations

Under the 'Continue Statutory Maintenance' option, a programme of effective flood risk management would continue to be carried out. This option would therefore be socially acceptable to the agricultural sector and other relevant flood-prone parties.

8.5.4 Option 4: Proactive Approach to Mitigate Flood Risk

The Proactive Approach to Mitigate Flood Risk option would uphold the Commissioner of Public Works' statutory requirements under the 1945 and 1995 Arterial Drainage Acts to maintain all rivers, embankments and flood defenses on which it has executed works since the 1945 Act in '*proper repair and effective condition*'. Under this option, the statutory maintenance of channels, embankments and associated structures would be continued, and a series of 'Designations' for channels or defenses of strategic importance would be proposed.

8.5.4.1 Environmental Considerations

Under the 'Proactive Approach to Mitigate Flood Risk' option, a program of effective flood risk management would continue to be carried out. However, while this option would result in the prevention or reduction of any negative environmental impacts of flooding, it encompasses little or no scope for the improvement of environmental conditions, in terms of biodiversity or water quality.

The 'Designation' of a series of channels and defenses of strategic importance, which is encompassed by 'Option 4', represents a more thorough management of potential flood risk than the criteria-based 'Designation' process that would be implemented under 'Option 3'. 'Option 4' therefore offers increased scope for the reduction of flood risk and

the associated negative environmental impacts than 'Option 3' but also increases the potential of any biodiversity gain which requires an increase in flood risk.

8.5.4.2 Economic Considerations

The works proposed under 'Option 4' represent cost-effective expenditure by the State. This flood management option would continue to significantly reduce the flood risk to benefiting lands, and therefore the potential for the financial losses and costs associated with flooding.

8.5.4.3 Social Considerations

Under the 'Continue Statutory Maintenance' option, a program of effective flood risk management would continue to be carried out. This option would therefore be socially acceptable to the agricultural sector and other relevant flood-prone parties.

8.5.5 Option 5: Proactive Approach to Mitigate Flood Risk with Heightened Environmental Enhancement

The 'Proactive Approach to Mitigate Flood Risk with Heightened Environmental Enhancement' option would uphold the Commissioner of Public Works' statutory requirements under the 1945 and 1995 Arterial Drainage Acts. Under this option, the statutory maintenance of channels, embankments and associated structures would be continued, and a series of 'Designations' for channels or defenses of strategic importance would be proposed. Environmental enhancement opportunities under OPW's Environmental River Enhancement Programme would be integrated into all works.

8.5.5.1 Environmental Considerations

'Option 5' encompasses a program of proactive and integrated flood risk management, similar to 'Options 3 and 4'. 'Option 5' however also provides increased potential for positive environmental impacts in terms of the environmental enhancement works. These works are described in **Section 8.2.4** above. The environmental benefits associated the implementation of Option 5 would directly assist Ireland's compliance with the Water Framework Directive (2000/60/EC) through hydromorphology measures, and will assist other broader requirements such as the Habitats Directive (92/43/EEC) and the National Biodiversity Plan 2011 by maximizing the biodiversity of the river corridor while maintaining the flood risk management functions.

8.5.5.2 Economic Considerations

'Option 5' represents a higher expenditure than the alternative options, but can still be executed in a cost-effective manner. This flood management option would continue to significantly reduce the flood risk to benefiting lands, and therefore the potential for the financial losses and costs associated with flooding.

8.5.5.3 Social Considerations

Under the 'Proactive Approach to Mitigate Flood Risk with Heightened Environmental Enhancement' option, a program of effective flood risk management would continue to be carried out. This option would therefore be socially acceptable to the agricultural sector and other relevant flood-prone parties.

8.6 Preferred Option

In assessing the alternative flood management strategies, the alternative that emerges as the preferred option is 'Option 5: Proactive Approach to Mitigate Flood Risk with Heightened Environmental Enhancement'. This is summarized in **Table 8.4** below.

‘Options 1 and 2’, as outlined in **Sections 8.5.1 and 8.5.2**, entail little or no maintenance or ‘Designation’ works, which would contravene current drainage legislation. An increased level of flooding would in some cases have an environmental benefit, for example a potential increase in the bird species associated with wetland habitats. In other instances however, increased flooding would result in negative environmental impacts. Under ‘Options 1 and 2’, State expenditure for river maintenance would reduce but economic losses would increase significantly due to a loss in land productivity and to flood-related damage. Both options would also be socially unacceptable to the agricultural sector and other parties affected by flood risk issues.

‘Options 3 and 4’, as outlined in **Sections 8.5.3 and 8.5.4**, uphold the statutory drainage requirements under the 1945 and 1995 Arterial Drainage Acts and would largely maintain the environment at current status. These options also represent cost-effective expenditure by the State and are likely to be socially acceptable to the agricultural sector and other relevant parties. However, there is little or no potential for environmental enhancement associated with either option.

The preferred option, ‘Option 5’, will uphold the statutory drainage requirements under the 1945 and 1995 Arterial Drainage Acts and can be executed in a cost-effective way by the State. It is also likely to be socially acceptable to the agricultural sector and other relevant parties affected by flood risk. However, this option also incorporates heightened environmental enhancement with the aim of creating more positive environmental impacts.

Table 8.4 *Summary of Alternative Flood Management Options*

Management Option	Environmentally Appropriate	Economically Viable	Socially Acceptable	Sustainability
Option 1. Do-nothing scenario	Increase in flood events, in turn impacting positively on wetland habitats/species but with some negative impacts on species/habitats, water and soil quality. Risk of inappropriate maintenance carried out by private landowners. - +	Increased flood risk to property, resulting in financial losses, and loss of production in agricultural sector. Contravenes Arterial Drainage Acts. - -	Increase in flood risk, resulting in increased risk to health and safety, including mental and physical health. - -	Damaging to habitats Unacceptable economical risks Unacceptable social risks Contravenes Floods Directive and Arterial Drainage Acts - -
Option 2. Do absolute minimum	Increase in flood events, in turn impacting positively on wetland habitats/species but with some negatively impacts on species/habitats, water and soil quality. Risk of inappropriate maintenance carried out by private landowners. - +	Increased flood risk to property, resulting in financial losses, and loss of production in agricultural sector. Contravenes Arterial Drainage Acts. - -	Increase in flood risk, resulting in increased risk to health and safety, including mental and physical health. -	Damaging to habitats Unacceptable economical risks Unacceptable social risks Contravenes Floods Directive and Arterial Drainage Acts -
Option 3. Continue statutory maintenance	Prevention or reduction of the negative environmental impacts resulting from flooding. No scope for enhancement of environmental conditions. - +	Cost effective State expenditure. Reduced flood risk. +	Socially acceptable to agricultural sector and other flood prone parties. +	Acceptable option, however no scope for environmental enhancement. - +
Option 4. Proactive approach to mitigate flood risk	Prevention/ Reduction of negative environmental impacts resulting from flooding. No scope for enhancement of environmental conditions. - +	Cost effective State expenditure. Proactive approach to channel 'Designation'. Reduced flood risk. + +	Socially acceptable to agricultural sector and other flood prone parties. +	Acceptable option, however no scope for environmental enhancement. +
Option 5. Proactive approach to mitigate flood risk with heightened environmental enhancement.	Prevention/ Reduction of negative environmental impacts resulting from flooding. Enhancement of Environmental Conditions under EREP. +	Cost effective State expenditure. Proactive approach to channel 'Designation'. Reduced flood risk. + +	Socially acceptable to agricultural sector and other flood prone parties. Assist Irelands obligations under EU Directives. + +	Preferred option, as limits risk of flooding and provides opportunity for enhancement of environmental conditions. + +

9.0 Impact Assessment

9.1 Introduction

This section of the Environmental Report identifies the likely significant effects on the environment, of implementation of the OPW flood management works, as described in **Chapter 3**. The identification and evaluation of the environmental effects of plans and programmes is a key aspect of the Strategic Environmental Assessment process. This process ensures the integration of environmental considerations into the proposed plan or programme, while the identification of any adverse environmental effects at an early stage allows the formulation of mitigation measures that may be used to prevent, reduce or offset these effects before implementation of the works.

9.2 Methodology

An objective-led approach has been applied in the assessment of the flood management works. The works have been assessed with reference to each of the Strategic Environmental Objectives and Sub-objectives identified in **Chapter 7** of the Environmental Report, and the environmental impact described in terms of human beings, flora and fauna, geology and soils, water, air and climate, landscape, cultural heritage and material assets.

9.3 Impact Assessment Results

9.3.1 Human Beings

Impacts on human beings as a result of the OPW works range from 'Little' or 'No Impact' to 'Very Positive/Beneficial Impact'. In terms of the Strategic Environmental Objectives, several of the sub-objectives under the Core Criteria heading of Environmental will have no relationship or impact on human beings. The achievement of some Environmental sub-objectives will however also result in a positive impact on human beings, for example minimising the risk of the spread of invasive aquatic species and ensuring no adverse effects on commercial fisheries.

The interaction of the sub-objectives of the Social and Economic Core Criteria with human beings result in 'Positive' and 'Very Positive Impacts'. Works to be incorporated into the achievement of these sub-objectives include the protection of existing waterside access for recreational and community facilities and the protection of public health and safety.

In terms of the overall impact on human beings, the effective management of flood risk as carried out under these works will have a 'Very Beneficial' impact. The works significantly reduce the risk of flooding and its associated impacts on human health and safety, infrastructure and amenities, and the associated stress, trauma and financial losses and costs.

9.3.2 Flora and Fauna

Impacts on flora and fauna as a result of the OPW works range from having an 'Undetermined/Uncertain Impact' to 'Very Positive/Beneficial Impact'. Where an impact has been found to be 'Undetermined' or 'Uncertain', the mitigation works as described in **Chapter 10** of this report will be incorporated into the works so as to avoid negative impacts. Further information regarding impacts on specific habitats and species is set out below.

Impacts on Peatland

The long-term effects of drainage maintenance works on the hydrological regime of bog habitats are unknown and the therefore the impact is indeterminate. The purpose of Arterial drainage maintenance works is to retain current Scheme's design standards in terms of outfall for drainage and flood mitigation by maintaining the channels designed capacity to convey water. Thus no new drainage channels are dug and OPW manage sensitive sites in order to maintain current water levels.

Impacts on Fens

The long-term effects of drainage maintenance works on the hydrological regime of fen habitats are unknown and the therefore the impact is indeterminate. The purpose of Arterial drainage maintenance works is to retain the Scheme's design standards in terms of outfall for drainage and flood mitigation by maintaining the channels' designed capacity to convey water.

Impacts on Riverine Habitats

The management of silt and aquatic vegetation, which forms an integral part of the OPW drainage works, could impact directly on this habitat. The works may result in the direct removal of the habitat or the release of excessive amounts of silt upstream, smothering this aquatic habitat. However as part of the OPW Standard Operational Procedures (SOPs) efforts are made to retain a marginal portion of all forms of aquatic vegetation and to leave sections of sensitive channels untouched. In addition, a large volume of the annual works programming, includes the timing of works to be carried out in certain seasons to minimise impact on fisheries spawning channels or other sensitive habitats.

Impacts on Lakes

The management of silt and aquatic vegetation, which forms an integral part of the OPW drainage works, could impact directly on lake habitats. The works may result in the release of excessive amounts of silt, and thus the eutrophication of lakes as silt and sediment gets washed into lakes from upstream.

Impacts on Turloughs

Arterial drainage works for flood relief may interrupt the local hydrological regime and thus impact upon turlough habitats, which are dependant on ground water and rainfall. 'The OPW series of Ecological Assessment on Arterial Drainage Maintenance no. 8' (ISSN 1649-9840) is concerned with drainage maintenance on and within turlough habitats. This publication has identified mitigation measures for works in the vicinity of turloughs and specific measures in relations to some Special Areas of Conservation.

Changes to water levels of turloughs that could arise as a result of OPW works could also impact on wintering wildfowl and other bird species utilising turlough habitats.

Impacts on Estuarine Habitats

Channel maintenance works could potentially result in the release of high levels of suspended solids into estuarine habitats downstream of works. Estuarine habitats are known to have high levels of suspended solids and any additional suspended solids flowing into an estuary are likely to be insignificant as a consequence.

The release of suspended solids could have a negative impact on any aquatic species using the watercourse, for instance suspended solids are known to get trapped in the gills of fish such as salmon.

Impacts on Salmon

There is the potential for salmon to be adversely affected by the OPW programme of works. Populations of salmon within the channels could be affected by smothering of spawning beds due to increased suspended solids or by direct excavation of the same. These impacts are minimised by the implementation of OPW's Environmental Management Protocols and SOPs (as provided in **Appendix 4**) and liaison with the NPWS and IFI at Scheme/project level.

Impacts on Freshwater Crayfish

The direct removal of existing substrate features that provide cover and refuge for crayfish could impact upon their populations. However such impacts are minimised by the OPW's Environmental Management Protocols and SOPs regarding crayfish, and by liaison with the National Parks & Wildlife Service (NPWS) and Inland Fisheries Ireland (IFI).

Impacts on Lamprey

There is the potential for lamprey species along the OPW channels to be affected by the OPW programme of works. Populations of lamprey within the site could be affected by smothering of spawning beds due to increased suspended solids or by direct excavation of juvenile lamprey in silt deposits. Impacts are minimised by strict adherence to the OPW's Environmental Management Protocols and SOPs (as provided in **Appendix 4**), and liaison with the NPWS and the IFI.

Impacts on Otters

Disturbance to otters (and nearby otter holts) is a possibility, but is minimised provided that the OPW's Environmental Management Protocols and SOPs (as provided in **Appendix 4**) are implemented and through liaison with the NPWS and IFI.

Impacts on Birds

Kingfisher could be impacted by the OPW drainage maintenance works, if banks where they are nesting are removed or damaged. Kingfisher may also be impacted through disturbance during the works or knock-on effects relating to water quality.

9.3.3 Geology and Soils

Impacts on geology and soils as a result of the OPW works range from 'Little' or 'No Impact' to 'Very Positive/Beneficial Impact'. In terms of the Strategic Environmental Objectives, several of the sub-objectives under the Core Criteria heading of Environmental will have a positive impact on soils and geology, for example enhancing the natural fluvial processes, and maintaining existing riverine and wetland habitats. Overall, the incorporation of the sub-objectives under the Core Criteria headings of Economic and Social into the OPW works has little or no interaction with soils and geology. The main exception of this is the sub-objective of maintaining soil quality and function for productivity on agricultural lands. This aspect of the OPW works has a 'Very Positive/Beneficial Impact' in terms of soils.

In terms of the overall impact on geology and soils, the effective management of flood risk as carried out under these works has a 'Beneficial Impact'. The works significantly reduce the risk of flooding. In the absence of these works, the risk of flooding to the benefiting lands would increase significantly, leading to potential damage to the valuable soil resource within the benefiting lands, and knock-on effects including

reduced land productivity and the associated financial losses and costs. Flooding can also result in soil erosion, bank erosion and land sliding.

9.3.4 Water

Impacts on water as a result of the OPW works range from 'Little' or 'No Impact' to 'Very Positive/Beneficial Impact'. The majority of the objectives and sub-objectives identified under the Core Criteria heading of Environmental result in a 'Positive' or 'Very Positive' impact on water, for example enhancing natural fluvial processes and avoiding conflicts with the aim for all waterbodies to achieve good status by 2015. The incorporation of the sub-objectives under the Core Criteria headings of Economic and Social into the OPW works also results in 'Positive' impacts at water. Examples include the objectives to avoid negative impacts to existing water-based leisure activities and supporting economic activities without conflicting with environmental objectives.

In terms of the overall impact on water, the effective management of flood risk as carried out under these works has a Very Beneficial impact. In the absence of the works, the risk of flooding to the benefiting lands would increase significantly, leading to potential negative impacts on water from sources such as the leaching of pollutants from soils and the flooding of wastewater treatment utilities.

9.3.5 Air and Climate

The overall impact on air and climate as a result of the works is predicted to be negligible.

9.3.6 Landscape

Impacts on the landscape as a result of the OPW works range from 'Little' or 'No Impact' to 'Positive/Beneficial Impact'. With reference to new 'Designation' projects, the objective to protect and where possible enhance landscape character and visual amenity results in a 'Very Positive/Beneficial Impact' for landscape.

In the majority of cases, the landscape and visual impacts associated with the OPW works will be negligible. These impacts are limited to the immediate vicinity of where the works are being carried out. The works that could potentially give rise to localised landscape or visual impacts include tree removal, the spreading of material that has been removed in maintenance operations along the bank or on top of existing spoil heaps where present, and repair works to embankments, in the form of topping up with clay to design height.

9.3.7 Cultural Heritage

The majority of sub-objectives have 'Little' or 'No Impact' on cultural heritage. With reference to new 'Designation' projects, the specific objective to protect features of cultural heritage has a 'Very Positive/Beneficial Impact'. This objective incorporates the protection of architectural buildings and structures listed on the Record of Protected Structures and the protection of archaeological features listed on the Record of Monuments and Places.

In more general terms, the OPW works reduce the flood risk to benefiting lands, and therefore also reduce the flood risk to sites and features of archaeological and architectural heritage located within these lands. The works therefore have the potential to have a Very Positive/Beneficial Impact on Cultural Heritage.

9.3.8 Material Assets

Impacts on material assets as a result of the OPW works range from 'Little' or 'No Impact' to 'Very Positive/Beneficial Impact'. In terms of the Strategic Environmental Objectives, some of the sub-objectives under the Core Criteria heading of Environmental will have no relationship or impact on material assets. The achievement of some Environmental sub-objectives will however also result in a positive impact on material assets, for example ensuring no adverse effects on commercial shellfisheries.

The interaction of the sub-objectives of the Social and Economic Core Criteria with material assets result in 'Positive' and 'Very Positive Impacts'. Works to be incorporated into the achievement of these sub-objectives include the protection of existing waterside access for recreational and community facilities and the protection of public health and safety.

In terms of the overall impact on material assets, the effective management of flood risk as carried out under these works has a 'Very Beneficial' impact. These works significantly reduce the risk of flooding to the benefiting lands. In the absence of the works being implemented, the risk of flooding to the benefiting lands would increase significantly, with resulting potential negative impacts for material assets located on these lands, including agricultural land, commercial and industrial premises, transport and communications infrastructure, water supply and wastewater treatment facilities and infrastructure. Flood damage to these material assets could have potential knock-on negative impacts on human beings, flora and fauna and air and soil quality.

9.3.9 Cumulative Impacts

There is now comprehensive EU legislation seeking a holistic approach to water management, led through two large drivers i.e. the River Basin Management Plans (RBMPs) and the Flood Risk Management Plans (FRMPs). These plans will guide all flood risk management activities in a holistic manner and taking account of cumulative impacts due to multiple plans and programmes in the water sector. Ongoing arterial drainage maintenance and the future High Risk Channel Designation process, are part of a suite of national flood risk management activities and will align with the requirements of the RBMPs and FRMPs. To date, drainage maintenance activities have been aligned with the RBMPs (2009) and are the key element for Ireland's implementation of the formal Hydromorphology WFD measures. This SEA has been deliberately aligned with the central water management timeline of 2015 and the SEAs of the RBMPs and FRMPs will integrate this SEA, providing the ultimate solution in the overview of managing cumulative impacts.

9.4 Summary of Impact Assessment

The following key has been used in setting out the results of the impact assessment:

Table 9.1 *Impact Assessment Criteria*

Type of Impact	Symbol Used
Very positive / beneficial impact	++
Positive / beneficial impact	+
No relationship / little or no impact	0
Negative impact	-
Very negative impact	--
Undetermined / uncertain impact	X

The results of the impact assessment are set out in Tables 9.2 to 9.3. Arterial Drainage Maintenance and High Risk Channel Designation have been assessed separately, and the results set out as follows:

- Table 9.2: Impact Assessment: Arterial Drainage Maintenance
- Table 9.3: Impact Assessment: High Risk Channel Designation

Table 9.2 Impact Assessment: Arterial Drainage Maintenance Works

Core Criteria	Objective	Sub-objective	Human Beings	Flora and Fauna	Geology and Soils	Water	Air and Climate	Landscape	Cultural Heritage	Material Assets
Environmental	Support the achievement of Good Ecological Status/Potential (GES/GEP) under the Water Framework Directive (WFD).	Maintain existing and, where feasible, enhance natural fluvial processes in support of proposed WFD measures.	+	++	+	++	0	0	0	0
		Avoid conflicts with the aim for all water bodies to achieve good status by 2015.	+	++	0	++	0	0	0	+
	Protect the flora and fauna within the river, river corridor and along machine and vehicular access points and where possible enhance biodiversity.	Avoid damage to internationally and nationally designated sites of nature conservation importance.	0	++	+	+	0	0	0	0
		Avoid damage to habitats supporting legally protected species and other known species of conservation concern.	0	++	+	+	0	0	0	0
		Protect existing riverine and wetland habitats to maintain naturally functioning ecosystems	0	++	+	++	0	+	0	+
		Minimise the risk of spread of any invasive aquatic species.	+	++	+	++	0	+	0	+
	Protect and, where possible, enhance the integrity of fisheries within the Arterial Drainage Schemes and Flood Relief Schemes.	Maintain existing habitat supporting salmonid fisheries and carry out enhancement where possible.	+	++	0	++	0	0	0	+
		Expand salmonid habitat where feasible due to barrier removal.	+	++	0	0	0	0	X	+
		Ensure no adverse effects on commercial shellfisheries.	+	++	0	++	0	0	0	++
Social	Protect existing waterside access for recreational and community facilities during Scheme Maintenance operations.	-	++	X	0	0	0	+	0	+

Core Criteria	Objective	Sub-objective	Human Beings	Flora and Fauna	Geology and Soils	Water	Air and Climate	Landscape	Cultural Heritage	Material Assets
	Protect public health, safety and employment (including physical, psychological and economic aspects of flooding).	Maintain the level of flood protection provided under the original Arterial Drainage Schemes & Flood Relief Schemes.	++	X	+	+	0	0	0	++
	Avoid negative impacts to existing water-based leisure activities.	Maintain the level of flood protection provided under the original Arterial Drainage Schemes & Flood Relief Schemes.	+	X	0	+	0	0	0	+
Economic	Reduce vulnerability to the impacts of climate change and maintain flexibility for future responses.	Reduce frequency and level of flooding on Arterial Drained catchments and Flood Relief Schemes.	++	0	0	0	0	0	0	0
	Avoid damage to the function and quality of the soil resource.	Maintain soil quality and function for productivity on agricultural lands.	+	X	++	+	0	+	0	+
	Support economic activities without conflicting with environmental objectives.	Maintain lands available for economic activity and no change as to render existing economic activity unviable.	++	+	0	+	0	0	0	++
	Reduce inappropriate floodplain development, through advice and guidance to Local Authorities.	-	++	+	+	+	0	+	0	+
	Mitigate the risk of flooding to existing developments, infrastructure and material assets.	-	++	X	+	+	0	+	+	++

Table 9.3 Impact Assessment: High Risk Channel Designation

Core Criteria	Objective	Sub-objective	Human Beings	Flora and Fauna	Geology and Soils	Water	Air and Climate	Landscape	Cultural Heritage	Material Assets
Environmental	Support the achievement of Good Ecological Status/Potential (GES/GEP) under the Water Framework Directive (WFD).	Maintain existing and, where feasible, enhance natural fluvial processes in support of proposed WFD measures.	+	++	+	++	0	0	0	0
		Avoid conflicts with the aim for all water bodies to achieve good status by 2015.	+	++	0	++	0	0	0	+
	Protect the flora and fauna within the river, river corridor and along machine and vehicular access points and where possible enhance biodiversity.	Avoid damage to internationally and nationally designated sites of nature conservation importance.	0	++	+	+	0	0	0	0
		Avoid damage to habitats supporting legally protected species and other known species of conservation concern.	0	++	+	+	0	0	0	0
		Protect existing riverine and wetland habitats to maintain naturally functioning ecosystems	0	++	+	++	0	+	0	+
		Minimise the risk of spread of any invasive aquatic species.	+	++	+	++	0	+	0	+
	Protect and, where possible, enhance the integrity of fisheries within Designated channels.	Maintain existing habitat supporting salmonid fisheries and carry out enhancement where possible.	+	++	0	++	0	0	0	+
		Expand salmonid habitat where feasible due to barrier removal.	+	++	0	0	0	0	X	+
		Ensure no adverse effects on commercial shell fisheries.	+	++	0	++	0	0	0	++
Social	Protect existing waterside access for recreational and community facilities during 'Designation' operations.	-	++	X	0	0	0	+	0	+

Core Criteria	Objective	Sub-objective	Human Beings	Flora and Fauna	Geology and Soils	Water	Air and Climate	Landscape	Cultural Heritage	Material Assets
	Protect public health, safety and employment (including physical, psychological and economic aspects of flooding).		++	X	+	+	0	0	0	++
	Avoid negative impacts to existing water-based leisure activities.		+	X	0	+	0	0	0	+
	Protect and where possible enhance landscape character and visual amenity for new 'Designation' projects.	Protect the character of designated landscape protection areas such as Scenic Views and Scenic Routes within urban and rural areas.	++	X	0	+	0	0	+	++
Economic	Reduce vulnerability to the impacts of climate change and maintain flexibility for future responses.	Reduce frequency and level of flooding on Designated channels.	++	0	0	0	0	0	0	0
	Avoid damage to the function and quality of the soil resource.	Maintain soil quality and function for productivity on agricultural lands.	+	+	++	0	0	0	0	+
	Support economic activities without conflicting with environmental objectives.	Maintain lands available for economic activity and no change as to render existing economic activity unviable.	++	+	0	+	0	0	0	+
	Reduce inappropriate floodplain development, through advice and guidance to Local Authorities.	-	++	+	+	+	0	+	0	+
	Mitigate the risk of flooding to existing developments, infrastructure and material assets.	-	++	X	0	0	0	0	0	++

Core Criteria	Objective	Sub-objective	Human Beings	Flora and Fauna	Geology and Soils	Water	Air and Climate	Landscape	Cultural Heritage	Material Assets
Cultural Heritage	Protect known features of cultural heritage.	Protect architectural buildings and structures listed on the Record of Protected Structures (RPS) and designated areas of architectural importance such as Architectural Conservation Areas (ACAs).	+	0	0	0	0	+	++	+
		Protect archaeological features listed on the Record of Monuments and Places (RMP) or other listed National Monument and Archaeological Sites that are at risk from flooding.	+	0	0	0	0	+	++	+

- Undetermined/Uncertain impacts to Flora and Fauna will be subject to monitoring detailed in Chapter 10.
- Undetermined/Uncertain impacts to Cultural Heritage were identified as weirs/barriers identified for removal may have be of cultural heritage value. Any weirs/barriers identified for removal will be assessed for their archaeological/architectural value prior to removal.

