

# **Arterial Drainage Maintenance List of Activities 2016-2021**

**Strategic Environmental Assessment Scoping Report**

**May 2016**

**Office of Public Works  
Main Street  
Headford  
Co Galway  
Ireland**



## JBA Project Manager

Tom Sampson  
24 Grove Island  
Corbally  
Limerick  
Ireland

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This report describes work commissioned by Kevin Kennedy, on behalf of the Office of Public Works, by a letter dated 27/01/2016. The OPWs's representative for the contract was Nathy Gilligan. Catalina Herrera, Tom Sampson, Niamh Sweeney, Anne Murray and Declan Egan of JBA Consulting carried out this work.

Prepared by ..... Catalina Herrera BSc MSc  
Environmental Consultant

Reviewed by ..... Thomas Sampson BSc MSc FRGS C.WEM  
MCIWEM  
Chartered Senior Analyst

..... Declan Egan BSc MSc CSci CEnv C.WEM  
Technical Director

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# Contents

<b>1</b>	<b>Introduction .....</b>	<b>1</b>
1.1	Background.....	1
1.2	Legislation and Guidelines .....	1
1.3	The SEA Process .....	2
1.4	Objectives of the SEA.....	2
<b>2</b>	<b>Methodology .....</b>	<b>3</b>
2.1	Strategic Environmental Assessment (SEA) .....	3
<b>3</b>	<b>Programme Description .....</b>	<b>6</b>
3.1	Introduction .....	6
3.2	Arterial Drainage Maintenance .....	6
3.3	Environmental Management and Maintenance Planning .....	9
3.4	OPW Standard Operating Procedures (SOP) .....	10
3.5	Mitigation and Monitoring.....	13
<b>4</b>	<b>Plan and Policy Context.....</b>	<b>15</b>
4.1	Introduction .....	15
4.2	Plan and Policy Context.....	15
<b>5</b>	<b>Baseline Environment .....</b>	<b>17</b>
5.1	Introduction .....	17
5.2	Human Beings .....	17
5.3	Land-Use .....	21
5.4	Soil and Geology .....	25
5.5	Flora, Fauna, Biodiversity .....	26
5.6	Water .....	31
5.7	Cultural Heritage (Architectural and Archaeological Heritage).....	37
5.8	Infrastructure and Material Assets .....	38
5.9	Air and Climate Change.....	40
5.10	Interrelationships .....	44
<b>6</b>	<b>Draft Environmental Objectives and Targets .....</b>	<b>45</b>
6.1	Introduction .....	45
<b>7</b>	<b>Proposed Monitoring Programme .....</b>	<b>54</b>
7.1	Introduction .....	54
7.2	Updating Monitoring Measures.....	54
7.3	Indicators .