10.0 Mitigation and Monitoring

10.1 Introduction

The Environmental Report has highlighted the more significant potential positive and negative environmental impacts from the implementation of Arterial Drainage Maintenance and High Risk Channel Designation Programme with the following sections describing the mitigating and monitoring arrangements to manage these potential impacts.

10.2 Measures to Prevent or Reduce Effects

A dedicated Environment Section was established within the Drainage Maintenance Service in 2003, to ensure the long-term integration of environmental protection and drainage maintenance. For drainage maintenance activities, there are a series of measures in place to minimise any negative significant environmental impacts and in many cases to affect a positive impact. This is an ongoing process supported by a range of research, and implemented through the OPW's environmental management system, which includes a set of Management Protocols and Standard Operating Procedures. It is envisaged that the proposed 'Designation' process will incorporate all the relevant drainage maintenance environmental measures as applicable to the type of particular project. An overview of the environmental good practice measures is as follows:

10.2.1 Environmental Management Protocols

An Environmental Management framework was developed in 2009, based largely on the Ecological Impact Assessments (EclAs) carried out under OPW's Environmental research strategy detailed in **Section 10.2.4**. A set of Environmental Management Protocols were formally introduced nationally in May 2009 which sets out how regional management staff manage a range of aspects, from environmental stakeholder consultations, forward planning for Article 6 Assessments, national recording of relevant conservation data, the approach to a range of protected species such as crayfish, Lamprey, Otter etc, through to the approach to Invasive species.

A number of Standard Operating Procedures (SOPs) have been used in operations for some years but in May 2009, a full suite of all SOPs (7 No.) were introduced nationally in a folder format to be used by all operational staff on-site. SOPs set out actions designed to eliminate, or substantially reduce impacts to identified protected species and their associated habitats. The complete set of OPW's Environmental Management Protocols and Standard Operating Procedures are shown in **Appendix 4**. The 7 SOP's currently in place are as follows:

- Environmental Drainage Maintenance Guidance Notes (10 Steps to Environmentally Friendly maintenance)
- Lamprey SOP
- Crayfish SOP
- Otter SOP
- Mussels SOP
- Invasive Species SOP
- Zebra Mussel SOP

10.2.2 Liaison with Statutory Bodies

In light of the fact that drainage works are predominately within inland waters, Inland Fisheries Ireland (IFI) and the National Parks & Wildlife Service (NPWS) are seen as

the primary statutory body stakeholders. Over the years, working relationships have been established with these stakeholders. Their regional management now have the opportunity to review the annual works programme and operational staff have developed open, on-site communications with many of the Fishery Officers, Conservation Rangers and District Conservation Officers, which will integrate a deeper understanding of practical environmental protection within maintenance works.

Observations or comments on practical measures to either mitigate possible environmental impacts or exploit enhancement opportunities are integrated into the maintenance works. While the current communication framework offers adequate positive interaction, it is intended to continuously develop improved consultation protocols at all staff levels with both Inland Fisheries Ireland and National Parks and Wildlife Service.

10.2.3 Broader Stakeholder Interaction

The OPW are active members in a variety of multi-agency fora and working groups, where an ongoing consultation with a host of stakeholders is standard practice, to assist with implementation of a range of environmental requirements. Example of such for a include:

- All seven River Basin District Management Groups/Technical Councils.
- National Freshwater Morphology Programmes of Measures Study (now completed).
- National Heavily Modified Water Bodies Programmes of Measures Study (now completed).
- National Conservation Working Group.
- National Biodiversity Working Group.
- Control of Aquatic Invasive Species in Ireland Life+ project.
- Irish Ramsar Wetland Committee.
- National Wetlands Steering Group.
- National Expert Placement with DG Environment, European Commission.
- Scottish Government Natural Flood Management Steering Group (now completed).

OPW maintain some international presence to ensure that there is an understanding of how these agendas are been progressed outside Ireland. OPW presence at foreign conferences on aspects such as hydromorphology, and river restoration is common. Contact is maintained with bodies such as, European Commission, European Centre for River Restoration, UK River Restoration Centre, Northern Ireland Environment Agency and Rivers Agency Northern.

OPW also work with a number of ecological consultants as engaged for the various research and assessments required. In more recent years, OPW work with a number of NGOs including Bird Watch Ireland since 2006 and Bat Conservation Ireland since 2008.

10.2.4 Environmental Research

The Natura 2000 network has been screened for the impacts of arterial drainage maintenance operations and a research strategy was developed. This screening was published by OPW in 2007 as "*Screening of Natura 2000 Sites for Impacts of Arterial Drainage Maintenance Operations*". This research strategy was in recognition that statutory drainage maintenance operations are an ongoing activity across the State and overlap with many Natura 2000 Sites to varying degrees, resulting in a possible

requirement for multiple individual environmental assessments for the same conservation aspects. The strategy sets out a strategic and reasonable, practical approach that can be followed by the OPW. The objective was to target resources on a more focused list of environmental assessments through a coordinated nationwide approach, to gather understanding on a range of conservation aspects. The research strategy was implemented through the form of targeted Ecological Impact Assessments (EcIA). Output from this research was used in the development of OPW's Environmental Management Protocols and Standard Operating Procedures.

The 2007 'Screening Report', along with all emanating EcIAs are published in a series entitled "*Series of Ecological Assessments on Arterial Drainage Maintenance*", all published under International Standard Series Number ISSN 1649-9840. The completed series listed in **Table 10.1** are available in all main Irish and UK University libraries, and can be downloaded through www.opw.ie/en/FloodRiskManagement/Publications/.

The EcIAs focused on a range of Annex I Habitats and Annex II Species and were completed through a range of independent ecological consultants, statutory authorities and NGOs. Twelve EcIAs were identified and eleven have now been completed. The recommended EcIA on "*Overwintering birds frequenting inland areas with particular focus on disturbance*" is not to proceed. In consultation with Bird Watch Ireland, it was decided that the potential disturbance to wintering birds is not of a sufficient scale to justify a full EcIA. Alternatively, OPW and Bird Watch Ireland have extended the Kingfisher research to include river enhancement trials.

Table 10.1 *Series of Ecological Assessments on Arterial Drainage Maintenance*

Issue No.	Title
1	Screening of Natura 2000 Sites for Impacts of Arterial Drainage Maintenance Operations
2	EcIA of the Effects of Statutory Arterial Drainage Maintenance Activities on Raised Bogs & Associated Habitats
3	EcIA in Relation to Atlantic Salmon in Special Areas of Conservation & potential for Impact of OPW's Channel Maintenance Work
4	EcIA of the Effects of Statutory Arterial Drainage Maintenance Activities on the Otter (<i>Lutra lutra</i>)
5	EcIA of the Effects of Statutory Arterial Drainage Maintenance Activities on Water Courses of Plain to Montane Levels with Aquatic Vegetation (Floating River Vegetation)
6	EcIA of the Effects of Statutory Arterial Drainage Maintenance Activities on birds Dependent on Riparian Habitats
7	EcIA of the Effects of Statutory Arterial Drainage Maintenance Activities on Freshwater Pearl Mussels
8	EcIA of the Effects of Statutory Arterial Drainage Maintenance Activities on the Turloughs
9	EcIA of the Effects of Statutory Arterial Drainage Maintenance Activities on three Lamprey Species (<i>Lampetra planeri</i> Bloch, <i>Lampetra fluviatilis</i> L., and <i>Petromyzon marinus</i> L.)
10	EcIA of the Effects of Statutory Arterial Drainage Maintenance Activities on White-clawed Crayfish (<i>Austropotamobius pallipes</i>)
11	EcIA of the Effects of Statutory Arterial Drainage Maintenance Activities on Fens, Mires & Whorl Snails
12	EcIA of the Effects of Statutory Arterial Drainage Maintenance

10.2.5 Environmental Drainage Maintenance

IFI research has been ongoing with OPW since 1990. This research work known as the Environmental Drainage Maintenance (EDM) Programme developed environmentally friendly maintenance guidance, which is applicable both inside and outside Natura 2000 Sites.

The EDM programme was followed by the Environmental River Enhancement Programme (EREP). This OPW funded programme aims to enhance the river corridor, with a view to support the achievement of Good Ecological Status as described in the WFD and increasing biodiversity in support of the National Biodiversity Plan. The EREP as described in more detail in Section 10.2.6, includes continued scientific studies on white-clawed crayfish and lamprey.

10.2.6 Environmental River Enhancement Programme 2008-2012

The Arterial Drainage Maintenance Service of Engineering Services, OPW is carrying out a five year Environmental River Enhancement Programme. The enhancement works consist of both capital enhancement and enhanced maintenance. These works focus on river corridor improvements to salmonid channels with specific actions on 100 kilometres of scheme channel per annum, with pre and post measurement of biodiversity taking place on the channels in the relevant sub-catchments scheduled to benefit from these works. The identification of these channels, the carrying out of biodiversity assessments, the preparation of a five year programme of work and post biodiversity change assessments forms part of the work programme to be delivered by the service provider i.e. Inland Fisheries Ireland. It also involves making the assessment data available in a form that will allow completion of hydromorphological assessments. The enhancement works are being carried out using OPW staff and machinery with the IFI's staff working alongside OPW supervisory staff. All materials required for the construction of in-stream structures, gravel and fencing is being supplied by OPW.

10.2.7 Environmental Training

Environmental training of all staff is an ongoing process. Technical and operational staff have completed formal training in environmental river maintenance in 2004, and again in 2010, which contained the more recent environmental practices. This training was developed and delivered by Inland Fisheries Ireland as part of the EREP. The training programme delivered included presentations in river corridor ecology, maintenance strategies involving both enhanced maintenance and capital enhancement, and OPW's Environmental Management Protocols and SOPs.

The formal approach to EREP Training is complimented with on-site training. Regular site visits from IFI and OPW's Environment Section provide further guidance and advice to operational staff. Auditing of operational staff on the implementation of the Environmental Drainage Maintenance Guidance Notes (Ten Steps to Environmentally Friendly Maintenance) is also carried out under EREP. This is described in greater detail in **Section 10.3** Monitoring.

In addition, other environmental training takes place as deemed beneficial, e.g. in 2008, the majority of operational staff were trained in Otter Awareness. This course, provided by the Department of Zoology, Trinity College Dublin, included presentations on otter ecology, and on-site identification of otter signs and suitable habitat.

10.2.8 Geographical Information Systems (GIS)

GIS systems are now a significant tool to manage both the existing and future environmental information and to this effect, the Drainage Maintenance Service has recently digitised the original Drainage Scheme maps. GIS systems allow the rapid and accurate transfer of geographical environmental data and ultimately, it is intended to contain all maintenance work programmes, fishery information such as spawning reaches, environmentally designated areas e.g. SACs, other sensitive sites such as habitats of protected species and general habitat information in this format.

10.2.9 Ecological Assessments

The Arterial Drainage Maintenance Annual Works Programme is screened for potential impacts on Natura 2000 Sites. Channels identified as having the potential to impact on a Natura 2000 Sites are subject to Appropriate Assessment under Article 6(3) of the Habitats Directive. These Appropriate Assessments are carried out by external ecological consultants.

High Risk Channel Designation process is at development stage, and while there have been no formal 'Designations' under this approach, there are a number of localised flood alleviation projects completed or underway which would be of a similar nature as envisaged for 'Designation'. Recent practice for any new localised flood alleviation projects is to carry out Screening for Appropriate Assessment, and full AA if required, or an ecological assessment if the works are not within a Natura 2000 Site but still need to have regard to the broader protected habitats and species such as Annex IV species, Wildlife Acts or Flora Protection Order.

10.2.10 Environmental Impact Assessments

European Communities (Environmental Impact Assessment) Regulations, 1989 to 2006 transposes the EIA requirements, with recent further changes to the EIA thresholds been introduced through the Planning and Development (Amendment) (No. 2) Regulations 2011. The most applicable class of development relevant to Drainage Maintenance and 'Designation' projects is in respect of Canalisation. The thresholds are where canalisation and flood relief works, where the immediate contributing sub-catchment would exceed 100 hectares or where more than 2 hectares of wetland would be affected or where the length of river channel on which works are proposed would be greater than 2 km.

Arterial drainage maintenance works are considered to be sub-Environmental Impact Assessment threshold as the operations are maintaining the river corridor but are not canalising any new lengths or altering the existing post drainage catchment hydrology.

For 'Designation' projects, it is foreseen that the size and scale of the works will mainly be sub-threshold EIA. However, proposed 'Designation' projects will consider the EIA thresholds and any project exceeding the same will be subject to an EIA. In the absence of an EIA, an ecological assessment will be carried out as described in **Section 10.2.9**.

10.2.11 Planning & Development

While there is an extensive range of Planning and Development legislation, the most applicable current legislation is the Planning and Development Regulations, 2001 and the Planning & Development Acts 2000 to 2010. This legislation exempts from planning permission, works under an Arterial Drainage Scheme. These drainage works and the associated maintenance, forming part of a Scheme have been confirmed by a Minister

and have gone through a public exhibition process in accordance with the Arterial Drainage Acts 1945 and 1995.

For proposed High Risk Channel Designation projects, each specific project will require consideration of the requirements for compliance with the Planning and Development Acts and associated Regulations. Pending changes to legislation, 'Designation' projects of an urgent nature may be carried out on a once-off basis by agreement with affected landowners and statutory stakeholders or under the provisions of Part VIII of the Planning and Development Regulations, 2001 and the Local Authorities (Works) Act, 1949. Works using Part VIII procedures must be under the threshold for an EIS, as works above the threshold would fall under the Strategic Infrastructure Act, 2006.

It is the intent of the Flood Policy that 'Designation' would lead to ongoing maintenance and it envisaged that works carried out by agreement will involve upkeep, maintenance and repair only. Therefore, further legislative changes are necessary, and future 'Designation' would be made under new legislative powers, including absorption of prior works.

10.3 Monitoring Programme

10.3.1 Introduction

Article 10 of the SEA Directive requires that monitoring be carried out in order to identify at an early stage any unforeseen adverse effects due to the implementation of the Programme, with a view to taking remedial action where adverse effects are identified. The elements for monitoring of this Programme have been selected based on the outcomes of the Impact Assessment in Chapter 9. **Tables 10.2 and 10.3** indicated what elements have been identified for monitoring.

Table 10.2 Monitoring Selection: Arterial Drainage Maintenance Works

Core Criteria	Objective	Sub-objective	Criteria with potential Impact	Impact	Monitoring Identified	Proposed Form of Monitoring
Environmental	Support the achievement of Good Ecological Status/Potential (GES/GEP) under the Water Framework Directive (WFD).	Maintain existing and where feasible, enhance natural fluvial processes in support of proposed WFD measures.	Human Beings	+	No	-
			Flora & Fauna	++	Yes	Length of EREP works achieved Scientific Monitoring under EREP
			Geology & Soils	+	No	-
			Water	++	Yes	WFD Waterbody Status Monitoring
		Avoid conflicts with the aim for all water bodies to achieve good status by 2015.	Human Beings	+	No	-
			Flora & Fauna	++	Yes	Internal & External Audits Scientific Monitoring under EREP
			Water	++	Yes	WFD Waterbody Status Monitoring
			Material Assets	+	No	-
	Protect the flora and fauna within the river, river corridor and along machine and vehicular access points and where possible enhance biodiversity.	Avoid damage to internationally and nationally designated sites of nature conservation importance.	Flora & Fauna	++	Yes	Internal & External Audits Scientific Monitoring under EREP Article 17 Conservation Status Reports
			Geology & Soils	+	No	-
			Water	+	Yes	WFD Waterbody Status Monitoring
		Avoid damage to habitats supporting legally protected species and other known species of conservation concern.	Flora & Fauna	++	Yes	Internal & External Audits Scientific Monitoring under EREP
			Geology & Soils	+	No	-
			Water	+	Yes	WFD Waterbody Status Monitoring
		Protect existing riverine and wetland habitats to maintain naturally functioning ecosystems	Flora & Fauna	++	Yes	Internal & External Audits Scientific Monitoring under EREP
			Geology & Soils	+	No	-
			Water	++	Yes	WFD Waterbody Status Monitoring
			Landscape	+	No	-
			Material Assets	+	No	-
		Minimise the risk of spread of any invasive aquatic species.	Human Beings	+	No	-
			Flora & Fauna	++	Yes	Internal & External Audits Scientific Monitoring under EREP
			Geology & Soils	+	No	-
			Water	++	Yes	WFD Waterbody Status Monitoring
			Landscape	+	No	-
			Material Assets	+	No	-
			Material Assets	+	No	-
	Protect and, where possible, enhance the integrity of fisheries within	Maintain existing habitat supporting salmonid fisheries and carry out enhancement	Human Beings	+	No	-
			Flora & Fauna	++	Yes	Internal & External Audits Length of EREP works achieved

Core Criteria	Objective	Sub-objective	Criteria with potential Impact	Impact	Monitoring Identified	Proposed Form of Monitoring
	the Arterial Drainage Schemes and Flood Relief Schemes.	where possible.	Water	++	Yes	WFD Waterbody Status Monitoring
			Material Assets	+	No	-
		Expand salmonid habitat where feasible due to barrier removal.	Human Beings	+	No	-
			Flora & Fauna	++	Yes	No. of barriers removed as part of EREP Internal & External Audits
			Water	++	Yes	WFD Waterbody Status Monitoring
			Cultural Heritage	X	Yes	Assess Archaeological value of the site specific structure
			Material Assets	+	No	-
		Ensure no adverse effects on commercial shellfisheries.	Human Beings	+	No	-
			Flora & Fauna	++	Yes	Internal & External Audits Scientific Monitoring under EREP
			Water	++	Yes	WFD Waterbody Status Monitoring
			Material Assets	++	No	-
Social	Protect existing waterside access for recreational and community facilities during Scheme Maintenance operations.	-	Human Beings	+	No	-
			Flora & Fauna	X	Yes	Internal & External Audits Scientific Monitoring under EREP
			Landscape	+	No	-
			Material Assets	+	No	-
	Protect public health, safety and employment (including physical, psychological and economic aspects of flooding).	Maintain the level of flood protection provided under the original Arterial Drainage Schemes & Flood Relief Schemes.	Human Beings	++	Yes	Ongoing monitoring through Flood Hazard Maps & national database
			Flora & Fauna	X	Yes	Internal & External Audits
			Geology & Soils	+	No	-
			Water	+	Yes	WFD Waterbody Status Monitoring
			Material Assets	++	No	-
	Avoid negative impacts to existing water-based leisure activities.	Maintain the level of flood protection provided under the original Arterial Drainage Schemes & Flood Relief Schemes.	Human Beings	+	Yes	Ongoing monitoring through Flood Hazard Maps & national database
			Flora & Fauna	X	Yes	Internal & External Audits
			Water	+	Yes	WFD Waterbody Status Monitoring
			Material Assets	+	No	-

Core Criteria	Objective	Sub-objective	Criteria with potential Impact	Impact	Monitoring Identified	Proposed Form of Monitoring
Economic	Reduce vulnerability to the impacts of climate change and maintain flexibility for future responses.	Reduce frequency and level of flooding on Arterial Drained catchments, Flood Relief Schemes and on Designated channels and embankments.	Human Beings	++	Yes	Ongoing monitoring through Flood Hazard Maps & national database
	Avoid damage to the function and quality of the soil resource.	Maintain soil quality and function for productivity on agricultural lands.	Human Beings	+	No	-
			Flora & Fauna	X	Yes	Internal & External Audits Scientific Monitoring under EREP
			Geology & Soils	++	No	-
			Water	+	Yes	WFD Waterbody Status Monitoring
			Landscape	+	No	-
			Material Assets	+	No	-
	Support economic activities without conflicting with environmental objectives.	Maintain lands available for economic activity and no change as to render existing economic activity unviable.	Human Beings	++	No	Ongoing monitoring through Flood Hazard Maps & national database
			Flora & Fauna	+	Yes	Internal & External Audits Scientific Monitoring under EREP
			Water	+	Yes	WFD Waterbody Status Monitoring
			Material Assets	++	No	-
	Reduce inappropriate floodplain development, through advice and guidance to Local Authorities.	-	Human Beings	++	No	Ongoing monitoring through Flood Hazard Maps & national database
			Flora & Fauna	+	Yes	-
			Geology & Soils	+	No	-
			Water	+	Yes	WFD Waterbody Status Monitoring
			Landscape	+	No	-
			Material Assets	+	No	-
	Mitigate the risk of flooding to existing developments, infrastructure and material assets.	-	Human Beings	++	No	Ongoing monitoring through Flood Hazard Maps & national database
			Flora & Fauna	X	Yes	Internal & External Audits Scientific Monitoring under EREP
			Geology & Soils	+	No	-
			Water	+	Yes	WFD Waterbody Status Monitoring
			Landscape	+	No	-
			Cultural Heritage	+	No	-
			Material Assets	+	No	-

Table 10.3 Monitoring Selection: High Risk Channel Designation

Core Criteria	Objective	Sub-objective	Criteria with potential impact	Impact	Monitoring Identified	Proposed Form of Monitoring
Environmental	Support the achievement of Good Ecological Status/Potential (GES/GEP) under the Water Framework Directive (WFD).	Maintain existing and, where feasible, enhance natural fluvial processes in support of proposed WFD measures.	Human Beings	+	No	-
			Flora & Fauna	++	Yes	Length of EREP works achieved Scientific Monitoring under EREP
			Geology & Soils	+	No	-
			Water	++	Yes	WFD Waterbody Status Monitoring
		Avoid conflicts with the aim for all water bodies to achieve good status by 2015.	Human Beings	+	No	-
			Flora & Fauna	++	Yes	Internal & External Audits Scientific Monitoring under EREP
			Water	++	Yes	WFD Waterbody Status Monitoring
			Material Assets	+	No	-
	Protect the flora and fauna within the river, river corridor and along machine and vehicular access points and where possible enhance biodiversity.	Avoid damage to internationally and nationally designated sites of nature conservation importance.	Flora & Fauna	++	Yes	Internal & External Audits Scientific Monitoring under EREP Article 17 Conservation Status Reports
			Geology & Soils	+	No	-
			Water	+	Yes	WFD Waterbody Status Monitoring
		Avoid damage to habitats supporting legally protected species and other known species of conservation concern.	Flora & Fauna	++	Yes	Internal & External Audits Scientific Monitoring under EREP
			Water	+	Yes	WFD Waterbody Status Monitoring
		Protect existing riverine and wetland habitats to maintain naturally functioning ecosystems	Flora & Fauna	++	Yes	Internal & External Audits Scientific Monitoring under EREP
			Geology & Soils	+	No	-
			Water	++	Yes	WFD Waterbody Status Monitoring
			Landscape	+	No	-
			Material Assets	+	No	-
		Minimise the risk of spread of any invasive aquatic species.	Human Beings	+	No	-
			Flora & Fauna	++	Yes	Internal & External Audits Scientific Monitoring under EREP
			Geology & Soils	+	No	-
			Water	++	Yes	WFD Waterbody Status Monitoring
			Landscape	+	No	-
			Material Assets	+	No	-
	Protect and, where	Maintain existing habitat	Human Beings	+	No	-

Core Criteria	Objective	Sub-objective	Criteria with potential impact	Impact	Monitoring Identified	Proposed Form of Monitoring
	possible, enhance the integrity of fisheries within the Arterial Drainage Schemes and Flood Relief Schemes.	supporting salmonid fisheries and carry out enhancement where possible.	Flora & Fauna	++	Yes	Internal & External Audits Length of EREP works achieved
			Water	++	Yes	WFD Waterbody Status Monitoring
			Material Assets	+	No	-
		Expand salmonid habitat where feasible due to barrier removal.	Human Beings	+	No	-
			Flora & Fauna	++	Yes	No. of barriers removed as part of EREP Internal & External Audits
			Water	++	Yes	WFD Waterbody Status Monitoring
			Cultural Heritage	X	Yes	Assess Archaeological value of the site specific structure
			Material Assets	+	No	-
		Ensure no adverse effects on commercial shellfisheries.	Human Beings	+	No	-
			Flora & Fauna	++	Yes	Internal & External Audits Scientific Monitoring under EREP
			Water	++	Yes	WFD Waterbody Status Monitoring
			Material Assets	++	No	-
Social	Protect existing waterside access for recreational and community facilities during Scheme Maintenance operations.	-	Human Beings	++	No	-
			Flora & Fauna	X	Yes	Internal & External Audits Scientific Monitoring under EREP
			Landscape	+	No	-
			Material Assets	+	No	-
	Protect public health, safety and employment (including physical, psychological and economic aspects of flooding).	Maintain the level of flood protection provided under the original Arterial Drainage Schemes & Flood Relief Schemes.	Human Beings	++	Yes	Ongoing monitoring through Flood Hazard Maps & national database
			Flora & Fauna	X	Yes	Internal & External Audits Scientific Monitoring under EREP
			Geology & Soils	+	No	-
			Water	+	Yes	WFD Waterbody Status Monitoring
			Material Assets	++	No	-
	Avoid negative impacts to existing water-based leisure activities.	Maintain the level of flood protection provided under the original Arterial Drainage Schemes & Flood Relief Schemes.	Human Beings	+	Yes	Ongoing monitoring through Flood Hazard Maps & national database
			Flora & Fauna	X	Yes	Internal & External Audits Scientific Monitoring under EREP
			Water	+	Yes	WFD Waterbody Status Monitoring
			Material Assets	+	No	-
	Protect and where possible enhance	Protect the character of designated landscape	Human Beings	++	Yes	Ongoing monitoring through Flood Hazard Maps & national database

Core Criteria	Objective	Sub-objective	Criteria with potential impact	Impact	Monitoring Identified	Proposed Form of Monitoring
Economic	landscape character and visual amenity for new 'Designation' projects.	protection areas such as Scenic Views and Scenic Routes within urban and rural areas.	Flora & Fauna	X	Yes	Internal & External Audits Scientific Monitoring under EREP
			Water	+	Yes	WFD Waterbody Status Monitoring
			Cultural Heritage	+	No	-
			Material Assets	++	No	-
	Reduce vulnerability to the impacts of climate change and maintain flexibility for future responses.	Reduce frequency and level of flooding on Designated channels.	Human Beings	++	Yes	Ongoing monitoring through Flood Hazard Maps & national database
	Avoid damage to the function and quality of the soil resource.	Maintain soil quality and function for productivity on agricultural lands.	Human Beings	+	No	-
			Flora & Fauna	+	Yes	Internal & External Audits Scientific Monitoring under EREP
			Geology & Soils	++	No	-
			Material Assets	+	No	-
	Support economic activities without conflicting with environmental objectives.	Maintain lands available for economic activity and no change as to render existing economic activity unviable.	Human Beings	++	No	Ongoing monitoring through Flood Hazard Maps & national database
			Flora & Fauna	+	Yes	Internal & External Audits Scientific Monitoring under EREP
			Water	+	Yes	WFD Waterbody Status Monitoring
			Material Assets	+	No	-
	Reduce inappropriate floodplain development, through advice and guidance to Local Authorities.	-	Human Beings	++	No	Ongoing monitoring through Flood Hazard Maps & national database
			Flora & Fauna	+	Yes	Internal & External Audits Scientific Monitoring under EREP
			Geology & Soils	+	No	-
			Water	+	Yes	WFD Waterbody Status Monitoring
			Landscape	+	No	-
			Material Assets	+	No	-
	Mitigate the risk of flooding to existing developments, infrastructure and material assets.	-	Human Beings	++	No	Ongoing monitoring through Flood Hazard Maps & national database
			Flora & Fauna	X	Yes	Internal & External Audits
			Material Assets	++	No	-

Core Criteria	Objective	Sub-objective	Criteria with potential impact	Impact	Monitoring Identified	Proposed Form of Monitoring
Cultural Heritage	Protect known features of cultural heritage.	Protect architectural buildings and structures listed on the Record of Protected Structures (RPS) and designated areas of architectural importance such as Architectural Conservation Areas (ACAs).	Human Beings	+	No	-
			Landscape	+	No	-
			Cultural Heritage	++	No	Reported in assessments for individual 'Designation' projects.
			Material Assets	+	No	-
		Protect archaeological features listed on the Record of Monuments and Places (RMP) or other listed National Monument and Archaeological Sites that are at risk from flooding.	Human Beings	+	No	-
			Landscape	+	No	-
			Cultural Heritage	++	No	Reported in assessments for individual 'Designation' projects.
			Material Assets	+	No	-

Table 10.4 Monitoring Reporting

Impact	Monitoring	Monitoring carried out by	Reporting
Human Beings	Flood Hazard Maps & national database	OPW	Report through Flood Maps in 2013 under Floods Directive and interim updates via Flood Maps website.
Flora and Fauna	Internal Audits	OPW Environment Section	Report issues to relevant Operations Engineer.
	External Audits	Inland Fisheries Ireland	Reports issued to OPW Environment Section and Operations Engineer
	Lengths of EREP works achieved and overall Scientific Monitoring through EREP. Biodiversity gain due to EREP. Hydromorphology gain due to EREP.	Inland Fisheries Ireland	Overall results summarised in EREP Annual Report. Biodiversity information reported to DAHG for National Biodiversity Plan. Hydromorphology RHAT scores reported to relevant WFD Competent Authorities.
	Article 17 Conservation Status Report	Department of Arts Heritage and Gaeltacht.	Report issued to European Commission
Water	WFD Waterbody Status monitoring	WFD Competent Authorities	RBMPs and interim status results via EPA website.
Cultural Heritage	Assessment of Archaeological/Architectural value of any structures identified for removal/modification	OPW	Reported in assessments for individual 'Designation' projects.

10.3.2 Auditing

External auditing of operational staff, on the implementation of the Environmental Drainage Maintenance (EDM) Guidance Notes (Ten Steps to Environmentally Friendly Maintenance), is carried out by Inland Fisheries Ireland, as part of the EREP. These audits inform the OPW of the level of compliance with the Environmental Management Protocols and Standard Operating Procedures, with particular focus on the EDM Guidance Notes. External auditing covers approximately one-third of OPW drainage machine crews annually.

Internal auditing is carried out by OPW's Environment Section. A number of OPW/IFI audits are carried out in tandem annually for standardisation purposes. A standard audit form is used by both IFI and OPW's Environment Section (**Appendix 5**).

Auditing (both internal and external) provides an opportunity to assess the level of compliance with environmental Management Protocols and SOPs. It also allows for discussion on any difficulties encountered and experimental works that could be applied. The OPW Foreman is present throughout the audit along with the entire machine gang. A section of recently maintained channel is examined along with the next section to be maintained. This gives a good idea of pre-maintenance conditions and enables recommendations to be made about maintenance should proceed, should changes be required. The audit form (**Appendix 5**) is forwarded to the relevant Engineer.

A rating system was developed and is recorded in OPW's Integrated Management System (**Table 10.5**). Ratings are monitored by both IFI and OPW to identify any issues with particular machine crews, or any difficulties with particular aspects of environmental maintenance.

Table 10.5 *Audit Ratings*

Rating %	Category
0-49	Unacceptable
50-59	Poor
60-70	Acceptable
71-84	Good
85-100	Very Good

Audit results are reported to OPW Management Staff throughout the year and presented in the IFI's Annual EREP report. Presentations are delivered on the auditing and recommended improvements at an annual meeting had with IFI's EREP Team and OPW's Engineers, Technicians and Foremen.

10.3.3 Scientific Monitoring

The EREP biological monitoring programme assesses a range of impacts of routine maintenance and 'capital enhancement' projects on the river corridor biodiversity. Fish, flora, birds, macro-invertebrates, lamprey and crayfish are monitored across a selection of sites. The physical changes in the channels are also monitored. Monitoring of these aspects have been ongoing since the commencement of the EREP in 2008. The results of this 5-year monitoring programme will be examined in 2012, with a view to identifying areas where further information is deemed necessary.

10.3.3.1 River Corridor Biodiversity

EREP monitoring to date has indicated that often changes seen across the whole site can be interlinked. Enhancement of the physical regime can greatly improve channel diversity, through the creation of riffle/glide/pool sequences, addition of spawning gravels and bank protection.

Physical changes to the channel often result in changes in the floral communities, as a more diverse bed material is available. Species such as *Ranunculus* and *Scirpus* tend to favour gravelly bed material will softer sediment attracts species like *Sparganium*.

Changes to the aquatic, marginal and riparian vegetation can often result in changes to the invertebrate communities. Increased vegetation cover and diversity often correspond with increased invertebrate diversity and abundance.

10.3.3.2 Physical Monitoring

Physical monitoring includes pre and post works monitoring of a number of variables. Variables measured include bank-full width, wetted width, channel length, depth velocity and canopy cover.

The Water Framework Directive (WFD) requires information on hydromorphological conditions, along with biological quality and physico-chemical conditions, in order to determine the ecological status of any given water-body. A classification of 'High Ecological Status' cannot be assigned to a water-body unless the hydromorphological conditions are high also. If the hydromorphological condition of a water-body has not been determined and the system has been subject to drainage, then that catchment is deemed to be "probably at risk". Therefore the EREP has included monitoring of hydromorphology in its monitoring programme.

The River Hydromorphology Assessment Technique (RHAT) monitoring system has been approved as the appropriate method to determine hydromorphological status of a channel and is being used for WFD monitoring.

RHAT is used to monitor the hydromorphological condition of a selection of channels under EREP. The data collected will feed back to the WFD competent authorities and contribute to the overall national assessments on channel morphology.

10.3.3.3 Floral Monitoring

Three vegetation types are surveyed under the floral monitoring programme. These include:

- Aquatic (in-channel) vegetation
- Marginal vegetation
- Riparian vegetation

A walkover survey of the entire site is used to compile a species inventory of riparian and in-stream species. Quantitative assessments are also carried out within the sites. Tree surveys also form part of this monitoring process and include information of composition and abundance of tree cover.

10.3.3.4 Macro-invertebrate Monitoring

The macro-invertebrate communities of a river respond quickly to change and are a good reflection of conditions in the short term. Their assemblages reflect changes in habitat as well as changes in water quality, as most species have a preference for either fast or slow flowing water, sheltered or exposes areas and silt or cobbles. Sampling is carried out at both experimental and control sites, and a species inventory list compiled.

10.3.3.5 Fish Sampling

While the primary focus for the EREP fish stock survey is on salmon and brown trout, data from all species encountered during surveys are recorded. Data collected provides information on population, distribution, age-structure for any species encountered.

10.3.3.6 Bird Population Studies

Bird surveys are carried out a selection of sites, using standard survey methods used by Bird Watch Ireland and other relevant agencies. The key objectives of the bird studies are to:

- Record the abundance, species richness and distribution of bird species in OPW channels, and

- Assess the impacts of drainage and drainage maintenance on bird species based on this data.

To this end, surveying is conducted on:

- Various habitat types within the river corridor.
- Sites pre and post maintenance.
- Non-drained channels and drained channels

10.3.3.7 Lamprey & Crayfish Studies

OPW funded studies to examine the effects of drainage maintenance operations on lamprey and white-clawed crayfish have been ongoing since 2006. Ecological Impact Assessments (EclAs) were carried out on both species, by the then Central Fisheries Board. Further research was recommended in these EclAs, which resulted in the continuation of studies of both species as part of the EREP. Surveying of both species includes monitoring of population size and age structure, prior to, and in a series of years post maintenance.

10.4 Summary of Mitigation and Monitoring

The Strategic Environmental Assessment carried out on Arterial Drainage Maintenance and High Risk Channel Designation has ensured that any potential significant environmental Impacts have been identified and given due consideration. The proposed monitoring programme will be carried out under existing projects and some additional projects. Depending on the results, adjustments to targets and indicators may be made to ensure the continued effectiveness of the monitoring programme.

11.0 NEXT STEPS

The next steps in the SEA process will be an eight-week consultation period. During this time comments on the findings of the Environmental Report and the Habitats Directive Assessment may be submitted for consideration. **Table 11.1** outlines the remaining steps in this SEA process.

Table 11.1 *Remaining Steps in SEA process*

Date	Step in Strategic Environmental Assessment
December 2011	Publication of Environmental Report
February 2012	End of consultation
February 2012	Compilation of consultation report and SEA Statement
March 2012	Publication of SEA Statement
2011-2015	First 5 Year cycle

Written submissions or observations are now invited with respect to Arterial Drainage Maintenance & High Risk Channel Designation, and the associated Environmental Report and Habitats Directive Assessment. Written submissions should be forwarded to OPW's Environment Section on or before Fri 3rd February 2012 (contact details below). These submissions / observations will be taken into consideration before publication of the SEA Statement. Early responses would be appreciated to allow more time to clarify and resolve any issues that may arise.

**Environment Section
Office of Public Works
Headford
Co. Galway**

Fax: +353 93 35631

Email: info@opw.ie (marked attention of Environment Section)

12.0 ABBREVIATIONS

AA	Appropriate Assessment
ABFI	Agri Food & Biosciences Institute
ACA	Architectural Conservation Areas
ADS	Arterial Drainage Scheme
ASSI	Area of Special Scientific Interest
CAFÉ	Clean Air for Europe
CDP	County Development Plan
CFRAMS	Catchment Flood Risk Assessment and Management Study
CLC	Corine Land Cover
CO	Carbon Monoxide
Co. Co.	County Council
CSO	Central Statistics Office
DCENR	Department of Communication, Energy & Natural Resources
DD	Drainage District
DEHLG	Department of Environment, Heritage & Local Government
EAP	Environmental Action Plan
EC	European Community
EDM	Environmental Drainage Maintenance
EEC	European Economic Community
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ER	Environmental Report
ERBD	Eastern River Basin District
EREP	Environmental River Enhancement Programme
EU	European Union
FEPS	Forest Environmental Protection Scheme
FRMP	Flood Risk Management Plans
GEP	Good Ecological Potential
GES	Good Ecological Status
GIS	Geographical Information System
GSi	Geological Survey of Ireland
GSNI	Geological Survey Northern Ireland
HMWB	Heavily Modified Water Body
IFI	Inland Fisheries Ireland
ILWG	Irish Landslides Working Group
IRBD	International River Basin District
ISSN	International Standard Series Number
Kt	Kilo-tonnes
LCA	Landscape Character Assessment
LCT	Landscape Character Type
Lg	Locally important Sand and Gravel
LI	Regionally Important Moderately Productive Bedrock only in Local Zones
Lm	Regionally Important Moderately Productive Bedrock
NBIRBD	Neagh Bann International River Basin District
NWIRBD	North Western International River Basin District
NDP	National Development Plan
NEC	National Emissions Ceiling
NGO	Non-Governmental Organisation
NH₃	Ammonia

NHA	Natural Heritage Area
NI	Northern Ireland
NIEA	Northern Ireland Environment Agency
NIEH	National Industrial Engineering Heritage
NMVOC	Non-methane Volatile Organic Compound
NO_x	Nitrogen Oxide
NPWS	National Parks & Wildlife Service
NSS	National Spatial Strategy
NTS	Non-Technical Summary
O₃	Ozone
OECD	Organisation for Economic Co-operation and Development
OPW	Office of Public Works
PAH	Polycyclic Aromatic Hydrocarbons
PI	Poor Unproductive Bedrock except for Local Zones
PM_{2.5}	Particulate matter with diameter less than 2.5 µm
PM₁₀	Particulate matter with diameter less than 10 µm
POMS	Programme of Measures
PRP	Pollution Reduction Programme
Pu	Poor Unproductive Bedrock
RAL	Remedial Action List
RBD	River Basin District
RBMP	River Basin Management Plan
REPS	Rural Environmental Protection Scheme
Rf	Regionally Important Fissured Bedrock
Rg	Regionally Important Extensive Sand and Gravel
RHAT	River Hydromorphology Assessment Technique
Rk	Regionally Important Karstified Bedrock
Rkc	Regionally Important Karstified Bedrock (Conduit Flow)
Rkd	Regionally Important Karstified Bedrock (Diffuse Flow)
RMP	Record of Monuments and Places
RPS	Record of Protected Structures
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SEA	Strategic Environmental Assessment
SEO	Strategic Environmental Objectives
SERBD	South Eastern River Basin District
SFM	Sustainable Forestry Management
SFPA	Sea-Fisheries Protection Authority
ShIRBD	Shannon International River Basin District
SI	Statutory Instrument
SO₂	Sulphur Dioxide
SOC	Species of Conservation Concern
SOP	Standard Operating Procedure
SPA	Special Protection Area
SWMI	Significant Water Management Issues
SWRBD	South Western River Basin District
TSAS	Trophic Status Assessment Scheme
UK	United Kingdom
UNESCO	United Nations Educational, Scientific & Cultural Organisation
VOC	Volatile Organic Compound
WB	Water Body
WFD	Water Framework Directives

WHO	World Health Organisation
WRBD	Western River Basin District
WWTP	Waste Water Treatment Plant

13.0 GLOSSARY

Alien species	Invasive alien species are non-native plants or animals that successfully establish themselves in aquatic and fringing habitats and damage our natural flora and fauna.
Appropriate Assessment	An assessment of the effects of a plan or project on the Natura 2000 network. The Natura 2000 network comprises Special Protection Areas under the Birds Directive, Special Areas of Conservation under the Habitats Directive and Ramsar sites designated under the Ramsar Convention (collectively referred to as European sites).
Aquifers	A water bearing rock which readily transmits water to wells and springs.
Baseline environment	A description of the present state of the environment of the P/P area.
Biodiversity	Word commonly used for biological diversity and defined as assemblage of living organisms from all habitats including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part.
Birds Directive	Council Directive of 2nd April 1979 on the conservation of wild birds (79/409/EEC).
Business as Usual	The Business as Usual scenario is a conceptual baseline which projects what would happen in an area if there were no changes. It assumes current land use and other policies that guide or shape development remains the same, that current market-based trends continue, and that anticipated development projects occur as planned. This scenario also assumes that current demographic trends will continue as expected and future trends in urbanization and land consumption follow past patterns.
Catchment Flood Risk Management Plan (CFRMP)	A large-scale strategic planning framework for the integrated management of flood risks to people and the developed and natural environment in a sustainable manner.
Coastal Waters	Is that area of surface water on the landward side of a line, every point of which is at a distance of one nautical mile on the seaward side from the nearest point of the baseline from which the breadth of territorial waters is measured, extending where appropriate up to the outer limit of transitional waters.
Carbon Dioxide (CO₂)	A naturally occurring gas which is also a by-product of burning fossil fuels and biomass, land-use changes and industrial processes. It is the principal anthropogenic greenhouse gas that affects the earth's radiative balance. It is the reference gas against which other greenhouse gases are measured and therefore has a Global Warming Potential of 1.
Cumulative effects	Effects on the environment that result from incremental changes caused by the strategic action together with other past, present, and reasonably foreseeable future actions. These effects can

result from individually minor but collectively significant actions taking place over time or space.

Designated authority	An organisation that must be consulted in accordance with the SEA Regulations.
Diffuse sources	These are primarily associated with run-off and other discharges related to different land uses such as agriculture and forestry, from septic tanks associated with rural dwellings and from the land spreading of industrial, municipal and agricultural wastes.
Ecology	The study of the relationship among organisms and between those organisms and their non-living environment.
Ecosystem	A community of interdependent organisms together with the environment they inhabit and with which they interact, and which is distinct from adjacent communities and environments
Ecological status	Is an expression of the structure and functioning of aquatic ecosystems associated with surface waters. Such waters are classified as being of good ecological status when they meet the requirements of the Directive.
Environmental assessment	The preparation of an environmental report, the carrying out of consultations, the taking into account of the environmental report and the results of the consultations in decision-making and the provision of information on the decision (in accordance with Articles 4 to 9 of the SEA Directive).
Environmental indicator	An environmental indicator is a measure of an environmental variable over time, used to measure achievements of environmental objectives and targets.
Environmental objective	Environmental objectives are broad, overarching principles which should specify a desired direction of environmental change.
Environmental receptors	Include biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage (including architectural and archaeological) and landscape as listed in the SEA Directive. This list is not exhaustive, and can include other receptors which may arise for a particular P/P.
Environmental report (ER)	A document required by the SEA Directive as part of a strategic environmental assessment which identifies, describes and evaluates the likely significant effects on the environment of implementing a plan or programme.
Eutrophication	Enrichment of water by nutrients (phosphorus and nitrogen). The nutrients accelerate plant growth, which disturbs the balance of aquatic plants and animals and affects water quality.
Flood Defence	A structure (or system of structures) for the alleviation of flooding from rivers or the sea.

Floods Directive	Directive 2007/60/EC of 26 November 2007 on the assessment and management of flood risks.
Flood event	An occurrence of flooding.
Flood risk	Refers to the potential adverse consequences resulting from a flood hazard. The level of flood risk is the product of the frequency or likelihood of flood events and their consequences (such as loss, damage, harm, distress and disruption).
Flood Risk Management	The activity of understanding the probability and consequences of flooding, and seeking to modify these factors to reduce flood risk to people, property and the environment. This should take account of other water level management and environmental requirements, and opportunities and constraints. It is not just the application of physical flood defence measures.
Good status	Is a general term meaning the status achieved by a surface water body when both the ecological status and its chemical status are at least good or, for groundwater, and when both its quantitative status and chemical status are at least good.
Groundwater	All water which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil. This zone is commonly referred to as an aquifer which is a subsurface layer or layers of rock or other geological strata of sufficient porosity and permeability to allow a significant flow of groundwater or the abstraction of significant quantities of groundwater.
Greenhouse Gas	Gaseous constituents of the atmosphere that absorb/trap infrared (thermal) radiation which is mainly emitted by the earth's surface and thereby influence the earth's temperature.
Habitats Directive	Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild flora and fauna.
Hydromorphology	A study of the quantity and dynamics of water flow within a river/channel that has variations in its width, depth, structure and substrate of bed and riparian zone
Interrelationships	Associations or linkages, related to environmental impact of the proposed P/P usually on environmental receptors.
Key environmental issues	Those significant environmental issues, which are of particular relevance and significance within a P/P area and/or the zone of influence of that P/P. These issues should be identified during SEA Scoping process.
Kyoto Protocol	The 1997 protocol to the Convention on Climate Change under which industrialised countries will reduce their combined greenhouse gas emissions by at least 5 per cent compared to 1990 levels by 2008–2012.
Material Assets	Critical infrastructure essential for the functioning of society such as: electricity generation and distribution, water supply, wastewater treatment, transportation etc

Mitigation measures	Measures to avoid/prevent, minimise/reduce, or as fully as possible, offset/compensate for any significant adverse effects on the environment, as a result of implementing a P/P.
Monitoring	A continuing assessment of environmental conditions at, and surrounding, the plan or programme. This determines if effects occur as predicted or if operations remain within acceptable limits, and if mitigation measures are as effective as predicted. The primary purpose of monitoring is to identify significant environmental effects which arise during the implementation stage against those predicted during the plan preparation stage.
Natura 2000	European network of protected sites which represent areas of the highest value for natural habitats and species of plants and animals which are rare, endangered or vulnerable in the European Community. The Natura 2000 network will include two types of area. Areas may be designated as Special Areas of Conservation (SAC) where they support rare, endangered or vulnerable natural habitats and species of plants or animals (other than birds). Where areas support significant numbers of wild birds and their habitats, they may become Special Protection Areas (SPA). SACs are designated under the Habitats Directive and SPAs are classified under the Birds Directive.
Natural Heritage Area	An area considered important for the habitats present or which holds species of plants and animals whose habitat needs protection.
Non-technical summary	A summary of the findings of the ER, summarised under the headings listed in Annex 1 of the SEA Directive that can be readily understood by decision-makers and by the general public. It should accurately reflect the findings of the ER.
Oligotrophic	Term applied to water bodies that are poorly nourished, unproductive.
Programme of measures	Defines in detail those actions which are required to achieve the environmental objectives of the Directive within a river basin district.
Ramsar sites	Sites designated as internationally important wetland habitats under the International Convention on Wetlands of International Importance (1976) (Ramsar Convention).
Reasonable alternatives	Alternatives should take into account the objectives and geographical scope of the P/P. There can be different ways of fulfilling the P/P objectives, or of dealing with environmental problems. The alternatives should be realistic, capable of implementation and should fall within the legal and geographical competence of the authority concerned.
River Basin	Means the area of land from which all surface water run-off flows, through a sequence of streams, rivers and lakes into the sea at a single river mouth, estuary or delta.

River Basin Districts	Administrative areas for coordinated water Management and are comprised of multiple river basins (or catchments), with cross-border basins (i.e. those covering the territory of more than one Member State) assigned to an international RBD.
River Basin Management	Maintaining a balance between human activities and demands and ecological and hydrological status within river basin catchments. River Basin Management requires an understanding of all the elements of catchment management and the legislation that drives them such as the EU Water Framework and Habitats Directives.
River Basin Management Plan	Describes the unique characteristics of each river basin, and the pressures it faces from pollution and over-use.
Scoping	The process of deciding the content and level of detail of an SEA, including the key environmental issues, likely significant environmental effects and alternatives which need to be considered, the assessment methods to be employed, and the structure and contents of the Environmental Report
Screening	The determination of whether implementation of a P/P would be likely to have significant environmental effects on the environment. The process of deciding whether a P/P requires an SEA.
SEA Directive	Directive 2001/42/EC 'on the assessment of the effects of certain plans and programmes on the environment'.
SEA Statement	A statement summarising: <ul style="list-style-type: none"> - how environmental considerations have been integrated into the P/P - how the ER, the opinions of the public, and designated authorities, and the results of transboundary consultations have been taken into account - the reasons for choosing the P/P as adopted in the light of other reasonable alternatives.
Significant effects	Effects on the environment, including on issues such as biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and the interrelationship between the above factors.
Special Area of Conservation	Site designated according to the habitats directive.
Special Protection Area	An area designated under the European Directive on the Conservation of Wild Birds.
Statutory authority	The authority by which or on whose behalf the plan or programme is prepared.
Statutory Instrument	Any order, regulation, rule, scheme or byelaw made in exercise of a power conferred by statute.

Surface water	Means inland waters, except groundwater, which are on the land surface (such as reservoirs, lakes, rivers, transitional waters, coastal waters and, under some circumstances, territorial waters) which occur within a river basin.
Transitional waters	Bodies of surface water in the vicinity of river mouths which are partly saline in character as a result of their vicinity to coastal waters, but which are substantially influenced by freshwater flows.
Water body	A discrete and significant element of surface water such as a river, lake or reservoir, or a distinct volume of groundwater within an aquifer.
Water Framework Directive	The Water Framework Directive is a new piece of European legislation that promotes a new approach to water management through river basin planning. The legislation addresses inland surface waters, estuarine waters, coastal waters and groundwater.

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APPENDIX 1

Scoping Report Consultation Feedback

Nathy Gilligan
Environment Section
Office of Public Works
Main Street
Headford
Co. Galway

9th December 2009

Our Ref: SCP090901.1

Re: SEA Scoping – Arterial Drainage Maintenance & High Risk Channel Designation

Dear Nathy,

I refer to and acknowledge your correspondence in relation to Draft Scoping Report for the above Plan dated the 17/09/2009

Please find enclosed the EPA's initial submission to assist you in undertaking an environmental assessment as per *the European Communities (Certain Plans and Programmes) Regulations 2004 (435 of 2004)*.

EPA SEA Pack

The Pack has been compiled by the EPA and is based on our experience to date as a statutory SEA Environmental Authority and on current best practice in the SEA process. As this SEA Pack is issued as part of statutory SEA Scoping consultation. It is a matter for the NPWS and its SEA Team to ensure that the contents of the Pack are taken into account and followed as appropriate during the SEA process.

Scoping Meetings/Workshops

As part of the SEA Scoping process, we would suggest that the convening of a Scoping Meeting / Workshop with key staff within NPWS and their consultants be considered. There would also be merits in having personnel from the Department of Communications, Energy and National Resources (DCENR), Regional Fisheries Boards, Regional Planning Authorities and Environmental Protection Agency, as appropriate, at this meeting.

Possible Proposed Amendments to the Draft Plan

You are referred to the requirement for any amendments proposed to the Plan to be assessed for likely significant effects. This assessment should take account of the SEA Regulations Schedule 1 Criteria (S.I. No 435 of 2004) and should be subject to the same method of assessment as undertaken in the "environmental assessment" of the Draft Plan. Any proposed amendments should also be screened with respect to the requirement for Habitats Directive Assessment, as required under Article 6 of the Habitats Directive.

SEA Statement

You are referred to the requirement to prepare an SEA Statement outlining "Information on the Decision" as required by Article 16 of *the European Communities (Certain Plans and Programmes) Regulations 2004 (435 of 2004)*. This should summarise the following:

- How environmental considerations have been integrated into the Plan;
- How the Environmental Report, submissions, observations and consultations have been taken into account during the preparation of the Plan;
- The reasons for choosing the Plan adopted in the light of other reasonable alternatives dealt with; and,
- The measures decided upon to monitor the significant environmental effects of implementation of the Plan.

A copy of the SEA Statement with the above information should be sent to any environmental authority consulted during the SEA process.

Environmental Authorities

You are referred to the requirement, where appropriate under the SEA Regulations, to give notice to the following:

- The Minister for the Environment, Heritage & Local Government where it appears to the Planning Authority that the proposed Plan might have significant effects in relation to architectural or archaeological heritage or to nature conservation, and
- The Minister for Communications, Energy and Natural Resource (formerly Communications, Marine and Natural Resource), where it appears to the Planning Authority that the proposed Plan might have significant effects on fisheries or the marine environment.

The Agency may provide further comment as appropriate during the SEA and Plan-making process.

Should you have any queries or require further information in relation to the above please contact Cian O'Mahony at the undersigned

Yours Sincerely,

Tadhg O'Mahony
Senior Scientific Officer
SEA Section - Environmental Research Centre
Office of Environmental Assessment
Environmental Protection Agency
Regional Inspectorate
Inniscarra, County Cork
email: t.omahony@epa.ie

EPA SEA SCOPING SUBMISSION

Arterial Drainage Maintenance & High Channel Designation

Part I –SEA Process Guidance

EPA SEA Process Checklist

The SEA Process Checklist is a detailed stage-by-stage guide to the key SEA procedures, activities and associated outputs. This checklist is intended to be used to document the SEA process with a view to ensuring compliance with the requirements of the SEA Directive and Regulations. A comprehensive list of relevant references, guidance contact information and websites is provided.

The EPA 's SEA Process Checklist, incorporated into the EPA's SEA Pack, has been issued as a separate file electronically. The SEA Process Checklist is issued as part of statutory SEA Scoping consultation in relation to the Plan, it is a matter for the Office of Public Works (OPW) and their SEA consultants to ensure that the contents of the Pack are taken into account and followed as appropriate during the SEA process.

The Checklist can be downloaded at:

<http://www.epa.ie/downloads/consultation/name.24012.en.html>

Up-to-date Environmental Monitoring Data etc.

The current state of the environment should be described using most recent and up-to-date environmental data, information and reports. Where updating of significant environmental data and associated reports become available during the SEA process, where possible, this information should be incorporated into the description of the current state of the environment and where relevant related environmental problems.

You are referred in this regard to the full range of Water and Air Quality Reports prepared by the EPA.

(See www.epa.ie <https://www.epa.ie/downloads/pubs/>).

Geographical Information Systems

The use, and application, of GIS should be considered where possible at the various key stages in the SEA process. GIS could, along with other methodologies, and depending on the availability of relevant spatial data, assist in determining the cumulative vulnerability of various environmental resources within the Plan area. GIS could also demonstrate visually how the Plan might impact on these resources. In undertaking the SEA, all the environmental data and information presented on these GIS based maps should be taken into account.

You are referred to the EPA's web based Environmental Mapping / Geographical Information System (GIS) ENVision, which can be found at:

<http://maps.epa.ie/InternetMapView/MapView.aspx>

You are also referred to the Department of Energy, Communications and Natural Resources GIS Spatial Data at:

<http://www.dcenr.gov.ie/Spatial+Data/DCENR+Spatial+Data.htm>

The following data sources as displayed on the Department of Agriculture, Fisheries and Food website should also be consulted as appropriate:

<http://www.agriculture.gov.ie/fisheries/environmentalassessment/sourcesofenvironmentalinformation/>

EPA SEA Submission

You are referred to the EPA GISEA Manual. This document sets out current practice regarding the application of GIS as a support tool in SEA and can be downloaded via the following link:

<http://www.epa.ie/downloads/consultation/name.25835.en.html>

Appropriate Assessment

You are referred to the requirements of Article 6 of *Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora*, the Habitats Directive. Appropriate Assessment, in accordance with the Directive, is required for:

“Any plan or project not directly connected with or necessary to the management of the site (Natura 2000 sites) but likely to have significant effect thereon, either individually or in combination with other plans or projects, shall be subject to Appropriate Assessment of its implications for the site in view of the sites conservation Objectives...”

OPW and their SEA/AA consultants should consult with the National Parks and Wildlife Service (NPWS) with regard to screening of the Plan for Appropriate Assessment. Where Appropriate Assessment is required, any findings or recommendations should be incorporated into the SEA Environmental Report and Draft Plan, as appropriate.

In order to determine the requirement for an Appropriate Assessment the following Guidance is referenced.

European Commission, 2000. Managing Natura 2000 Sites – The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC

http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/provision_of_art6_en.pdf

European Commission, 2002. Assessment of plans and projects significantly affecting Natura 2000 sites - Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC

http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/natura_2000_asses_en.pdf

National Guidance on Appropriate Assessment is due to be published shortly by the Department of Environment Heritage and Local Government. In the meantime the above Guidance should be followed.

Scoping Meetings/Workshops

As part of the SEA Scoping process, we would suggest that the convening of a Scoping Meeting / Workshop with key staff within the Plan and SEA team and Key stakeholders including representatives from Northern Ireland be considered. There would also be merits in having personnel from National Parks and Wildlife Service (NPWS), Department of Communications, Energy and National Resources (DCENR), and Environmental Protection Agency, at this meeting/workshop.

For any environmental issue(s) determined to be scoped out of the SEA process, clear justification should be included in the Environmental Report as to why the specific environmental issues were not considered likely to be potentially affected by the Plan.

Alternatives

In considering and assessing alternatives, the alternatives proposed should be reasonable and realistic and should be set at the appropriate strategic level at which the Plan will be

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implemented operating within the national planning hierarchy. They should be assessed against the relevant environmental objectives established for the key environmental aspects of the environment likely to be significantly affected. Clear justification should be provided for the selection of the preferred alternative/ combination of alternatives.

Where relevant, the development of alternatives should be clearly described. In addition, the methodology applied in the assessment of alternatives along with any assumptions made should be described.

Consultation

In order to promote Best Practice in SEA in the context of consultation, it is recommended that the public be given an opportunity to make submissions on the issues to be addressed in the SEA process for the Plan. To this effect consideration should be given to the publication of relevant and appropriate notices etc. to inform and engage the wider public in the SEA process.

Following completion of the Draft Scoping Report consideration should be given to the making available of this document on OPW's website or other relevant websites.

Assessment of Likely Significant Effects

In assessing the likely significant effects of the Plan on the full range of environmental issues likely to be significantly affected, the full range of effects as set out in Annex I of the SEA Directive - likely significant effects should include- secondary, cumulative, synergistic, short, medium and long term, permanent, temporary, positive and negative effects, should be assessed and reported on.

Particular reference should be made to the potential for cumulative effects associated with the implementation of the Plan in association with other relevant Plans / Programmes and projects potentially influenced by the Plan.

The methodology applied in the assessment of the preferred alternative along with any assumptions made should be described. Where possible and practical, quantitative assessments should be undertaken of the assessment of the preferred alternative/ combination of alternatives.

Mitigation of Significant Effects

Where significant adverse effects are identified associated with the implementation of the Plan, there should be a clear link with relevant and appropriate mitigation measure(s). The emphasis should, in the first instance, be on avoidance of significant adverse effects.

Monitoring Proposals

Monitoring arrangements should be clearly set out along with responsibilities, frequency of monitoring, analysis, and reporting on monitoring. Monitoring arrangements should be sufficiently flexible so as to be able to react to unforeseen / unexpected events. Maximum use should be made of existing environmental monitoring programmes.

The monitoring arrangements and related monitoring programme for the Plan should include relevant and appropriate thresholds which should trigger when remedial action should be undertaken for the particular aspect of the environment being monitored.

Process and SEA-Environmental Report Compliance

The SEA Process for the Plan should comply fully with the procedural and output requirements set out in the SEA Directive, and the relevant national SEA Regulations. The

EPA SEA Submission

Environmental Report should be prepared in accordance with the specific information specified in Article 5 - Environmental Report, Paragraphs 1 – 3 and Annex I of the SEA Directive.

Integration of SEA and Plan/Programme

Particular emphasis should be given during the SEA and Plan-making process to ensuring that both process are fully integrated from the outset. Appropriate SEA Team /Plan Team Workshops should be held at key stages during both processes to ensure full engagement, interaction, and sharing of information with key members of both teams and to ensure full integration of environmental considerations in the Plan.

Consideration could also be given to the assigning a facilitator either within or external to the OPW with the specific role of ensuring full integration takes place during the SEA process and the Plan making process.

Documentation of the SEA Process

Where key decisions are made during the SEA process e.g. Scoping In/Out environmental topics, selection of preferred alternative (s) etc. these decisions should be documented as part of an overall SEA/Plan making process.

Possible Proposed Amendments to the Draft Plan

You are referred to the requirement for any amendments proposed to the Draft Plan, to be assessed for likely significant effects. This assessment should take account of the SEA Regulations Schedule 1 Criteria (S.I 435 of 2005) and should be subject to the same method of assessment as undertaken in the “environmental assessment” of the Draft Plan.

Information on the Decision/ SEA Statement

Following adoption of the Plan, the competent authority is required to make available the adopted P/P and a statement setting out relevant “Information on the Decision” as set out in Article 9 of the SEA Directive.

You are referred to the requirement to prepare an SEA Statement outlining “Information on the Decision” as required by Article 16 of the European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations 2004.

This SEA Statement should summarise the following:

- how environmental considerations have been integrated into the Plan;
- how the Environmental Report, submissions, observations and consultations have been taken into account during the preparation of the Plan;
- the reasons for choosing the Plan adopted in the light of other reasonable alternatives dealt with; and,
- the measures decided upon to monitor the significant environmental effects of implementation of the Plan.

A copy of the SEA Statement with the above information should be sent to any environmental authority consulted during the SEA process.

While not a mandatory requirement consideration should be given at the Draft Plan stage to providing summary key information on: the key findings of the environmental assessment and how these findings have been integrated within the Plan.

SEA Guidance /Methodology

You are referred to the following Guidance/ Methodology, which should be referred to along with other relevant and appropriate SEA and related Guidance during the SEA process:

EPA SEA Submission

- EPA –Development of Strategic Environmental Assessment (SEA) Methodologies for Plans and Programmes in Ireland –Synthesis report (EPA, 2003)
<http://www.epa.ie/downloads/advice/ea/name.13547.en.html>
- The Department of Environment Heritage and Local Government Guidelines: "Implementation of SEA Directive 92001/42/EC): Assessment of the Effects of Certain Plans and Programmes on the Environment –Guidelines for Regional Authorities and Planning Authorities" (DoEH&LG, November 2004) While the focus is on Land use Planning, this SEA guidance is of relevance.
<http://www.envirom.ie/en/Publications/DevelopmentandHousing/Planning/FileDownload,1616.en.pdf>

Environmental Authorities

You are referred to the requirement, where appropriate under the SEA Regulations, to give notice to the following:

- The Minister for the Environment, Heritage & Local Government where it appears to the Planning Authority that the Guidelines might have significant effects in relation to architectural or archaeological heritage or to nature conservation, and
- The Minister for Communications, Energy and Natural Resource (formerly Communications, Marine and Natural Resource), where it appears to the Planning Authority that the proposed Plan might have significant effects on fisheries or the marine environment.

Environmental Impact Assessment (EIA)

The Plan should highlight that under the EIA Regulations the range of offshore renewable energy related projects that will arise during the implementation of the Plan may require an Environmental Impact Assessment. There are also requirements with regard to EIA for sub-threshold development.

In this regard, you are referred to the following Publications:

- "Guidelines on Information to be contained in Environmental Impact Statements" EPA, 2002.
- "Advice Notes on Current Practice in the preparation of Environmental Impact Statements", EPA 2003.

In addition to the above, you are referred to the Department of the Environment, Heritage and Local Government's Publication:

- "Environmental Impact Assessment (EIA) Guidance for consent Authorities regarding sub-threshold development", DoEH&LG, 2003.

These documents can be downloaded at: <http://www.epa.ie/downloads/advice/ea/guidelines/>

It should be noted that projects which may arise during the implementation of the Plan would also be required to be screened with respect to the requirement for Habitats Directive Assessment/Appropriate Assessment as required by Article 6 of the Habitats Directive.

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Obligations with respect to National Plans and Policies and EU Environmental Legislation etc.

It is a matter for the OPW to ensure that, when undertaking and fulfilling their statutory responsibilities, they are at all times compliant with the requirements of relevant national and EU environmental legislation conventions and agreements.

EPA Report: Ireland's Environment 2008 "Main Environmental Challenges"

The Plan should take into account where relevant and appropriate, the "Main Environmental Challenges" for Ireland as set out in Chapter 16 – "Main Environmental Challenges" of EPA Ireland's Environment 2008 (EPA, October 2008). These are as follows:

Limiting and Adapting to Climate Change

1. Mitigating the causes and effects of climate change
2. Adapting to climate change impacts
3. Improving our understanding of climate change

Reversing Environmental Degradation

1. Preventing eutrophication and other water pollution
2. Protecting natural habitats and species populations
3. Remediation of contaminated land

Complying with Environmental Legislation and Agreements

1. Building of a culture of compliance
2. Enforcement of legislation at national and local levels
3. Meeting EU and other international obligations

Mainstreaming of Environmental Considerations

1. Incorporating environmental considerations into policies and plans
2. Ensuring environmentally responsible businesses
3. Changing behaviours

This Chapter can be downloaded at:

<http://www.epa.ie/downloads/pubs/other/indicators/irlenv/43366%20epa%20report%20chap%2016.pdf>



Comhshaol, Oidhreacht agus Rialtas Áitiúil
Environment, Heritage and Local Government



28th October 2009

Environment Section,
Office of Public Works,
Headford,
Co. Galway



Our Ref: G2009/599

Re: SEA Scoping- Arterial Drainage Maintenance and High Risk Channel Designation

A chara,

We refer to your letter of 17th September looking for feedback in relation to the above SEA Scoping report. Please find below the built heritage observations of the Department of the Environment, Heritage and Local Government.

Archaeological Assessment

In preparing the SEA assessment of impacts on the archaeological heritage should have regard to the following:

International Conventions

The European Convention on Protection of the Archaeological Heritage known as the Valletta Convention of 1992. This was ratified by Ireland in 1997 and requires that appropriate consideration be given to archaeological issues at all stages of the planning and development process.

National Policies, Plans and Programmes

National Heritage Plan (2002) - accessible at www.envron.ie. The core objective is to protect our heritage. In this regard the 'polluter pays' principle and the precautionary principle are operable. Specifically in regard to archaeological heritage the 'Framework and Principles for the protection of the archaeological heritage' document (1999) sets out the archaeological policies and principles that should be applied by all bodies when undertaking or authorising development.

Relevant Policies and Plans at County Level

County Development Plan and Local Area Plans. Drafts of these documents should always be forwarded to this department for comment.

Archaeological Heritage

Archaeological monuments can be identified from the Record of Monuments and Places for the various counties and the National Monuments Service monuments data on www.archaeology.ie. Any monuments that are National Monuments in State ownership or guardianship and monuments subject to Preservation Orders should be identified and zones of visual amenity defined for them.

National Monuments in ownership or guardianship of Local Authorities should also be identified. It should be noted that any direct impacts on national monuments in State or Local Authority care or subject to a preservation order will require the consent of the Minister for the Environment, Heritage and Local Government under Section 14 of the National Monuments Act 1930 as amended by Section 5 of the National Monuments (Amendment) Act 2004.

Areas of high archaeological potential including subsurface archaeological structures should be identified. A pointer to the potential for the occurrence of subsurface archaeology is the annual Excavations Bulletin which contains brief accounts of excavations conducted in Ireland each year; these reports are also at www.excavations.ie. Information on occurrences of chance finds of archaeological objects is also a useful indicator of archaeological potential - information may be obtained from the National Museum and local museums. The archaeological potential of the coastal and inter-tidal zone, where relevant, should be carefully considered. Any potential impacts on archaeological heritage should be subject to full archaeological assessment.

It will be important to consult with the Underwater Unit of National Monuments Service, Department of the Environment, Heritage and Local Government in relation to the proposed schemes.

Development Issues

Increased development pressure increases the potential for impact on the archaeological resource. Impacts can be avoided or lessened by following criteria set out in 'Framework and Principles for the protection of the archaeological heritage'.

The Development Plan

There should be liaison with National Monuments Section on the drafting of the archaeological content of the plan. The plan should address in detail the potential archaeological impacts of any proposed development.

Architectural Heritage

Strategic Environmental Assessment (SEA) is intended to bring about improved decision making and have a positive effect when plans and programmes are being developed. This development, and associated decision-making, continues until a plan or programme is formally adopted.

'Architectural heritage' is a material asset which is to be taken into account in SEA.

As recognised in the Office of Public Works Scoping Report for Arterial Drainage Maintenance 2009-2015 and High Risk Channel Designation 2009-2015, the present built and natural environment is the point of departure in formulating any new plan.

It is stated in Section 7.2.5, Cultural Heritage (Architectural and Archaeological Heritage), of the Scoping Report that -

"The built heritage of Ireland, within its cities, towns and villages, is also of significant value Many of these are designated as 'Protected Structures' which positively recognises"

However, it is 'architectural heritage' which is to be taken into account in SEA rather than 'protected structures'.

The term "*architectural heritage*" is defined in the Architectural Heritage (National Inventory) & Historic Monuments Act, 1999, as meaning "*all*

(a) structures and buildings together with their settings and attendant grounds, fixtures and fittings,

(b) groups of such structures and buildings, and
(c) sites,
which are of architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest”.

Guidance on what is encompassed by the term “*architectural heritage*” is given in Section 2.5 of the “*Architectural Heritage Protection, Guidelines for Planning Authorities, 2004*” issued by the Department of the Environment, Heritage and Local Government.

Within the context of Section 51 of the 2000 Planning and Development Act, structures which are included in the Record of Protected Structures (RPS) are in effect a subset of the architectural heritage of a locality which the planning authority deems to be of ‘special interest’.

It should also be noted that many structures of architectural heritage merit lie outside the confines of “*cities, towns and villages*”. In that regard the Scoping Report notes in Section 1.3.1 that the OPW is responsible for the maintenance of “*some 18,500 bridges and 750 ancillary structures ...*”. A considerable number of these structures are likely to be of architectural heritage merit even though they have not been designated as protected structures. Indeed they may not have been comprehensively documented in any record or source other than in the file records of the OPW.

It is noted in Section 9.10, Planning & Development, of the Scoping Report that the 2001 Planning and Development Regulations “*exempts from planning permission, works under an Arterial Drainage Scheme.*”

Article 8 of the 2001 Regulations states –

“Works specified in a drainage scheme confirmed by the Minister for Finance under Part II of the Arterial Drainage Act, 1945 (No. 3 of 1945) or the Arterial Drainage (Amendment) Act, 1995 (No. 14 of 1995), carried out by, on behalf of, or in partnership with, the Commissioners, with such additions, omissions, variations and deviations or other works incidental thereto, as may be found necessary by the Commissioners or their agent or partner in the course of the works, shall be exempted development.”

However, while the works themselves would be deemed to be exempted development after confirmation of the drainage scheme by the Minister for Finance, it would be anomalous if the impact on structures of architectural heritage merit was not taken into account in planning a drainage scheme.

Furthermore, it is stated in Table 8, Environmental Objectives, of the Scoping Report that, for new designation projects only, it is intended as an Objective to “*Protect known features of cultural heritage*”. It is further stated as a Sub-objective that it is intended to –

“Protect architectural buildings and structures listed on the Record of Protected Structures (RPS) and designated areas of architectural importance such as Architectural Conservation Areas (ACAs).”

This falls short of what is specified in the SEA regulations. As stated above ‘architectural heritage’ is a material asset which is to be taken into account in SEA. It should follow as a matter of course that significant effect on structures of architectural heritage merit is taken into account in setting out any arterial drainage scheme.

It is self evident that arterial drainage works could have a significant effect on many structures of architectural heritage merit both across the countryside at large and within the boundaries of cities,

towns and villages. These structures of architectural heritage merit may well include protected structures and those within the boundaries of Architectural Conservation Areas (ACAs).

It is recommended that the relevant sections of text in the Scoping Report are amended to take note of this fact and that the text is not restricted to simply taking into consideration protected structures and those in ACAs.

Please acknowledge receipt of this letter and forward any further documentation to the undersigned at the following address:

Development Applications Unit,
Department of the Environment, Heritage and Local Government,
4th Floor,
Dun Sceine
Harcourt Lane,
Dublin 2

Is mise le meas,



David Tuohy
Development Applications Unit
01 8883183
David.tuohy@environ.ie



Western Regional Fisheries Board

Bord Iascaigh Réigiúnach an Iarthair



Fisheries Ireland

Our Natural Heritage

11th October 2009.

Mr. Nathy Gilligan,
OPW.,
Headord,
Co. Galway.

Dear **Nathy,**

**STRATEGIC ENVIRONMENTAL ASSESSMENT & HABITATS DIRECTIVE
ARTICLE 6 ASSESSMENT ARTERIAL DRAINAGE MAINTENANCE 2009 - 2015
& HIGH RISK CHANNEL DESIGNATION 2009 - 2015**

I refer to the scoping document as circulated.

The document appears to capture the main issues of interest from a fisheries perspective and acknowledges the close cooperation that exists between the OPW and the Fisheries Boards.

In the context of the Water Framework Directive, an attempt should be made to define reference conditions for OPW channels, possibly by reference to the original OS maps. It would also be helpful if the assessment included a map showing the drainage history for rivers within the western RBD region and some information regarding changes/alterations in bed levels. In this context, the artificial nature of some channels is recognized and indeed it is clear that many channels either did not exist, and were created and that many that existed that are now linear were not always so. While our staff are now very conversant with the OPW naming conventions for channels, there may be a need to re-evaluate it in the context of WFD methodology.

Increasingly, interactions between pressures are best evaluated using up to date geographic information and the fact that the fishery service and OPW are continuing to extend the use of GIS should help facilitate meaningful dialogue. It is suggested that the completed SEA should include maps of the major salmonid fisheries with spawning and nursery zones highlighted so that enhanced protection can be initiated. In the context of the SEA, consideration should be afforded towards the integration of OPW drainage into the WFD monitoring framework whereby a number of control and impacted sites would be selected and monitored on an ongoing basis within the period of the WRBD River Basin Management Plan.

Also the document should make reference to specific sections of the Fisheries Acts specifically s.173 and s.131 of The Fisheries Consolidation Act 1959 which provide for protection of spawning areas and migratory fish respectively. Mitigation measures should continue to be developed in order to minimize the impact of OPW operations on early life stages of fish. In this regard there is a need for a briefing of OPW personnel on the relevant legal provisions of the Fisheries Act and their interpretation.



The normal concerns of the Board relate to the following issues;

- Impact on salmonid spawning zones. (sediment transport, nutrients)
- Nutrient transport into lakes.
- Instream channel morphology issues with emphasis on restoration schemes where status surveys confirm that morphological pressure is the cause of moderate, poor or bad ecological status.
- Riparian zone Management including issues with respect to the dredge spoil that arose from the original drainage scheme.
- Protection of flood plains
- Vector for the spread of alien species.

There are also areas of mutual interest such as (a) the need for accurate measurement of low flows in rivers. OPW because of their particular remit are obviously more interested in flood flows. (b) low level weirs and deflectors (c) flood plain protection (d) Protection of river mouths.

While the Boards primary remit relates to protection and conservation of fish species, the importance of fish habitat to this objective should be noted. For example, it is noteworthy that some rivers sustain mayfly populations which is of ecological significance. In this regard, it may be possible in the context of the SEA to access the EPA raw biological data records for the records of *Ephemera danica* in OPW channels and to implement appropriate measures. It is known for example that mayfly are present in the River Robe.

Of particular interest to the Board are issues relating to instream channel morphology with emphasis on restoration schemes where status surveys confirm that morphological pressure is the cause of moderate, poor or bad ecological status. There is a need for the fisheries service to continue to view such issues from a fisheries perspective, to undertake investigative monitoring as appropriate using WFD compliant methodologies. It is likely that a certification system will be introduced with regard to any instream engineering works and the fisheries service are tracking current thinking in this area.

With regard to alien species, the role of OPW in working with other agencies in removal of such species is highlighted. For example this Board has had a good working relationship with OPW in relation to the removal of the south African pondweed from Lough Corrib and the water fern from watercourses at Sylau Headford Co. Galway.

Also it is acknowledged that OPW has accommodated the Board where practicable with regard to the installation of fish passes and fish counters at OPW controlled weirs.

In the context of the WFD, it is likely that a complete survey of all weirs, obstructions will be initiated.

The SEA process should examine issues in relation to location and management of dredge spoil of which there are particularly large stockpiles in some zones bordering the Clare River. As the bed of the Clare River lacks the normal heterogeneity required to sustain normal fish populations, the potential for returning instream gravels should be considered.

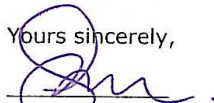
In the context of the River Robe Catchment management group, attempts were made to explore the potential for planting of river riparian zones with hardwoods from seed locally sourced but never progressed beyond the discussion phase.

With regard to protection of flood plains, there are concerns that local authority zoning of such zones for development will increase flood risk in downstream zones that will give rise to pressures to remove weirs that were created in order to improve the fishery. For example the Board was recently successful in that Bord Pleanala upheld an appeal by this Board against a development within a flood plain in Louisburgh despite a flood risk assessment having been undertaken.

In general, , because of the integration of environmental enhancement opportunities we favour management option 5 as set out in table 9 of the scoping report but it is likely that other options may be more environmentally acceptable depending on the significance of the species present and the particular circumstances. Presumably the SEA process will examine this in greater depth. At present liaison takes place with fishery officers on a regular basis and sensitive sites from a fisheries perspective are flagged based on local knowledge. The development of new protocols in recent times by the OPW is viewed as a positive development. It is hoped that the SEA will provide a framework whereby the impact of OPW drainage operations can be assessed on an ongoing basis using WFD compliant methodologies. The Fisheries Service will advise regarding new fish assessment methodologies.

It is recommended that in order to improve future consultation that OPW should build on recent progress and continue to present the work programme for review in GIS format. Also as a component to the SEA process, it would be helpful if any maps generated as part of the process could be made available in GIS format.

Yours sincerely,



Greg Forde
Chief Executive Officer.



Eastern Regional Fisheries Board

Bord Iascaigh Réigiúnach an Oirthir

Environment Section
The Office of Public Works,
Headford,
Co. Galway.

Your Reference: NA
Our Reference: BB/DD/01

October 13th, 2009

Re: SEA Scoping – Arterial Drainage Maintenance & High Risk Channel Designation.

Dear Sir or Madam,

The Eastern Regional Fisheries Board (ERFB) is a Statutory Body with a remit encompassing the management, conservation, protection, development and improvement of the fisheries within its Region.

In determining the likely significant effects of a) the Arterial Drainage Maintenance and b) High Risk Channel Designation Programmes under the Strategic Environmental Assessment process, regard should be had to the need for the sustainable development of the inland and marine fisheries resource (including the conservation of fish and other species of fauna and flora, aquatic habitats and the biodiversity of inland and marine water ecosystems). Some key issues for consideration in the SEA include:

- Water quality
- Surface water hydrology
- Fish spawning and nursery areas
- Passage of migratory fish
- Areas of natural heritage importance including geological heritage sites
- Biological Diversity
- Ecosystem structure and functioning
- Sport and commercial fishing and angling
- Amenity and recreational areas

We endorse the recognition of surface waters and their riparian areas as important natural habitats inherently supporting significant floral and faunal biodiversity as outlined in the scoping document. As such, these features should be maintained and where possible improved and enhanced (ecologically) through OPW programmes (open natural surface waters by default form a core element in the "Green Infrastructure" which can facilitate enhancement of habitat networks / open spaces and green corridors). In order to facilitate the earliest possible entry for fisheries information to the system, it is essential that the Board be contacted in relation to all works that may have an impact on surface waters as early in the OPW planning phase as possible.

The ERFB Guidelines document "*Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites*" (www.fishingireland.net/environment/constructionanddevelopment.htm) should be consulted when planning to undertake works at river sites in the Eastern Region (in addition to Environmental Drainage Maintenance Guidance Notes). The maintenance of habitat integrity (both in-stream and riparian) is essential in safeguarding the ecological value of these important resources. The specific details of any works directly affecting watercourses or riparian habitats under the Arterial Drainage Maintenance and High Risk Channel Designation Programmes, must first be submitted to the Board for assessment and approval.

As rightly identified in Section 7.2.1 of the scoping document, a significant proportion of our floral and faunal biodiversity resource is located outside areas under formal European designation (SAC, SPA, NHA, Ramsar). It is also important to note that while many river systems in the Eastern Region are not designated under the Habitats Directive, they may hold species that are designated under that directive. Atlantic salmon (present in the River Liffey system), for example, are listed as an Annex II Species under the European Habitats Directive. The Report of the Standing Scientific Committee of the National Salmon Commission "status of Irish Salmon Stocks in 2006 and precautionary catch advice for 2007" states that in applying the Habitats Directive consideration must be given to all of the populations and not just specifically to the 26 SAC designated Rivers.

Again, regard should be had to the need for the sustainable development of the inland and marine fisheries resource when undertaking any works on any surface water (whether subject to formal designated or not). It is respectfully highlighted that various fish species receive protection under Irish National Fisheries Legislation (which can be found referenced in our guidelines document). This legislation has implications for the rolling out of any programme which may impact on surface waters in any way and should be considered under the SEA process. The key environmental issues identified in Table 7 are fully endorsed by the Board.

The issue of climate change should be comprehensively considered and integrated into the final SEA. Whilst forecasting data is currently debatable, the consensus is that summer base flows in surface waters within the region will reduce significantly in the short term. The formulation of future OPW plans and policies will afford an opportunity to address not only the flooding issue but also the key issue of ecological sustainability inherently associated with this scenario. A new and dynamic approach will be required to ensure the sustainability of both current and future practices regarding surface and ground water management. The Arterial Drainage Maintenance and High Risk Channel Designation Programmes must address the need to meet WFD objectives for all surface waters in the region. All resulting programmes and policies should be informed by fisheries and other relevant legislation.

Please be in touch if we can be of further assistance.

Yours faithfully,

Pat Doherty – **Chief Executive Officer.**



North Western Regional Fisheries Board

Bord Iascaigh Réigiúnach an Iarthuaiscirt



Fisheries Ireland

Our Natural Heritage

29 Oct, 2009

Mr Nathy Gilligan
Environment Section
OPW
Headford
Co Galway

Re: Observations on the Scoping for Strategic Environmental Assessment on Arterial Drainage Maintenance and High Risk Channel Designation by the Office of Public Works

Dear Mr Gilligan

I refer to your letter of 17 September, 2009 regarding the above. As the statutory authority for the protection and conservation of Inland Fisheries in the Mayo / Sligo region, the North Western Regional Fisheries Board has a wealth of experience in matters relating to drainage and its ecological impacts. Consequently, the Board welcomes the opportunity to comment on this SEA scoping document. The Board also holds the view that, by being subject to the SEA Directive a positive step has been taken towards environmental protection which could facilitate a reappraisal of current practices and allow for a more nuanced approach to drainage activities.

The large scale arterial drainage schemes of the 1940s – 1990s and the subsequent drainage maintenance programs which are carried out by the OPW have a direct effect on two of this region's major salmonid catchments, i.e. the Moy and Garavogue rivers. Neither catchment has been subject to High Risk Channel Designation and, consequently, these comments are largely confined to drainage maintenance activity which is frequently a cause of concern to the Board.

A significant amount of salmonid habitat enhancement works have been carried out by the Board in both of the above catchments, sometimes with the direct assistance of the OPW. In the context of salmonid habitat management in these catchments, however, the process of arterial drainage maintenance can only be regarded as disruptive and undesirable.

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Where river channels are subject to regular mechanical maintenance, vegetation and (unintentionally) aquatic organisms are removed from the fluvial ecosystem. Recolonisation of the disturbed habitat takes place over subsequent years. The first species to become established are the more robust pioneer species of plant and animal (*Scirpus* spp, *Apium* Spp. etc.). Before the habitat can develop assemblages of more complex and sensitive organisms, it is usually subject to maintenance again, effectively precluding it from ever achieving a desirable level of biodiversity.

A high level of biodiversity is of immense benefit to salmonid production as it allows for greater levels of seasonally abundant food organisms for fish. Notwithstanding the fact that salmonids often do not occur in the same habitat type that is the subject of frequent drainage maintenance, this type of disturbance on part of a river channel cannot be regarded as an activity that has no impact on the integrity of the ecosystem as a whole.

While the Board acknowledges the OPW's statutory obligation with regard to the maintenance of flood relief schemes under the 1945 Act, we would hold the view that in some cases works are carried out on channels where there has been no perceptible flood risk and where alternative, less invasive strategies might be employed. Under the current drainage maintenance methodologies, these works effectively undo years of natural hydrological and ecological recovery and have a negative impact on stream biodiversity.

Promoting sustainable flood relief

Drainage schemes, in their current form, have resulted in the loss of extensive areas of wetland, much of which has subsequently been developed as agricultural and development land. Large complexes of lake, pond, fen, marsh and stream were eliminated or reduced to isolated fragments of wetland with, undoubtedly a considerable loss of biodiversity.

The loss of these wetlands and the requirement to maintain conveyance in drained channels has two significant implications. Firstly, the works involved in the drainage process inevitably lead to increased sedimentation in downstream waterways. Secondly, the loss of wetlands removes a vital hydrological sump from river catchments, causing de-watering of streams during droughts and more violent, short lived flood events during wet periods.

In recent years many areas globally have felt the effects of climate change manifested in an increased frequency and severity of major floods. In some instances, relevant authorities have responded to this new threat by investigating more sustainable methods of flood relief. In Scotland the adoption of the Water Framework Directive resulted in the enactment of the Water Environment Water Services Act (2003). This act imposes a new duty for public bodies to promote "Sustainable Flood Management". Amongst the new strategies adopted by professionals working in the field of flood management is the concept of slowing rather than increasing flow rates in certain key locations within river catchments.

By strategically managing flow rates within catchments, many professionals believe that flood relief can be achieved where it is most needed by allowing flooding to occur in managed wetland areas within the catchment. This model of sustainable flood management has gained

significant credence in other countries and has obvious ecological and fisheries benefits over the current Irish model.

The Board would regard this SEA as an opportunity for the relevant authorities to investigate the feasibility of adopting such sustainable flood management strategies at least in some parts of ecologically sensitive river catchments.

In view of the likely future effects of climate change, the preservation of remaining wetlands and the buffering of severe hydrological conditions through sustainable floodplain management, should be viewed as a matter of priority. The Board recommends that significant resources be directed into the research and development of wetland areas which could be used as a buffer from extreme flood and drought conditions.

Managing the riparian zone as a mechanism for less invasive channel maintenance.

Over many years of practical observation, Board staff have realised the importance of the relationship between the riparian area and the instream ecology and conditions in the water-body itself. More natural, well vegetated riparian zones can act as buffers against harmful run-off from surrounding lands, effectively reducing the amount of pollutant and sediment reaching the water-body. Well vegetated river/stream banks also improve fish habitat significantly by providing shade and cover for fish and boosting insect life and, consequently, food supply. Conversely, riparian areas that are too heavily vegetated with trees can prevent sufficient light from penetrating into the water body thus limiting productivity within the fluvial habitat. A reasonable balance is what is required.

Consequently, much of the Board's development activity in recent years has focused on the management of vegetation in the riparian zone. It has been noted that in many cases where a desirable level of riparian tree growth has been achieved, the partially shaded channels are considerably less amenable to excessive instream weed growth, even in low gradient channels. It is highly likely, therefore, that well managed stands of deciduous woodland within the riparian zone could function as a management tool for the attenuation of instream weed growth, with enormous ecological benefits for the aquatic habitat. This approach could obviate the need for mechanical removal of silt and weed in certain sensitive channels. Such stands of trees could be strategically located in the riparian area so as to facilitate access to the channel for machinery should this be occasionally required.

Yours sincerely



Vincent Roche
Chief Executive Officer

opw-drainage109

APPENDIX 2

Article 17 Results Summary for Habitats and Species

HABITAT ASSESSMENT

Table 1: Assessment of each attribute and overall Conservation Status for Annexed Habitat (* indicates priority habitat)

Code	Habitat Name (summarised)	Range	Area	Structure & Functions (Condition)	Future Prospects	Overall
1110	Sandbanks	Good	Good	Good	Poor	Poor
1130	Estuaries	Good	Good	Unknown	Poor	Poor
1140	Tidal Mudflats and Sandflats	Good	Good	Poor	Poor	Poor
1150	Coastal Lagoons*	Good	Poor	Bad	Poor	Bad
1160	Large Shallow Inlets and Bays	Good	Good	Unknown	Poor	Poor
1170	Reefs	Good	Unknown	Poor	Poor	Poor
1210	Annual Vegetation of Drift Lines	Good	Poor	Good	Poor	Poor
1220	Perennial Vegetation of Stony Banks	Good	Poor	Poor	Poor	Poor
1230	Vegetated Sea Cliffs	Good	Good	Poor	Poor	Poor
1310	Salicornia mud	Good	Poor	Poor	Poor	Poor
1320	Spartina Swards	Good	Poor	Good	Poor	Poor
1330	Atlantic Salt Meadows	Good	Poor	Poor	Poor	Poor
1410	Mediterranean Salt Meadows	Good	Good	Poor	Poor	Poor
1420	Halophilous Scrub	Good	Bad	Poor	Bad	Bad
2110	Embryonic Shifting Dunes	Good	Poor	Poor	Poor	Poor
2120	Marram Dunes (White Dunes)	Good	Bad	Bad	Bad	Bad
2130	Fixed Dunes (Grey Dunes)*	Good	Poor	Bad	Bad	Bad
2140	Decalcified Empetrum Dunes*	Good	Good	Bad	Poor	Bad
2150	Decalcified Dune Heath*	Good	Good	Bad	Poor	Bad
2170	Dunes with Creeping Willow	Good	Good	Poor	Poor	Poor
2190	Humid Dune Slacks	Good	Poor	Poor	Bad	Bad
21AO	Machair*	Good	Poor	Bad	Bad	Bad
3110	Lowland Oligotrophic Lakes	Good	Good	Bad	Bad	Bad
3130	Upland Oligotrophic Lakes	Good	Good	Bad	Bad	Bad
3140	Hard Water Lakes	Good	Good	Bad	Bad	Bad
3150	Natural Eutrophic Lakes	Unknown	Unknown	Unknown	Bad	Bad
3160	Dystrophic Lakes	Good	Unknown	Bad	Bad	Bad
3180	Turloughs*	Good	Good	Poor	Poor	Poor
3260	Floating River Vegetation	Good	Good	Bad	Bad	Bad
3270	Chenopodium rubri	Good	Good	Good	Good	Good
4010	Wet Heath	Good	Unknown	Bad	Bad	Bad
4030	Dry Heath	Good	Good	Poor	Poor	Poor
4060	Alpine and Subalpine Heath	Good	Poor	Poor	Poor	Poor
5130	Juniper Scrub	Good	Poor	Poor	Poor	Poor
6130	Calaminarian Grassland	Good	Good	Good	Poor	Poor
6210	Orchid-Rich Grassland/Calcareous Grassland*	Good	Bad	Bad	Bad	Bad
6230	Species-Rich Nardus Upland Grassland*	Good	Bad	Bad	Bad	Bad
6410	Molinia Meadows	Good	Bad	Bad	Bad	Bad
6430	Hydrophilous Tall Herb	Good	Good	Poor	Poor	Poor
6510	Lowland Hay Meadows	Bad	Bad	Bad	Bad	Bad

HABITAT ASSESSMENT

Table 1: Assessment of each attribute and overall Conservation Status for Annexed Habitat (* indicates priority habitat) - continued

Code	Habitat Name (summarised)	Range	Area	Structure & Functions (Condition)	Future Prospects	Overall
7110	Raised Bog (Active)*	Bad	Bad	Bad	Bad	Bad
7120	Degraded Raised Bogs	Good	Good	Poor	Poor	Poor
7130	Blanket Bog (Active)*	Good	Bad	Poor	Bad	Bad
7140	Transition Mires	Good	Good	Bad	Bad	Bad
7150	Rhynchosporion Depressions	Good	Good	Good	Good	Good
7210	Cladium Fens*	Good	Good	Bad	Bad	Bad
7220	Petrifying Springs*	Good	Good	Bad	Bad	Bad
7230	Alkaline Fens	Good	Good	Bad	Bad	Bad
8110	Siliceous Scree	Good	Poor	Poor	Poor	Poor
8120	Calcareous Scree	Good	Poor	Poor	Poor	Poor
8210	Calcareous Rocky Slopes	Good	Poor	Poor	Poor	Poor
8220	Siliceous Rocky Slopes	Good	Poor	Poor	Poor	Poor
8240	Limestone Pavement*	Good	Poor	Poor	Poor	Poor
8310	Caves	Good	Unknown	Good	Good	Good
8330	Sea Caves	Good	Unknown	Good	Good	Good
91A0	Old Oak Woodlands	Good	Bad	Bad	Bad	Bad
91D0	Bog Woodland*	Good	Poor	Poor	Poor	Poor
91E0	Residual Alluvial Forests*	Good	Bad	Bad	Bad	Bad
91J0	Yew Woodlands*	Bad	Bad	Bad	Bad	Bad

SPECIES ASSESSMENT

Table 2: Assessment of each attribute and overall Conservation Status for Annexed Species

Code	Species Name	Annex	Range	Population	Suitable Habitat	Future Prospects	Overall
1421	Killarney Fern (<i>Trichomanes speciosum</i>)	II	Good	Good	Good	Good	Good
1528	Marsh Saxifrage (<i>Saxifraga hirculus</i>)	II	Good	Good	Good	Good	Good
1833	Slender Naiad (<i>Najas flexilis</i>)	II	Good	Poor	Poor	Good	Poor
1393	Slender Green Feather-Moss (<i>Hamatocaulis vernicosus</i>)	II	Good	Good	Good	Good	Good
1395	Petalwort (<i>Petalophyllum ralfsii</i>)	II	Good	Good	Good	Good	Good
1376	Maerl (<i>Lithothamnion coralloides</i>)	V	Good	Unknown	Unknown	Poor	Poor
1377	Maerl (<i>Phymatolithon calcareum</i>)	V	Good	Unknown	Unknown	Poor	Poor
1400	White Cushion Moss (<i>Leucobryum glaucum</i>)	V	Good	Good	Poor	Good	Poor
1409	Sphagnum genus	V	Good	Good	Poor	Poor	Poor
1413	Lycopodium species group	V	Good	Poor	Poor	Poor	Poor
5113	Cladonia subgenus Cladonia	V	Good	Good	Poor	Poor	Poor
1013	Geyer's Whorl Snail (<i>Vertigo geyeri</i>)	II	Good	Poor	Poor	Poor	Poor
1014	Narrow-mouthed Whorl Snail (<i>Vertigo angustior</i>)	II	Good	Poor	Poor	Poor	Poor
1016	Desmoulin's Whorl Snail (<i>Vertigo moulinsiana</i>)	II	Bad	Bad	Poor	Bad	Bad
1024	Kerry Slug (<i>Geomalacus maculosus</i>)	II, IV	Good	Good	Good	Good	Good
1029	Freshwater Pearl Mussel (<i>Margaritifera margaritifera</i>)	II, V	Good	Bad	Bad	Bad	Bad
1990	Nore Freshwater Pearl Mussel (<i>Margaritifera durrovensis</i>)	II, V	Bad	Bad	Bad	Bad	Bad
1092	White-clawed Crayfish (<i>Austropotamobius pallipes</i>)	II, V	Poor	Poor	Poor	Poor	Poor
1065	Marsh Fritillary (<i>Euphydryas aurinia</i>)	II	Good	Poor	Poor	Poor	Poor
1095	Sea Lamprey (<i>Petromyzon marinus</i>)	II	Poor	Poor	Poor	Poor	Poor
1099	River Lamprey (<i>Lampetra fluviatilis</i>)	II, V	Good	Good	Good	Good	Good
1096	Brook Lamprey (<i>Lampetra planeri</i>)	II	Good	Good	Good	Good	Good
1102	Alis Shad (<i>Alosa alosa</i>)	II, V	Good	Unknown	Unknown	Unknown	Unknown
5046	Killarney Shad (<i>Alosa fallax killarneyensis</i>)	II, V	Good	Good	Good	Good	Good
1103	Twaite Shad (<i>Alosa fallax fallax</i>)	II, V	Good	Bad	Unknown	Poor	Bad
5076	Pollan (<i>Coregonus autumnalis</i>)	V	Good	Bad	Poor	Poor	Bad
1106	Atlantic Salmon (<i>Salmo salar</i>)	II, V	Good	Bad	Poor	Poor	Bad
1202	Natterjack Toad (<i>Bufo calamita</i>)	IV	Bad	Bad	Poor	Poor	Bad
1213	Common Frog (<i>Rana temporaria</i>)	V	Good	Good	Poor	Good	Poor
1223	Leatherback Turtle (<i>Dermochelys coriacea</i>)	IV	Unknown	Unknown	Unknown	Poor	Poor
1303	Lesser Horseshoe Bat (<i>Rhinolophus hipposideros</i>)	II, IV	Good	Good	Good	Good	Good
1309	Common Pipistrelle (<i>Pipistrellus pipistrellus</i>)	IV	Good	Good	Good	Good	Good
5009	Soprano Pipistrelle (<i>Pipistrellus pygmaeus</i>)	IV	Good	Good	Good	Good	Good
1317	Nathusius' Pipistrelle (<i>Pipistrellus nathusii</i>)	IV	Good	Good	Good	Good	Good
1322	Natterer's Bat (<i>Myotis nattereri</i>)	IV	Good	Good	Good	Good	Good
1314	Daubenton's Bat (<i>Myotis daubentonii</i>)	IV	Good	Good	Good	Good	Good
1330	Whiskered Bat (<i>Myotis mystacinus</i>)	IV	Good	Good	Good	Good	Good
1320	Brandt's Bat (<i>Myotis brandtii</i>)	IV	Good	Good	Good	Good	Good
1326	Brown Long-eared Bat (<i>Plecotus auritus</i>)	IV	Good	Good	Good	Good	Good
1331	Leisler's Bat (<i>Nyctalus leisleri</i>)	IV	Good	Good	Good	Good	Good

SPECIES ASSESSMENT

Table 2: Assessment of each attribute and overall Conservation Status for Annexed Species (continued).

Code	Species Name	Annex	Range	Population	Suitable Habitat	Future Prospects	Overall
1334	Irish Hare (<i>Lepus timidus hibernicus</i>)	V	Good	Unknown	Poor	Good	Poor
1355	Otter (<i>Lutra lutra</i>)	II, IV	Good	Poor	Good	Good	Poor
1357	Pine Marten (<i>Martes martes</i>)	V	Good	Good	Good	Good	Good
1364	Grey Seal (<i>Halichoerus grypus</i>)	II, V	Unknown	Good	Good	Good	Good
1365	Common (Harbour) Seal (<i>Phoca vitulina vitulina</i>)	II, V	Unknown	Good	Good	Good	Good
1345	Humpback Whale (<i>Megaptera novaeangliae</i>)	IV	Unknown	Unknown	Unknown	Unknown	Unknown
1349	Bottle-nosed Dolphin (<i>Tursiops truncatus</i>)	II, IV	Good	Unknown	Good	Good	Good
1350	Common Dolphin (<i>Delphinus delphis</i>)	IV	Good	Unknown	Good	Good	Good
1351	Harbour Porpoise (<i>Phocoena phocoena</i>)	II, IV	Good	Good	Good	Good	Good
2027	Killer Whale (<i>Orcinus orca</i>)	IV	Unknown	Unknown	Unknown	Unknown	Unknown
2029	Long-finned Pilot Whale (<i>Globicephala melas</i>)	IV	Unknown	Unknown	Unknown	Unknown	Unknown
2030	Risso's Dolphin (<i>Grampus griseus</i>)	IV	Unknown	Unknown	Unknown	Unknown	Unknown
2031	White-sided Dolphin (<i>Lagenorhynchus acutus</i>)	IV	Good	Unknown	Good	Good	Good
2032	White-beaked Dolphin (<i>Lagenorhynchus albirostris</i>)	IV	Unknown	Unknown	Unknown	Unknown	Unknown
2034	Striped Dolphin (<i>Stenella coeruleoalba</i>)	IV	Unknown	Unknown	Unknown	Unknown	Unknown
2035	Cuvier's Beaked Whale (<i>Ziphius cavirostris</i>)	IV	Unknown	Unknown	Unknown	Unknown	Unknown
2038	Sowerby's Beaked Whale (<i>Mesoplodon bidens</i>)	IV	Unknown	Unknown	Unknown	Unknown	Unknown
2618	Minke Whale (<i>Balaenoptera acutorostrata</i>)	IV	Good	Unknown	Good	Good	Good
2621	Fin Whale (<i>Balaenoptera physalus</i>)	IV	Good	Unknown	Good	Good	Good
5020	Blue Whale (<i>Balaenoptera musculus</i>)	IV	Unknown	Unknown	Unknown	Unknown	Unknown
5031	Sperm Whale (<i>Physeter macrocephalus</i>)	IV	Unknown	Unknown	Unknown	Unknown	Unknown
5033	Northern Bottlenose Whale (<i>Hyperoodon ampullatus</i>)	IV	Unknown	Unknown	Unknown	Unknown	Unknown
2619	Sei Whale (<i>Balaenoptera borealis</i>)	IV	Unknown	Unknown	Good	Unknown	Unknown
1348	Northern Right Whale (<i>Eubalaena glacialis</i>)	IV	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant
2028	False Killer Whale (<i>Pseudorca crassidens</i>)	IV	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant
2037	True's Beaked Whale (<i>Mesoplodon mirus</i>)	IV	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant
2622	Pygmy Sperm Whale (<i>Kogia breviceps</i>)	IV	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant
5029	Beluga/White Whale (<i>Delphinapterus leucas</i>)	IV	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant
5034	Gervais' Beaked Whale (<i>Mesoplodon europaeus</i>)	IV	Vagrant	Vagrant	Vagrant	Vagrant	Vagrant

APPENDIX 3

Article 17 list of Major Pressures Identified for Habitats and Species

Table 3: An overview of the major pressures reported in the assessment of habitats

Rank	Pressures	Amalgamated counts
1	Grazing (including overgrazing and undergrazing)	40
2	Recreation (sports & leisure structures & activities)	32
3	Peat extraction	29
3	Communication networks (e.g. roads)	29
4	Forestry	25
4	Urbanisation (e.g. housing)	25
5	Drainage	22
6	Sand & gravel extraction	20
7	Reclamation (e.g. landfill)	19
8	Pollution	17
8	Invasive species	17
9	Restructuring agricultural land holding (e.g. removal of hedges)	15
10	Fertilisation	13
10	Burning	13
11	Discharges (e.g. household waste)	11
12	Erosion	10
13	Fishing (including trawling and other commercial fishing)	9
14	Trampling	8
15	Abandonment	7
15	Stock feeding	7

Table 4 – An overview of the major pressures reported in the assessment of Annex species

Rank	Pressures	Amalgamated counts
1	Fishing (including trawling and other commercial fishing)	43
2	Drainage	41
3	Pollution	38
4	Communication networks (e.g. roads)	25
5	Forestry	22
5	Recreation (sports & leisure structures & activities)	22
6	Pesticides	18
6	Urbanisation	18
7	Restructuring agricultural land holding (e.g. removal of hedges)	17
7	Collection of fauna & flora	17
8	Discharges (e.g. household waste)	15
9	Fertilisation	12
9	Grazing (including overgrazing and undergrazing)	12
9	Sand & gravel extraction	12
10	Cultivation (including modification of cultivation practices.)	10
10	Reclamation (e.g. landfill)	10

APPENDIX 4

OPW's Environmental Management Protocols & Standard Operating Procedures



The Office of Public Works

Arterial Drainage Maintenance Service

Environmental Management Protocols

&

Standard Operating Procedures

The Office of Public Works
Environment Section
West Region Drainage Maintenance
Headford
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The Office of Public Works Arterial Drainage Maintenance Environmental Management Protocols & Standard Operating Procedures

Contents:	Current
Version	
Environmental Management Protocols	April 2011
Environmental Drainage Maintenance Guidance Notes (10 Steps to Environmentally Friendly Maintenance)	April 2011
Lamprey Standard Operating Procedure	V2 April 2009
Crayfish Standard Operating Procedure	V2 April 2009
Otter Standard Operating Procedure	V2 April 2009
Mussels Standard Operating Procedure	V2 April 2009
Invasive Species Standard Operating Procedure 2009	V2 March
Zebra Mussel Standard Operating Procedure	V2 May 2009
Blank OPW/ EREP Audit Form	April 2011
NPWS Local Contact Details	May 2009
Fisheries Contact Details	April 2011
OPW Bridges on National Primary Roads	March 2009

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ENVIRONMENTAL MANAGEMENT PROTOCOL
ARTERIAL DRAINAGE MAINTENANCE SERVICE
(APPLICABLE TO ENGINEERS, TECHNICIANS AND FOREMEN)



PART I – OPERATIONS MANAGEMENT

COMMUNICATIONS - STATUTORY STAKEHOLDERS

- By the end of September of each year, each Drainage Region to forward a **draft** copy of its Annual Works Programme for the coming year to OPW's Environment Section, and to the Inland Fisheries Ireland (IFI) EREP Project Manager who will review it for appropriate sites and study locations for the Environmental River Enhancement Programme 2008 -2012.
- By end of November of each year, each Drainage Region to forward the relevant sections of the Finalised Annual Maintenance Programme for the coming year with a copy of appropriate scheme maps, to the National Parks & Wildlife Services (NPWS) Regional Managers and the IFI Directors.
- When compiling the programme the type of works proposed should be indicated for each channel under the headings A-F to facilitate the Screening for Appropriate Assessment (AA).
 - A – Silt & Vegetation Management
 - B – Aquatic Vegetation Cutting
 - C – Bank Protection
 - D – Bush Cutting/Branch Trimming
 - E – Tree Cutting
 - F – Bridge/ Structure Repairs
- Ideally, approximate timing (season/month) and approximate duration of works should be included for each channel.
- Works that fall within SACs, SPAs or NHAs are to be highlighted on the programme.
- As a follow up, the Drainage Regions offer the opportunity for a meeting with the stakeholders to discuss the programme and where a meeting is requested, preferable for this to take place as early as possible in the year.
- Prior to entry onto a channel contained wholly or partly within an SAC, SPA or NHA, three weeks notice in advance of entry, and for SAC & SPA an AA Screening Statement/Conclusion Statement must be completed and forwarded through the NPWS District Conservation Officer.

INTERIM STAKEHOLDERS MEETINGS

- In addition to the start of the year stakeholder meeting to overview the Annual Works Programme, Regional Offices will offer and facilitate a schedule of more frequent and catchment focused meetings.
- The need and the frequency of these meetings will be determined on a regional basis in partnership with the relevant stakeholders.
- Typically a frequency of every 2-3 months to discuss the following 2-3 months work on the catchment, identifying any further environmental sensitivities, appropriate mitigating measures, follow up joint site visits where deemed beneficial and flagging any opportunities for added benefit in proposed River Enhancement works.
- Typical attendance includes a range of OPW Management Staff, i.e. Engineer, Technician and/or Foreman, NPWS Rangers and/or DCO and IFI Officers.

- OPW Engineer will compile minutes of the meeting to record attendance and a brief account of main decisions and follow up actions.
- Any channel specific information resulting from these meetings, such as timing requests should be entered into the Records Database in accordance with the National Recording Process.
- Fruitful consultations with statutory stakeholders such as NPWS and IFI are of critical importance to continuously improving environmental performance. However, in the interest of maximising the efficiency of stakeholders input, Management Staff are as far as practical, to plan their consultative requirements and address a range of aspects in any one discussion forum. Interim Stakeholder Meetings or similar forums offer good opportunities to maximise consultation efficiencies.

CORRESPONDENCE

- All Environment related correspondence/complaints should be logged on the Engineering Services Correspondence Database as per normal protocol. Complaints received should be forwarded to the Environment Section should assistance be required.

WALKOVER SURVEYS

- As a component to the EREP Project, on a number of channels, EREP team will request for Walkover Surveys as an opportunity to discuss in detail on site the environmental options for a particular channel with a range of relevant stakeholders.
- Typical attendance will be an IFI EREP representative, a range of OPW Management Staff and relevant Operational Crew if deemed beneficial, local IFI Officer and/or NPWS Ranger or DCO.
- OPW Management Staff to liaise with EREP team and coordinate the site visit with local IFI and NPWS to facilitate their participation if these stakeholders wish to attend.
- Environmental procedures as agreed on-site will be recorded by IFI EREP team and issued to the OPW Engineer as part of the design guidance for the particular Enhanced Maintenance works.
- Regional Management Staff to ensure that Operational Staff carry out the works in accordance with the agreed procedures.

NATURA 2000 SITE ASSESSMENTS

- All scheduled maintenance operations in the vicinity of a Natura 2000 Site i.e. an SAC or SPA, will require Screening for Appropriate Assessment and Stage II Appropriate Assessment where required.
- By the end of September of each year, each Drainage Region to forward a draft copy of its Annual Works Programme for the coming year to OPW's Environment Section to facilitate this process.
- Environment Section will procure the Ecological Consultant, collate all the channel lists and issue completed AA Screening Statements/Conclusion Statements to the respective OPW engineers as completed.
- The Ecological Consultant will consult with OPW management to define the precise extents of proposed works in each Natura 2000 Site.
- In addition, the Ecological Consultant will be carrying out walkover surveys for pre and post maintenance works for a representative number of the sites and OPW Management will be required to facilitate the same.
- OPW Management Staff will issue the relevant completed Assessments directly to the NPWS District Conservation Officer. In addition, Environment Section will issue all of the Assessments to the Development Applications Unit, DEHLG, Dun Sceine, Harcourt Lane, Dublin 2.

- Preferably for the Assessments to be forwarded to the DCO as soon as it is completed, but in any case with a minimum of three weeks notice before commencement of the works.
- Management Staff to implement all prescribed mitigating measures and ensure that Operational Staff are made aware of all relevant site specific mitigating measures.

Current version of Designated Sites GIS Layers available on Socialtext

ENVIRONMENTAL RIVER ENHANCEMENT PROGRAMME (EREP)

- After reviewing the draft Annual Works Programme, IFI EREP team will revert to the respective Regional Engineers Office and request follow up meetings as required to discuss aspects of the programme in relation to the EREP.
- Enhancement sites require ground truthing to ensure they are technically feasible as envisaged. This is to be coordinated by the IFI EREP team with local IFI and OPW personnel as required.
- Sites shortlisted by IFI EREP team for Capital Enhancement works are emanating from a screening process of technical feasibility in terms of gradient and water quality. In the future, sites selected will increasingly be resulting from other requirements such as the Water Framework Directive Programme Of Measures under Morphology.
- IFI EREP team in consultation with the local IFI and OPW, will prioritise sites on a basis of best return for investment. IFI EREP team will liaise with the Regional Offices to assist in identifying channels deemed suitable for capital enhancement which should be integrated with the following years work programme. In some cases, a situation may arise where the site selected is not overlapping with the current Annual Works Programme but where feasible and subject to any third party agreement, OPW will accommodate these works.
- Similarly for enhanced maintenance works, IFI EREP team in consultation with the local IFI and OPW, will select sites again that are technically feasible and offer best return for investment. These sites will normally be from channels on the current Annual Works Programme.
- IFI EREP team will coordinate all the scientific monitoring works, provide the enhancement design details and guidance to OPW Management Staff and maintain a reasonable level of site supervision, proportional to the complexity of the works and the experience of the OPW Staff involved.
- Consultations with local IFI through the Interim Stakeholder meetings are encouraged to identify sites suitable for Enhancement works and in some cases the local IFI may also be in a position to produce an enhancement design. All enhancement designs and works are to be coordinated through the IFI EREP team to facilitate formal recording into the national EREP project and allow for biodiversity and/or hydromorphology monitoring if required. Local IFI may coordinate with IFI EREP team or alternatively OPW Regional Staff coordinate directly with the EREP team.
- A small portion of channels have more infrequent maintenance cycles and these cases can offer particularly good opportunities for enhanced maintenance type works. Channels programmed where maintenance works have not being carried out for in excess of 10 years, to be flagged to IFI EREP team for possible Walkover Surveys and guidance on appropriate EDM procedures.
- Management Staff to ensure that as far as practical, all Operational crews have an opportunity to get experience on these projects.
-
- Each Regional Engineer is to make provision in the Annual Works Programme for Plant & Labour resources in addition to provisions in the Annual Budget for materials subject to expenditure constraints. Typical resources are as follows:

Capital Enhancement

Region	Target (Km)	Capital Costs	Machine Weeks	ManWeeks
East Region	20	€200,000	30	60
South West Region	14	€140,000	21	42
West Region	16	€160,000	24	48
	50	€500,000	75	150

Enhanced Maintenance *(in conjunction with routine maintenance)*

Region	Target (Km)	Capital Costs	Machine Weeks	ManWeeks
East Region	20		15	0
South West Region	14		11	0
West Region	16		12	0
	50		38	0

- Progress targets for EREP to be shown on monthly production reports.
- OPW are the primary contact point for liaison with landowners including the organising of access and egress for machinery and materials. Brochures on EREP are available in all Regional Offices. Additional copies can be obtained through OPW Environment Section.
- Management Staff are encouraged to maximise the use of all available on-site materials such as stone from historical spoil heaps as opposed to importing materials at a higher cost.
- In addition, Management Staff are encouraged to maximise synergies with other funding sources such as Fisheries Development grants attained by local Angling Clubs which could combine with OPW plant and labour to supply materials.
- In all cases, Inland Fisheries Ireland are the statutory authority to give design guidance to OPW. Angling Clubs or other sectoral funding sources to liaise with the Fisheries authorities in respect of all design and environmental monitoring requirements.
- As-Built plans are to be completed by the IFI EREP team for all enhancement works. This will entail a site visit by IFI and relevant OPW Staff where requested. These will be retained by IFI as well as any relevant design information.
- IFI EREP team will forward a copy of the As-Built plans to Environment Section who will upload the same to Socialtext for access to the information by all Staff.
- At the end of the year, IFI EREP team will forward Environment Section a GIS layer of that year's works for uploading to OPW's GIS records.

Current version of Enhancement GIS Layer available on Socialtext

NATIONAL RECORDING PROCESS

- Weekly Record Cards can contain information on Lamprey, Crayfish, Kingfisher, Mussels, Otter and other site specific environmental information as arises.
- Environmental information on Cards will be recorded onto the Records Database by each Drainage office. The latest Records Database has been revised to integrate environmental records.
- On an interim basis, a copy of all Cards with environmental information to be copied and forwarded to Environment Section by each Drainage Office. This is to allow Environment Section to review the detail of information being recorded, feedback to the Operational crews through the Management Staff and attain a national consistency in the style of information being recorded.
- All relevant information to be uploaded to GIS by Environment Section.

- All other relevant environmental information sourced by Management Staff whether from direct observations or through stakeholder consultations, should be entered into the Records Database.
- Relevant environmental information sourced through the EREP project and related research will be forwarded by IFI EREP team to Environment Section directly for centralised GIS uploading.
- On an annual basis, Environment Section will compile an update of Weekly Records Cards species records and make available to all Staff via Socialtext to assist in tracking progress.
- On an ongoing basis, Environment Section will make available the various OPW compiled species records to other authorities to assist in contributing to any appropriate national conservation knowledge.
- As described above, each drainage office will upload onto the Records Database all environmental information from the Weekly Record Cards and all other broader environmental information attained by Management Staff. Within a few years, it's envisaged that multiple regional Staff will be able to use the new Records Database, and then environmental information from all sources will be uploaded directly by a whole host of Staff. Typically this will include any mitigating agreements for particular channels agreed with stakeholders or any other individuals observation such as protected species presence noted during a separate site visit.

SALMONIDS

- As far as practicable, the maintenance works are to be scheduled to accommodate salmonid (Salmon & Trout) spawning areas, as is in place across all regions for many years. This is a widespread measure on many catchments and is most applicable to medium gradient channels with gravel substrate.
- Prior to works commencing, consult with local IFI. Ideally, consultations to be conducted through Interim Stakeholder Meetings or alternatively, direct contact in respect of the specific site.
- Maintenance operations on salmonid spawning beds typically carried out between July and September but timing subject to adjustment due to local knowledge of IFI.
- Raking of spawning gravels to improve spawning capacity also typically carried out between July and September.
- River enhancement works to enhance both the fisheries and the broader ecology of the drainage channel are covered under the EREP project.
- In the future, as the extent of completed enhancement works increases, there is a risk of damage to structures due to future maintenance. All channels scheduled for maintenance to be checked against GIS records for presence of previous enhancement works. Where a presence is indicated, carry out a site visit as appropriate and in consultation with IFI, devise on-site procedures to protect or enhance existing instream structures.

Current version of Enhancements & Spawning GIS Layers available on Socialtext.

LAMPREY (BROOK, RIVER & SEA) & CRAYFISH

- All channels scheduled for maintenance to be checked against GIS records for presence of Lamprey or Crayfish.
- In accordance with the SOPs, Operational Staff will closely observe the spoil three times daily and report to the Foreman any Lamprey or Crayfish located.
- Mitigating procedures to apply when:
 - GIS records indicate species presence, or
 - Operational Staff locate Lamprey or Crayfish during operations, or

- Where particularly suitable habitat is identified by an environmental stakeholder.
- If significant populations are encountered, notify IFI EREP team and facilitate scientific studies if site deemed suitable by IFI.
- If significant populations are encountered, notify NPWS Ranger and local IFI Officer and conduct site visit as necessary.
- Combination of Mitigating Measures to be selected as applicable to the site while balancing the Flood Risk Management requirements and a sustainable approach to the conservation of Lamprey and/or Crayfish.
- Identify extent of channel applicable and the mitigating measures to apply.
- Inform Operational Staff of mitigating requirements.

Suite of relevant Mitigating Measures as follows:

On site measures

- Skip sections to retain intact habitat either in one long reach or multiple short reaches.
- Maintenance in an upstream direction to avoid secondary disturbance of a species moving downstream. Balance with the advantage of maintenance in a downstream direction where instream vegetation minimises siltation.
- Confine maintenance to 2/3 of channel width leaving marginal vegetation and silt intact.
- Maximise use of weed cutting bucket particularly where aquatic vegetation removal is the primary objective. This is effective for Lamprey juveniles as they are in the silt. For Crayfish, cutting of “Flaggers” type vegetation is effective but cutting of “water celery” mat type vegetation is less effective as it can result in Crayfish being removed within the weed mass.

Forward planning measures

- Annual maintenance of the channel in shorter segments sequentially completing the same over a number of years. Balance with maintaining reasonably operational efficiency in terms of machinery moving, transport, access and egress.
- Longer time periods between maintenance cycles e.g. move from 4-6 years to 7 to 8 years. Balance with overall river ecology as longer maintenance cycles will lead to more heavy-scale works.
- Timing of maintenance to accommodate Lamprey spawning. Stakeholder consultations between OPW and local IFI for salmonid mitigating purposes, to include consideration of Lamprey spawning. This is to be applied to channels where Lamprey spawning habitat is known as informed by IFI or other stakeholder. For River & Brook Lamprey, no works on relevant spawning channel from end March to start of June subject to adjustment due to local knowledge of IFI. For Sea Lamprey, as they spawn during the summer months, restrictions from late April to early July are required. To be applied to channels where Sea Lamprey spawning is known as informed by IFI or other stakeholder and timing subject to adjustment due to local knowledge of IFI. Note that Sea Lamprey are much less widespread so envisaged that the scale of this mitigation will be very limited.
- Loosening spawning bed gravels. Stakeholder consultations between OPW and IFI for salmonid gravel loosening purposes, now to include consideration of Lamprey spawning as above.
- Enhance channel profile such as skewed cross section and promote deposition of silt along margins. Integrate with IFI discussions on planning the EREP to avail of enhancement opportunities particularly for channels where Lamprey or Crayfish presence is recorded.
- Modification of OPW structures which impede upstream migration. Identification of weirs as barriers to be as informed by IFI or other stakeholder. Where modification designs required, liaison with IFI EREP team to integrate the improvement works into the EREP project. Identification of a bridge apron step attained through ongoing site inspections by

OPW Management Staff or other stakeholder. In consultation with IFI, steps at bridges to be modified by a rock armour type ramp or similar. Envisaged that these measures will be of a limited scale on drained channels.

GIS Records:

- Where Lamprey or Crayfish are discovered, Operational Staff will have recorded the same on the Weekly Record Cards. Cards with species location information will be uploaded to the Records Database as stated in the National Recording Process.
- All new Lamprey spawning location information attained through stakeholder consultation to be recorded on the Records Database in accordance with the National Recording Process.
- All database records of species location will be uploaded to GIS by Environment Section.
- IFI EREP team conducting ongoing research on Lamprey & Crayfish as a component of the EREP works. Scientific data calculating species density for some sites will be developed and to be supplied by IFI to OPW and uploaded to GIS by Environment Section.

Current version of relevant SOPs: V2 April 2009

Current version of relevant GIS Layers available on Socialtext.

OTTER

- Research to date indicates that Otters are widespread across all sizes of drainage channels nationally, hence it is prudent to assume that Otter use any particular site.
- In accordance with the Otter SOP, Operational Staff will walkover the works area one week in advance in conjunction with the Health & Safety assessment noting dense cover with access directly to the water that is to be avoided where feasible.
- In addition, any recognisable signs of Otter presence observed such as Spraints, Footprints or suspected Holts, will be recorded on the Weekly Record Cards. These signs were identified in Otter Awareness Training carried out across all regions in 2008.
- While holts are usually well concealed, where Operational Staff observe a suspected holt such as a burrow opening, in consultation with Management Staff, subject to flood risk management functions, no works to within a 50m buffer each side.

Bridge mammal crossing enhancement

- As a component of ongoing consultations with NPWS and other stakeholders, evidence may arise from time to time as to a particular spot for Otter road kill. Typically this can arise where the Otter always traverses the roadway as opposed to going through the bridge. While this scenario is not known to be a widespread issue in Ireland, the highest risk locations are on the National Primary Roads which have the heaviest traffic volumes.
- There are 170 National Primary Road bridges on OPW channels as listed in the table referenced below and Management Staff are to have particular regard to these locations if evidence arises on a possible road kill “hot spot”.
- Enhancement works will typically take the form of a bolt-on wildlife ledge or similar. Design and configuration is to be carried out in consultation with NPWS and relevant Local Authority.
- On an annual basis, Environment Section will review the national website www.biology.ie which records Otter road kill reports from the public. Any road kill location which overlaps with an OPW channel will be flagged by Environment Section to the relevant Management Staff.
- Current understanding is that Otter road kill is not a significant issue in Ireland. It's envisaged that while the justification for bridge mammal crossing works may arise for some scenarios, these measures will be of a limited scale on drained channels.

FRESHWATER PEARL MUSSEL

- GIS records from NPWS show the locations of the 91 known FWPM populations in Ireland.
- The following OPW channels have been identified as containing FWPM:

Channel	Scheme	Location	Most Recent Record
CH9	Corrib Headford	Oughterard	2009
C1/21/3	Moy	Approx 500yds from outfall to into L. Cullin	2004
C1 Sect M&N	Moy	Ballygallagart	2004
C1/21/14	Moy	Crossmolina	2008
C1	Dunmanway FRS	d/s of the Long Bridge	2003
C1	Owvane	Approx 1400 yds from outfall	2002
C1	Feale	d/s Listowel near Scartleigh cemetery	2006
**Owenaher	Moy	u/s of C1/54	1996
**Brown Flesk River	Maine	Trib of C1 Maine near Farranfore	1987
** Galey River	Feale	Approx 1400yds u/s of C1/18 near Ahavoher Br.	1950
**River Liffey	Ryewater	(Lucan) Approx 3.5km d/s C1 Ryewater outfall	1894

** Although not on OPW channels - these channels may or may not contain populations of FWPM. Works in the vicinity which could impact on a possible population need to be considered in close consultation with local NPWS knowledge.

- While highly unlikely to have instream works in a FWPM habitat, if a new population located by Operational Staff during operations, works to cease.
- Notify NPWS and in consultation with NPWS, area to be skipped or non in-stream works carried out as agreed for the specific site.
- For operations in the vicinity of known populations, mitigating procedures to apply:
- Consult with NPWS and local IFI and conduct site visit as necessary.
- Typically only selective non in-stream works adjoining the population.
- Works such as removal of a fallen tree is to be completed by lifting clear of the channel to minimise any channel bed disturbance due to the branches being dragged.
- Assess need for silt management procedures for works upstream of the population and implement in consultation with NPWS.

SWAN & DUCK MUSSELS

- Swan and Duck Mussels are not strictly a protected species, however they are of conservation interest.
- Both species are similar in appearance and habitat requirements and distinguishing between them is not necessary unless local environmental stakeholders can identify the exact species.
- As the Mussel SOP, if Operational Staff locate the same, Management Staff will be notified.
- Where significant populations are encountered notify NPWS Ranger and local IFI Officer, and where they are interested in visiting the site, facilitate a site visit as necessary.
- Identify extent of channel applicable and the mitigating measures to apply.
- Typical Mitigating Measures include:

- Operational Staff to observe spoil and return any Mussels to the channel whom are expected to recolonise the channel bed.
- Maximise use of weed cutting bucket particularly where aquatic vegetation removal is the primary objective.
- Skip sections to retain intact habitat either in one long reach or multiple short reaches.
- Confine maintenance to 2/3 of channel width leaving marginal vegetation and silt intact.
- Record species presence on the Weekly Record Cards which will be recorded on the Records Database.

Current version of relevant SOPs: V2 April 2009

KINGFISHER

- Avoid disturbing nesting sites in banks.
- Visual sightings of Kingfisher by Operational Staff to be recorded on the Weekly Record Cards.
- Sightings by Management Staff to be recorded on the Weekly Record Cards where works in progress or on other occasions, record by separate map or channel reference format.
- All sightings to be recorded on the Records Database in accordance with the National Recording Process.
- All database records of species location will be uploaded to GIS by Environment Section.
- On an annual basis, Environment Section will issue the records to Birdwatch Ireland whom will add to the national Kingfisher database.

Current version of Kingfisher GIS Layer available on Socialtext.

BIRDS

- Removal of any abnormally dense layer of vegetation is to be executed between September and February (inclusive) to minimise impacts on nesting birds unless there are other overriding requirements such as Health & Safety.
- For SPAs containing important over-wintering bird populations, in consultation with the NPWS, regard to be given to timing or phasing of the works to minimise potential disturbance.

BATS

- While the removal of large mature trees is not typically a requirement of maintenance works, where the case arises, in consultation with NPWS, regard to be given to the likelihood of bat roosting habitat.
- Typical mitigating measure would be to leave tree in fallen position for 24hrs to allow any bats vacate.
- Masonry bridges offer niches and crevices suitable for bat roosts and where masonry bridges are scheduled for maintenance works, regard to be given to the likelihood of bat roosting habitat. Typical maintenance works at low level such as wing wall repair or underpinning foundations have limited potential to impact on bat roosts. Where the case arises that repair works are to be above the high water level such as the upper arch, in consultation with NPWS, assess the potential for the works impacting on bat roosts.
- Typical mitigating measure would be to contract a bat specialist to survey for bat presence before works commence, to avoid entombment of any bats.

WETLANDS - BOGS, FENS & TURLOUGHES

- All channels scheduled for maintenance which overlap SAC designations to be checked against the list of channels that impinge on Raised Bog, Fen habitat or Turloughs and have regard to any NPWS agreements noted *.
- OPW Management Staff to consult with NPWS for expert opinion as to any evidence of ongoing ecological decline of the Bog, Fen or Turlough and judgement on, if the drainage datum set by the Drainage Scheme and its maintenance is an ongoing contributing factor by affecting the hydrological regime of the same.
- Where a likely impact is identified, conduct site visit as necessary and in consultation with NPWS, mitigating measures to be selected such as:
- Skipping the channel in question while taking cognisance of the flood risk management requirements.
- Maximise use of weed cutting bucket particularly where aquatic vegetation removal is the primary objective.
- Inspection by OPW line management to assess the possibility of over digging the channel below the original design datum. Presence of an existing water level control such as a bridge floor to be established and alternative reference datum to be installed if deemed warranted.

** Environment Section currently developing a list of channels which overlap with Raised Bog, Fen habitat and Turloughs within SACs. Channels that are subject to a previous NPWS agreement /understanding of the extent of maintenance will be recorded.*

Current version of Wetlands channels list available on Socialtext.

INVASIVE SPECIES – PLANTS

- Multiple invasive plant species are widespread nationally as described in the SOP and prudent to assume that one or more of these plants can be present on any works site.
- At present the OPW does not have any direct responsibility for the management of Invasive species. However to ensure OPW operations are not a vector for these invasives, measures are required to reduce the risk of spread.
- Ensure machine washing equipment transported to site for all appropriate machinery movements as described in the Invasive Species SOP.
- Ongoing EDM site audits by Environment Section will include confirmation that machine washing was executed in accordance with the SOP for the last applicable machine transfer.
- In some cases, OPW will assist other authorities in the control of invasive species. In these projects, the works are typically carried out in partnership between a number of authorities such as IFI, NPWS and relevant Local Authority. As scenarios arise where OPW are requested to assist in an invasive species control project, Management Staff are encouraged to support the multi-authority partnership model which will maximise resource efficiencies for all parties while still achieving a broader environmental good.

Current version of relevant SOP:

V2 March 2009

INVASIVE SPECIES – ZEBRA MUSSEL

- Zebra Mussels are present in the River Shannon, Grand Canal and are in many lakes such as L Derg, L Ree, L Garra, L Key, L Derragh, Derravaragh, L Sheelin and L Corrib. This species is spreading and it is prudent to assume that works in any large sluggish river or near a lake has potential to contain Zebra Mussel.
- For any proposed works in the vicinity of potential Zebra Mussel waters, flag for Operational Staff and ensure particular attention to cleaning procedures for all equipment prior to removal from site.

- Any new location of Zebra Mussel uncovered during operations, notify NPWS and IFI for their information.
- Record on Weekly Record Sheet which will be uploaded on the Records Database in accordance with the National Recording Process.
- On an annual basis, Environment Section will collate the records nationally and issue to any relevant authorities to assist in tracking the species spread.

Current version of relevant SOP:

V2 May 2009

TREE MANAGEMENT

- A small portion of channels have more infrequent maintenance cycles typically where self cleaning gradients are present. These sites can entail abnormally dense tree cover which may be required to be managed for conveyance or fisheries purposes. Removal of any abnormally dense layer of vegetation is to be executed between September and February (inclusive) to minimise impacts on nesting birds unless there are other overriding requirements.
- IFI requests to reduce “tunnelling” on drainage channels to be accommodated where feasible. OPW Management Staff to facilitate a site visit with the IFI Officer as required and devise a selective approach to the tree removal so as to retain a dappling of shade along the channel length.
- Excess woody vegetation to be collected and utilised by the following in order of preference:
- Reused by adjoining landowner for domestic firewood.
- Subject to landowners agreement, stockpile excess to form natural cover and niche habitat, preferably with some connection of cover to the channel e.g. along a hedge leading to the water.
- Shred and spread along the adjoining top of bank allowing the material to degrade rapidly and recolonisation of the underlying vegetation.

ENVIRONMENTAL DRAINAGE MAINTENANCE (EDM) GUIDELINES

- A portion of operational crews will be audited annually for implementation of the EDM Guidelines and other standard environmental procedures as adopted.
- Auditing will be carried out separately by both IFI and OPW Environment Section on a rotational basis to ensure all operational crews are audited at least once every three years.
- Audit results will be recorded on a standard format with the following feedback:
- All audit results will be forwarded to the relevant Engineer for that Drainage Scheme within two working weeks.
- In the event of an audit showing elements of unreasonable non-compliance with procedures, the relevant Engineer will be notified within one working day.
- Audit results will be forwarded to OPW Systems Co-ordinator for inclusion in monthly regional benchmarking reports.
- IFI EREP team will compile an overall summary of their findings in their end of year report under the EREP project.
- Design for Enhanced Maintenance works under EREP will include a design element for full scale implementation of the EDM Guidelines such as Boulder Replacement and Excavating Pools.
- Management Staff to ensure that as far as practical, all Operational crews have an opportunity to get experience on these projects.

Current version of EDM Guidelines: April 2011

Current version EDM Audit Sheet: April 2011

PART II – DEPOT MANAGEMENT

DEPOT WASTE MANAGEMENT

- 12 Waste Management Plans are available on Socialtext covering the 12 Drainage Offices.
- Environment Section will review 2 plans per annum and audit implementation.
- Updated Plans together with an overview of findings will be forwarded to the relevant Coordinator and uploaded to Socialtext.

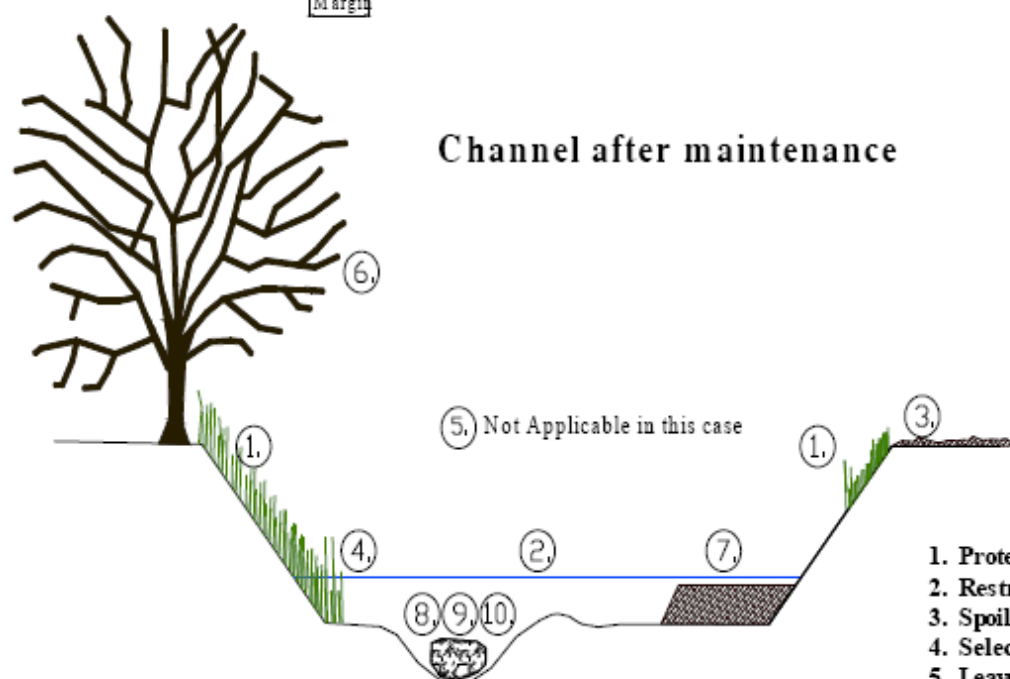
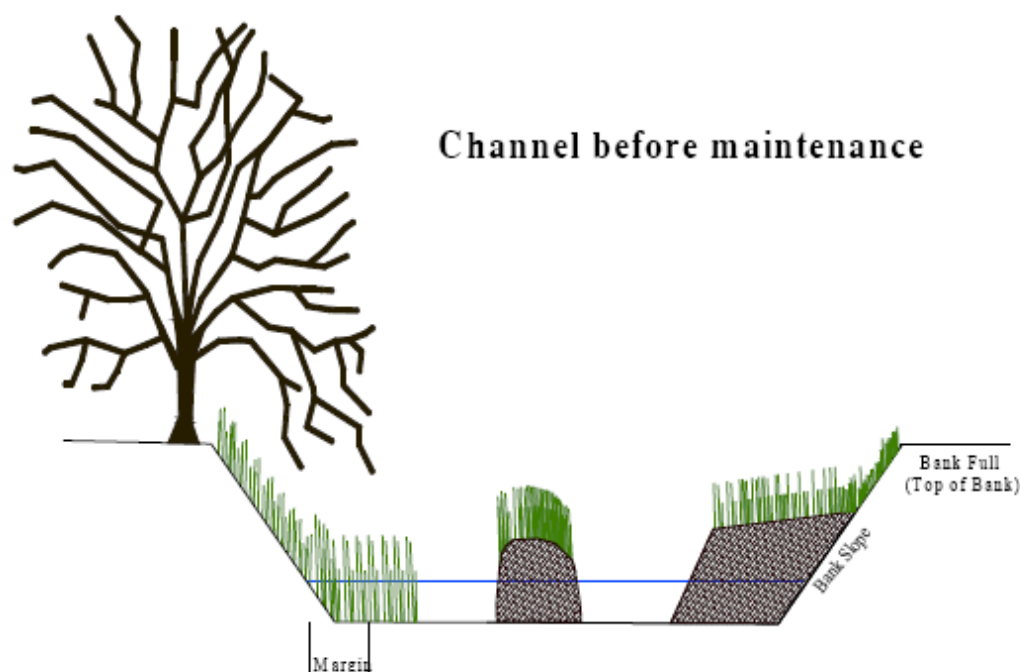
FUTURE REVISIONS

- Envisaged that this set of Protocols will be a fluid document and will be periodically updated as procedures are revised or new procedures introduced. In addition, to be used as a framework document for quality control purposes to reference the latest versions of all supporting information.

Environmental Drainage Maintenance Guidance Notes



10 Steps to Environmentally Friendly Maintenance



1. Protect bank slopes
2. Restrict maintenance to channel
3. Spoil management
4. Selective vegetation removal
5. Leave section untouched
6. Management of trees
7. Manage berm to form two stage channel
8. Replace stones and boulders
9. Loosen gravel beds
10. Re-profile channel bed

Environmental Strategies for Channel Maintenance



1. Protect bank slopes

- 1.1 Do not disturb the non-working bank slope
- 1.2 Minimise any effect on working bank
- 1.3 Leave margin of vegetation at foot of each bank slope



2. Restrict maintenance to channel

- 2.1 Remove only necessary silt – **no new diggings**
- 2.2 Remove instream material only
- 2.3 Retain marginal vegetation
- 2.4 Check spoil regularly. *See Lamprey & Crayfish SOPs*

3. Spoil Management

- 3.1 Maximise spoil placement on bank full line or spoil heaps **and**
- 3.2 Minimise spoil placement on bank slopes
- 3.3 Spread spoil as thinly as possible
- 3.4 Allow water to drain out of bucket over the water – lets small fish, lamprey and crayfish escape



Environmental Strategies for Channel Maintenance



4. Selective Vegetation Removal

- 4.1 Retain a band of vegetation on both sides at water's edge
- 4.2 Selectively manage instream vegetation
- 4.3 Maximise use of weed-cutting bucket
- 4.4 Avoid maintenance in coarse fish channels from 1st April to 1st July



- 4.5 Retain 1/3 to 1/2 of instream floating type vegetation, such as *Ranunculus* (water crowfoot) – see photo to right



5. Leave sections untouched

- 5.1 If channel capacity is not affected, leave section alone



Environmental Strategies for Channel Maintenance



6. Management of Trees

- 6.1 Remove trees that are blocking the flow
- 6.2 Tree-cutting window 1st September to 28th February



- 6.3 Remove overhanging branches to known flood level
- 6.4 Use saw secateurs for removal, not excavator bucket

- 6.5 Manage Trees to reduce very heavy shading
- 6.6 Manage briars and scrub.
See Otter SOP



7. Manage berms to form two-stage channels

- 7.1 Retain berm where channel capacity is not affected
- 7.2 Remove top of berms to low flow levels
- 7.2 Remove vegetation and soil from gravel berms
- 7.3 Replace sod to the berm where feasible
- 7.4 Only narrow berms if 'excessively' wide for the channel (i.e. greater than a third of the channel width)



8. Replace stone and boulders

- 8.1 Reinststate boulders and gravels as removed by maintenance operations
- 8.2 Reinststate suitably sized boulders into channel from spoil heaps where feasible
- 8.3 Boulders should be placed at or below low flow level and spaced out

9. Work in gravel bed channels

- 9.1 Loosen or toss bed gravels to wash out fines
- 9.2 Only considered between 1st July and 30th September
- 9.3 No work in gravel bed / spawning channels in fisheries 'closed season'
Note: This varies locally check with local IFI



Environmental Strategies for Channel Maintenance



10.1 Excavate bed to form deeper pool areas and shallow riffles



10.2 Overdeepen the channel along one side and place spoil on opposite side –particularly on curves and bends

10.3 Use existing boulders to form simple low-level structures



10.4 Record where such works are carried out

BROOK, RIVER & SEA LAMPREY STANDARD OPERATING PROCEDURE - ARTERIAL DRAINAGE MAINTENANCE

Actions during Maintenance Operations

- Machine gangs to closely observe the spoil three times daily for Lamprey (and Crayfish).
- Where Lamprey encountered:
 - Contact area Foreman immediately.
 - Foreman to contact Engineering Staff in line with the Environmental Management Protocols.
 - Record the location and abundance of Lamprey on the time card.

Measures as directed by Foreman to minimise impact may include:

- Skip a defined stretch of channel.
- Confine maintenance to 2/3 of channel width leaving marginal vegetation and silt intact.
- Maximise use of weed cutting bucket particularly where aquatic vegetation removal is the primary objective.



Lamprey in the spoil

RIVER, BROOK & SEA LAMPREY IDENTIFICATION CARD



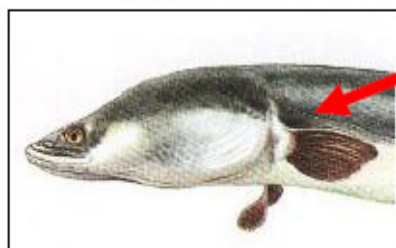
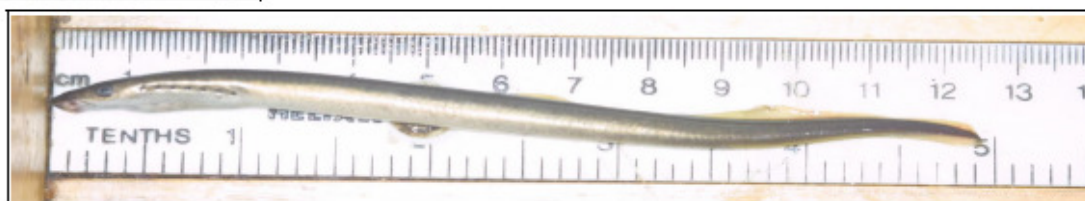
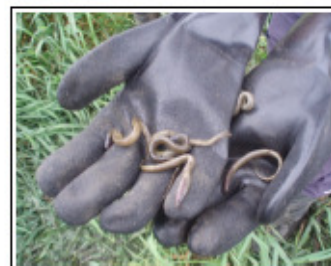
Gill Pores



Lamprey and young eels can look very similar. These key identifying features can be used to distinguish the two species

Lamprey:

- Gill Pores (Holes)
- No Fins
- No Jaw
- Average length 8 to 15cm (3 to 6 inches)



No Gill pores

Eels: No Gill Pores

Paired Fins

Jawed Mouth

Average length 65cm (26 inches)

Juvenile Lamprey:

- Juvenile Lampreys live in the sediment.
- It is in this juvenile phase that they can be removed from the sediment during maintenance.



Adult Lamprey:

- Largest is the Sea Lamprey species.
- Also are River and Brook Lamprey
- Length from 30 to 60cm (12 to 24 inches).



WHITE-CLAWED CRAYFISH

STANDARD OPERATING PROCEDURE - ARTERIAL DRAINAGE MAINTENANCE

Actions during Maintenance Operations

- Machine gangs to closely observe the spoil three times daily for Crayfish (and Lamprey).
- Where Crayfish encountered:
 - Contact area Foreman immediately.
 - Foreman to contact Engineering Staff in line with the Environmental Management Protocols.
 - Record the location and abundance of Crayfish on the time card.

Measures as directed by Foreman to minimise impact may include:

- Skip a defined stretch of channel.
- Confine maintenance to 2/3 of channel width leaving marginal vegetation and silt intact.
- Maximise use of weed cutting bucket particularly where aquatic vegetation removal is the primary objective.



Crayfish in the spoil

WHITE-CLAWED CRAYFISH



Identification

- Resemble small lobsters.
- Colour varies from light to dark green-brown, with large front claws.
- Adults typically 7cm - 10cm (3" - 4") long.
- Juveniles can be as small as 2cm (1") long.
- Prefer channels with
 - dense weed cover (flaggers / watercelery) or
 - with a mixture of rocks / gravels that provide crevices for cover.



OTTER

STANDARD OPERATING PROCEDURE - ARTERIAL DRAINAGE MAINTENANCE

Week before Maintenance Operations begin:

- Operational staff will walkover works area one week in advance in conjunction with the PRA noting areas of dense cover with access directly to the water. (As identified during Otter Awareness Training)
- These areas of suitable cover should be avoided where feasible during maintenance.
- Suspected presence of an Otter holt to be reported immediately to area Foreman, who will contact Engineering Staff in line with the Environmental Management Protocols.
- Signs of Otter presence observed such as Spraints, Footprints or suspected Holts, to be recorded on the Weekly Record Cards.

Measures to minimise disturbance may include:

- Retain suitable cover where possible.
- Areas of dense scrub to be avoided by large plant.
- Skip stretch of channel in proximity of suspected holt.



Otters

- Widespread presence on OPW channels.
- Shy animals and not normally seen.
- Adults 1 metre long and weigh 10kg.
- Streamlined profile.

OTTER

Holts

- Usually well concealed.
- Typically burrows, or spaces under banks, tree roots or dense cover.



Spraints

- Found on rocks, paths, channel junctions.
- Dark, oily, sweet smelling.

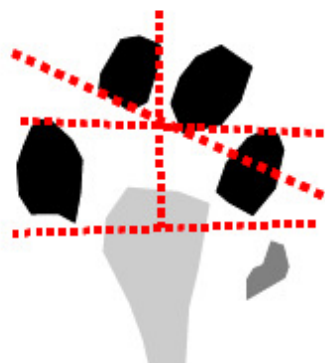


Suitable areas of cover

Dense bankside vegetation, particularly where there is direct covered access to the water.
Any isolated clumps of dense vegetation giving cover along an open length of channel.

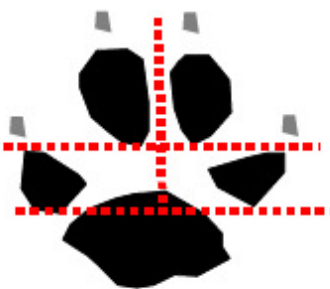


Foot-prints



Otter

(Non-symmetrical toes)



Dog

(Symmetrical toes)



Fox



Badger



Mink

MUSSELS

STANDARD OPERATING PROCEDURE - ARTERIAL DRAINAGE MAINTENANCE

FRESH WATER PEARL MUSSELS

Before Maintenance Operations begin:

- Maintenance must not commence where a known population of Fresh Water Pearl Mussel exists (as listed in the Environmental Management Protocols).
- In the unlikely event of new population of Fresh Water Pearl Mussel being encountered during maintenance,
 - **All works must cease immediately.**
 - Contact area Foreman.
 - Record the location of Mussels on the time card.

Measures to minimise disturbance may include:

- Placing of straw bales to prevent movement of silt.
- Any exceptional / emergency works to be carried out in close consultation with the NPWS.
- For exceptional / emergency works e.g. fallen tree obstruction – these to be lifted clear of the channel to prevent disturbing the channel bed.

- Shells very thick & heavy – shaped like a kidney.
- Shell colour is dark-brown – black, to blue & black.
- Adults range in length from approx. 6 cm – 12 cm (2.5 – 5 inches) and can live for over 100 years.
- Suitable rivers are reasonably fast flowing, with very clean, good quality water, gravel bed, preferably with large cobbles.



A large, dark, oval-shaped shell, likely a clam or mussel, resting on a bed of small, dark, pebbly sediment. The shell has a mottled appearance with lighter and darker patches.

**INVASIVE SPECIES
STANDARD OPERATING PROCEDURE – ARTERIAL DRAINAGE MAINTENANCE**

Measures to reduce the risk of spread of invasive species

All excavators, weed cutting boats, tractors, dumpers & other machinery employed on maintenance must be thoroughly cleaned down using a power washer unit prior to being;

- (a) transported by Low- Loader**
- (b) moving to another catchment within the Region**
- (c) moving to another Region.**

Notify your supervisor immediately if you see any of the invasive species listed.

*Full details of all species are available in the CFB's
Field guide to the Identification of Aquatic Invasive Species*



Giant Hogweed

Found on the banks of many rivers throughout Ireland.

Can grow to a height of 4 metres.

Seeds are carried by water and spread very quickly.

!!!Avoid contact with the sap of this plant as it can cause extensive lesions or blistering of the skin.



Japanese Knotweed

Grows up to 2-3m in height along roadsides and river corridors throughout the country.

Even a tiny piece of this plant can produce a new plant.

Leaves are heart-shaped with a pale stripe down the centre.

In Summer cream flowers arise from the tips of the red-flecked stems.



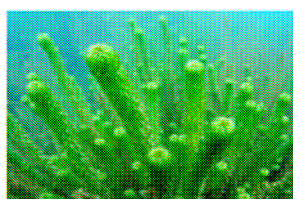
Himalayan Balsam

Grows in dense strands up to 3m high, and is found widespread across Ireland along banks of rivers.

Seed pods explode scattering seeds.

Dies back in Autumn exposing bare banksides to erosion.

White or pink flowers, smooth hollow stem, oval shaped pointed leaves with jagged edges.



Curly waterweed – *Lagarosiphon major*

Found in lakes and slow flowing waterways up to 6m deep.

Spread by fragmentation from one watercourse to another on boat hulls, trailers, outboard motors or angling equipment.

Significant weed stands located in Lough Corrib.



Zebra Mussels

Distinctive stripy shell, very small (1-3cm).

Attach in clusters to hard surfaces – boats, pipes, buoys.

Refer to the [Zebra Mussel Standard Operating Procedure](#).

All photographs courtesy of Central Fisheries Board

Actions for Maintenance Operations

1) Zebra Mussels detected on site

- Where Zebra Mussels are found, remark on the extent of Mussels on the Weekly Report Card and notify the Foreman/Technician.
- Technicians/Engineers to notify Environment Section of location and grid reference.
- Environment Section to update the National Database.

2) Maintenance close to R. Shannon or infested lakes

- Where a machine is working close to the R. Shannon or an infested lake, ensure that prior to the machine transferring to a new site, buckets and tracks are thoroughly cleaned of any material such as silt or vegetation.
- Ganger / Driver to visually inspect the bucket, tracks and any equipment that was in the water to ensure no Mussels are present.

3) Maintenance close to outlets/inlets of any lakes

- Where a machine is working close to any lake, ensure that prior to machine transferring to a new site, buckets are clean of any material such as silt or vegetation.
- Ganger / Driver to visually inspect the bucket and other equipment that was in the water to ensure no Mussels are present.

4) Boats and other equipment

- Boats or other water based equipment that is to be transferred between river catchments should be thoroughly cleaned on the outside, drained of any bilge water and inspected for the presence of Mussels.
- If it's suspected that the equipment was in contact with Zebra Mussel waters, steam clean the hull and trailer and leave the boat or equipment out of water for four weeks prior to moving.

OPW Role

Although it is a relatively low risk, OPW could spread Zebra Mussels if aquatic vegetation or excavated material containing Mussels is inadvertently transported to another non-infested channel. Adult Mussels can survive for up to four weeks out of water hence its critical not to transport the same. Larvae are tiny and barely visible but will not survive on a machine bucket if there is no silt, stones or vegetation to shelter it.



Environmental Threat

Zebra Mussels are thumbnail-sized black & orange striped shellfish. They grow into dense clusters and attach to any underwater hard surface. They are an invasive species that damage the natural ecology of the infested waters. They expand into catchments through been transported by man's activities e.g. transferring fishing boats. Once in a particular lake or river, if conditions are favourable, they will multiply and spread with the currents. It is envisaged that they will keep expanding their territory unless man makes a concerted effort to prevent transport of the Mussels into non-infested waters.

National Parks & Wildlife Service (NPWS) / An tSeirbhís Páirceanna Náisiúnta agus Fiadhúlra, 7 Ely Place, Dublin 2.
Regional Information/Eolas Reigiúnach (01) 888 2000
Local/Glaoch Áitiúil: 1890 20 20 21
Fax/Faics: (01) 888 3272
Internet/Idirlíon: www.npws.ie & www.environ.ie
E-mail/Ríomhphost: natureconservation@environ.ie

Eastern Division / Rannán an Oirthir

Divisional Manager: (01) 8883243
 Divisional Ecologist: (01) 6678256

South Eastern Region/Réigiún an Oirdheiscirt

(Carlow, Kilkenny, Wexford & Wicklow (incl. Wicklow Mountains National Park))

Regional Office: (0404) 45800
 Regional Manager: (0404) 45802
 Deputy Regional Manager: (0404) 45801
 Education Centre: (0404) 45656
 Information Office (Wicklow Mtns Nt Park) (0404) 45425
 District Conservation Officer:
 (North Wexford & Wicklow) (0404) 45807
 District Conservation Officer:
 (Carlow, Kilkenny & Wexford) (056) 7722135

North Eastern Region/Réigiún an Oirthuaiscirt

(Dublin, Kildare, Laois, Louth, Meath & Offaly)

Regional Manager: (045) 520 622
 Deputy Regional Manager: (045) 520 644
 District Conservation Officer:
 (Kildare, Laois & Offaly) (045) 521 713
 District Conservation Officer:
 (Dublin, Louth & Meath) (046) 909 3506

Western Division/Rannán an Iarthair

Divisional Manager: (091) 704 206
 Divisional Ecologist: (091) 704 208

Western Region/Réigiún an Iarthair

(Mayo, Galway West)

Regional Manager: (095) 41054
 Deputy Regional Manager: (098) 49996

District Conservation Officer: (Galway West) (095) 41054
 District Conservation Officer: (Mayo) (098) 49996

Mid Western Region/Réigiún an Lár-Iarthair

(Clare, Galway (except Galway West above))

Regional Office: (091) 704200
 Regional Manager: (091) 704 201
 Deputy Regional Manager: (091) 870341
 District Conservation Officer:(Clare) (065) 682 2711
 District Conservation Officer:
 Galway (except Galway West above) (091) 739654

Southern Division/Rannán an Deiscirt

Divisional Manager: (021) 4619901
 Divisional Ecologist: (021) 4619903

Mid Southern Region/Réigiún an Lár-Deiscirt

(East Cork, Limerick, Tipperary NR, Tipperary SR & Waterford)

Regional Manager: (067) 44287
 Deputy Regional Manager: (021) 4619904
 District Conservation Officer:
 (East Cork, Tipperary SR & Waterford) (021) 4619905
 District Conservation Officer:
 (Limerick & Tipperary NR) (067) 44135

South Western Region/Réigiún an Iardheiscirt

(West Cork & Kerry)

Regional Office: (064) 31440
 Regional Manager: (064) 70145
 Deputy Regional Manager: (064) 70143
 District Conservation Officer:
 (North Cork & Kerry) (064) 33567
 District Conservation Officer:
 (South & West Cork and South & West Kerry) ... (028) 37347

Northern Division/Rannán an Tuaiscirt

Divisional Manager: (071) 966 6020
 Divisional Ecologist: (071) 966 6928

Northern Region/Réigiún an Tuaiscirt

(Donegal, Leitrim West & Sligo)

Regional Office: (074) 913 7090
 Regional Manager: (074) 972 1837
 Deputy Regional Manager: (074) 913 7090
 District Conservation Officer:
 (Donegal Nth & Glenveagh National Park) ... (074) 913 7440
 District Conservation Officer:
 (Donegal, Leitrim West & Sligo) (071) 966 6178

North Midlands Region/An Réigiún Lár Tíre Thuaidh

(Cavan, Leitrim East, Longford, Monaghan, Roscommon & Westmeath)

Regional Office: (071) 9666178
 Regional Manager: (071) 966 6934
 Deputy Regional Manager: (044) 934 2661
 District Conservation Officer:
 (Cavan, Leitrim, Longford & Monaghan) (049) 433 5750
 District Conservation Officer:
 (Roscommon & Westmeath) (044) 933 7007

National Parks & Nature Reserves/Páirceanna Náisiúnta

Ballycroy National Park County Mayo, Lagduff More, Ballycroy, Westport, Co. Mayo (098) 49996
 Burren National Park, NEPS Building, St. Francis Street, Ennis, Co. Clare (065) 6822662
 Connemara National Park, Letterfrack, Co. Galway (095) 41054
 Coole Park Nature Reserve, Gort, Co. Galway (091) 631 804
 Glenveagh National Park, Church Hill, Letterkenny, Co. Donegal (074) 9137090
 Killarney National Park, Muckross House, Killarney, Co. Kerry (064) 31440
 Wexford Wildfowl Reserve, North Slob, Wexford (053) 9123129
 Wicklow Mountains National Park, Kilafin, Laragh, Co. Wicklow (0404) 45800

Inland Fisheries Ireland March 2011

IFI Region	Director	Address	Telephone	Region/Scheme
IFI Blackrock	William Walsh	15a Main Street Blackrock Co. Dublin	01 2787022	East: Glyde & Dee, Boyne, Blackwater, Bally-Teigue
IFI Ballina	John Connelly	Ardnaree House Abbey Street Ballina Co. Mayo	096 22788	West: Moy, Bonet
IFI Ballyshannon	Dr. Milton Matthews,	Station Road Ballyshannon Co. Donegal	071 9851435	West: Donegal schemes, Kilcoo, Duff
IFI Limerick	Sean Ryan	Ashbourne Business Park Dock Road Limerick	061 300238	East: Inny, Brosna West: Boyle, Ballyglass South: Killimor, Carrighahorig, Nenagh, Groody, Maigne, Deel, Feale
IFI Macroom	Dr. Patrick Buck	Sunnyside House, Macroom Co. Cork	026 41221	South: Maine, Owvane
IFI Clonmel	Suzanne Champion	Anglesea Street Clonmel Co. Tipperary	052 80055	East: Brickey
IFI Galway	Amanda Mooney	The Weir Lodge Earl's Island Galway	091 563118	West: Corrib Headford, Mask,
IFI	Dr. Ciaran Byrne	Unit 4 Swords Business Campus Balheary Rd Swords Co. Dublin	01 8842600	All
EREP Project Manager	Dr. Karen Delanty	Unit 4 Swords Business Campus Balheary Rd Swords Co. Dublin	01 8842624	All

(Note: Completed flood relief schemes are not listed but proposed works should be discussed with the relevant local IFI)

OPW Bridges (numbering 170) intersecting National Primary Roads.

Scheme	Channel ID	Bridge No.	National Route type	Bridge Name
Glyde and Dee	C2 (7C)	B80	N01	
Glyde and Dee	C2 (7E1)	B839	N01	
Glyde and Dee	C2 (7E1)	B840	N01	
Broadmeadow and Ward	C2/1	B230	N02	
Broadmeadow and Ward	C2/1	B239	N02	
Broadmeadow and Ward	C2	B204	N02	Coolatrath br.
Broadmeadow and Ward	C2/3	B243	N02	
Broadmeadow and Ward	C1/6/1	B86	N02	
Broadmeadow and Ward	C1/6/1/1	B96	N02	
Broadmeadow and Ward	C1/6	B68	N02	
Broadmeadow and Ward	C1	B16	N02	
Boyne	C1	B4	N02	Slane br.
Glyde and Dee	C2 (7H)	B101A	N02	
Glyde and Dee	C2 (17)	B179	N02	
Glyde and Dee	C2 (14B)	B118	N02	
Glyde and Dee	C2 (14)	B867	N02	
Glyde and Dee	C2 (1)	B30	N02	
Glyde and Dee	C2 (13)	B111	N02	
Glyde and Dee	C2 (16B4)		N02	
Glyde and Dee	C1 (1)	B15	N02	Aclint Br
Glyde and Dee	C29 (2)	B441	N02	
Glyde and Dee	C29 (3)	B443	N02	
Glyde and Dee	C25 (8)	B341	N02	
Glyde and Dee	C25 (7D1)	B672	N02	
Monaghan Blackwater	C1/1/5	B7	N02	
Monaghan Blackwater	C1/1/5/6/1	B1	N02	
Monaghan Blackwater	C1/3/5/2	B8	N02	
Monaghan Blackwater	C1/3/6/3	B1	N02	Hoaf Br
Boyne	C1/8/24	BX1	N03	
Boyne	C1/8/23	B733	N03	
Boyne	C1/8/21	B723	N03	
Boyne	C1/8/16	B644	N03	
Boyne	C1/8	B126	N03	Clavens Br
Boyne	C1/8/8	B294	N03	
Boyne	C1/12/1	B875	N03	Dillon's Br
Boyne	C1/12/7	B915	N03	
Owenmore	Behy Bridge	BX1	N04	
Boyle	C6/7/5	B2	N05	Ballanagare Br
Boyle	C6/7/1/4	B2	N05	
Boyle	C6/7/1	B3	N05	Cloonshanville Br
Boyle	C1/3/2/1	B4	N05	
Boyle	C1/9/1	B1	N05	
Boyle	C1	B4	N05	Old Lung Bridge
Boyle	C1/8	B1	N05	New Lung Bridge
Boyle	C1/45	B8	N05	
Moy	C1/31/2	B3	N05	
Moy	C1/31	B4	N05	
Moy	Not on a channel	B2	N05	Trimoge
Moy	Not on a channel	B2	N05	
Moy	Not on a channel	B1	N05	
Moy	C1/30/3/1	B1	N05	
Moy	C1/28/2	B3	N05	
Moy	C1/28/1	B4	N05	
Moy	C1/25	B6	N05	
Moy	C1/23/3	B2	N05	
Moy	C1/23	B9	N05	

Moy	Not on a channel	B1	N05	
Moy	C1/21/1/5/2/2	B3	N05	
Moy	C1/21/1/5/2/11	B2	N05	
Moy	C1/21/1/5/1/15	B1	N05	
Moy	C1/21/1/5/2/18	B1	N05	
Moy	C1/21/1/5/2/19	B2	N05	
Moy	C1/21/2/5/2/20/4	B1	N05	
Boyle	C1/44/15	B2976	N06	
Boyle	C1/44/17	B2984	N06	
Boyle	C1/64/1/11/6	B3337	N06	
Boyle	C1/64/1/11	B3303	N06	Miltownpass Br.
Boyle	C1/64/1/11/4	B3319	N06	
Boyle	C1/64/1/11/4/2	B3331	N06	
Boyle	C1/64/1/13/2	B3330	N06	
Boyle	C1/64/1/13	B3372	N06	Rochfort Br.
Boyle	C1/64/1/13/4	B3384	N06	
Brosna	C27 (1)	B150	N06	
Brosna	C1 (1)	B11	N06	Kilbeggan Br.
Brosna	C17 (1)	B143	N06	
Brosna	C17 (SE)	B726	N06	
Brosna	C17 (5)	B138	N06	New Br
Brosna	C17 (4)	B135	N06	
Corrib Clare	C1	B3	N06	Quincentennial Br.
Nenagh	C1/9	B23	N07	Ollatrim Br
Nenagh	C1/9/24	B4	N07	
Monaghan Blackwater	C1/1/6/1	B11	N12	Tyholland Br
Blanket Nook	C1/3	B23	N13	
Swilly embankments	E9	B1	N14	
Swilly embankments	C1/5	B9	N14	
Deele and Swillyburn	C1	B6	N14	
Deele and Swillyburn	C1/11	B19	N14	
Deele and Swillyburn	C2	B20	N14	
Abbey	C1/4	B39	N15	
Abbey	C1/4	B31	N15	
Abbey	C1/3A	B30B	N15	
Abbey	C1/2	B21 - B23	N15	
Abbey	C1/1	B18	N15	
Duff	C1	B1	N15	
Bonet	C1/12/3	B1	N16	
Bonet	C1/12	B5	N16	
Bonet	C1/12	B4	N16	
Bonet	C1/12	B2	N16	
Bonet	C1	B5	N16	
Bonet	C1/13/2	B1	N16	
Bonet	C1/13	B1	N16	
Moy	C1/50/2	B3	N17	
Moy	C1/50	B4	N17	
Moy	C1/48/3	B2	N17	
Moy	C1/48	B3	N17	
Moy	C1/45/4	B2	N17	
Moy	C1/45	B13	N17	
Moy	C1/30/5/9	B3	N17	
Moy	C1/30/5/9	B15	N17	
Corrib Mask	CM4/43/4	B2	N17	
Corrib Mask	CM4/34	B10	N17	
Corrib Mask	CM4/34/2	B2	N17	
Corrib Clare	C3/30	B8	N17	
Corrib Clare	C3/30/4	B1	N17	
Corrib Clare	C3/26	B2	N17	
Corrib Clare	C3/26/9	B1	N17	

Corrib Clare	C3/26/1	B3	N17	
Corrib Clare	C3/12/2	B1	N17	
Corrib Clare	C3	B14	N17	
Corrib Clare	C3	B2	N17	Claregalway bridge
Fergus	D7	B3	N18	
Owenagarney	C2	B1	N18	
Owenagarney	C4	B3	N18	
Coonagh Embankments	C10	B9	N18	
Coonagh Embankments	D13	B113	N18	
Coonagh Embankments		B1	N18	
Maigue	C1/36	B1	N20	Helena's br.
Maigue	C1/37/1	B3	N20	
Maigue	C1/37	B1	N20	
Maigue	C1	B23	N20	Creggane br.
Maigue	C1/33	B1	N20	Cappanafaha br.
Maigue	C1/30	B2	N20	Ballynabanoge br
Maigue	C1/26	B1	N20	
Maigue	C1/15	B10	N20	
Maigue	C1/10/5	B3	N20	
Maine	C1/28	BX1	N21	
Maine	C1/34	B117	N21	
Maine	C1/35	BX2	N21	
Deel SR	C12/2/2	B125	N21	
Deel SR	C12/2/2/2	B127	N21	
Deel SR	C12/2/1	B123	N21	
Deel SR	C10	B95	N21	Ballyfraleay br.
Deel SR	C8	B76	N21	Reens br.
Maigue	C1/17/10	B1	N21	
Maigue	C1/17/8	B2	N21	
Maigue	C1/17/5	B1	N21	
Maigue	C1	B1	N21	Adare br.
Maigue	C1/15	B5	N21	
Maine	C1	B3	N22	Maine br.
Maine	C1/32	B110	N23	Dysert br.
Maine	C1/33	B114	N23	Killfinnaun br.
Maine	C1	B9	N23	Herbert br.
Groody	C1/4	B29	N24	
Groody	C1	B4	N24	
Groody	C1/7	B53	N24	
Groody	C1/9	B56	N24	
Moy	C1/9/1	B1	N26	
Moy	C1/9	B2	N26	
Moy	F/282	B	N26	
Moy	C1/14	B1	N26	
Moy	RIVER	B3	N26	
Moy	C1/37	B1	N26	
Moy	C1/38	B1	N26	
Moy	RIVER	B2	N26	Cloongullaun br.
Moy	C1/39	B3	N26	
Moy	C1/39	B6	N26	
Moy	C1/39	B9	N26	
Moy	C1/39/3	B1	N26	

Otter Wildlife Passes and OPW Drainage Channels

- It has been brought to the attention of the OPW that there may be a need for small mammal passes on some of the maintained channels.
- The National roads constitute less than 6 percent of roads in this country, approx. 3 National Primary and 3 percent National Secondary. In spite of this they carry over 42 percent of the traffic.

It is for this reason that the focus will be on the National Primary road crossings.

- The national road kill survey was analysed and the data from the web site "www.biology.ie" was cross-referenced against OPW channel locations and the results were inconclusive, as the web page is not widely used. It appears for now that OPW channel road crossings have no affect on the deaths of otters as per this information.

Next Steps:

1. Consult NPWS throughout all regions to review any evidence of otter road kills on National Primary roads or are they aware of any other such road deaths.
2. Where there appears to be mammal deaths on National Primary roads that intersect OPW channels it will be seriously considered to install in the bridge (where possible) a small mammal pass to allow ease of access for otters.

Otter Habitat Disruption

- Otters, along with their breeding and resting places, are protected under the provisions of the Wildlife Act, 1976, as amended by the Wildlife (Amendment) Act, 2000. They are also included in Annex I and Annex IV of the Habitats Directive, which is transposed into Irish Law in the European Communities (Natural Habitats) Regulations (S.I. 94 of 1997), as amended.

Otter Pass Details

- Mammal Ledges and underpasses should be constructed parallel to the watercourse.
- Underpasses should be of a diameter of 600mm up to a length of 20m. Where lengths exceed this the pipe should be increased to 900mm diameter
- An underpass should be no more than 50m of the watercourse with channels or fencing guiding the animals to it.

Where there is sufficient space under the bridge for a ledge the following should be provided:

- Fencing: See "figure 1; Specification for Mammal Resistant Fencing" in the NRA, National Roads Authority, Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes, for more detail. Also, Design Manual for Roads and Bridges, DMRB Volume 10, Section 1, Part 5, Chapter 9.
- A bolt on ledge can be used under a bridge where there is no dry passage. The bolt on ledge should provide otters with a dry walkway of between 300mm and 450mm wide, constructed from 4.5mm Durbar patterned galvanised plate.
- At some sites, considerations of responsibility, cost, aesthetics or practicality might indicate the use of a solid ledge; this is most likely where an existing otter-ledge has proved to be sited too low to offer dry passage at spate conditions. A solid ledge can be created in 3 ways; concrete bagging, shuttering plus new concrete and concrete blocks.
- See (OPW, 2007), (DMRB, 2001) and (NRA 2006) for further Details



References

- NRA (2006) – National Roads Authority, Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes.
- NRA (2005) – National Roads Authority, Guidelines for the Crossing of Watercourses During the Construction Of National Road Schemes.

- OPW (2007) – Series of Ecological Assessments on Arterial Drainage Maintenance No. 4, Ecological Impact Assessment (EclA) of the Effects of Statutory Arterial Drainage Maintenance Activities on the Otter (*Lutra lutra*).
- OPW (2006) – Screening of Natura 2000 Sites for Impacts of Arterial Drainage Maintenance Operations. Environment Section, Engineering Services, Office of Public Works.
- DMRB (2001) - Design manual for roads and bridges (DMRB). Volume 10, Section 4 Environmental Design and Management Nature Conservation. Part 4 HA 81/99 Nature conservation advice in relation to otters. Section 1, Part 9 HA 81/99.

APPENDIX 5

Environmental Audit Form

OPW Site Audit Form

Region: _____ **CDS:** _____
Channel (name & code): _____ **Section (chg – chg):** _____
Foreman: _____ **Driver(s):** _____
Auditor: _____ **Date:** _____
Site surveyed from- working bank: ☐ non-working bank: ☐
GPS Reference: _____ **Photographs:** Yes ☐ No ☐
Weather Conditions: _____ **Water levels:** _____
Wetted/Base width: 0-3m ☐ 3-6m ☐ 6-10m ☐ 10-15m ☐ >15m ☐
Velocity Rating: Slow ☐ Moderate ☐ Fast ☐ Torrential ☐
Bed Type: _____ **Machine Number:** _____

OPW SOP AWARENESS / COMPLIANCE

Invasive Species SOP: Poor / Fair / Good / Excellent
 Protected Species SOP's: Poor / Fair / Good / Excellent
 Spill Kit Present: YES / NO

Environmental Drainage Maintenance Constraints

Maintenance Constraints		Working Bank	Non Working Bank
Ownership:	Woodland		
Ownership:	Tillage		
Ownership:	Position of Fencing		
Availability of suitable stone			
Placement of spoil			
Time of year:	Tree cutting		
Time of year:	Wildlife		
Time of year:	Fisheries		
Potential Habitat for Annex II Species	Lamprey		
	Crayfish		
	Otter		
	Pearl mussel		
	Salmon		

Comments on Audit Findings

Maintenance Strategies Achieved - (based on section recently maintained)							
Maintenance Options		Working Bank		Non-working Bank		Instream Channel	
		Suitability	Compliance*	Suitability	Compliance*	Suitability	Compliance*
1	Protect Bank Slopes						
	Non-working bank left intact						
	Protect working bank slope						
2	Restrict Maintenance to Channel						
	Restrict maintenance to open channel						
	Use of SOPs for lamprey and crayfish						
3	Spoil Management						
	Best practice placement of spoil						
	Spread spoil thinly						
	Let water drain from bucket over channel						
4	Selective Vegetation Removal						
	Manage instream vegetation (Attn SOPs)						
	Retain marginal vegetation both sides						
	Potential for weed cutting bucket						
	Outside coarse fish spawning (April 1 st to July 1 st)						
5	Leave Sections Intact						
	Sections skipped						
6	Management of Trees						
	Remove trees blocking flow						
	Observe tree cutting window						
	Remove low hanging branches to known flood level						
	Use chainsaw/secutors for tree removal or thinning						
	Tree thinning management						
	Manage scrub - Otter & Birds SOP						
7	Manage Berms to form 2 Stage Channels						
	Retain berms (no maintenance)						
	Top berm to just over summer water flow						
	Re-sod berms where suitable						
	Only narrow berms if OVER-WIDE						
8	Replace Stone & Boulders						
	Replace stone and gravel coming out in digging bucket (No New Diggings)						
	Replace large stones/boulders into channel from old spoil						
9	Working in Gravel Bed Channels						
	Loosen/toss gravels (between July 1 st & Sept. 30 th)						
	No instream works outside of Fisheries Window (between July 1 st & Sept. 30 th)						
	Use of silt barriers in winter/spring						
10	Re-profile Channel Bed						
	Dig pool - riffle sequences						
	Reprofile cross-section						
	Use existing stone to create 'simple' instream structures						

*based on rating system: 0-10, with 0=no compliance and 10=full compliance

Total Compliance (%)			
OVERALL COMPLIANCE (%)			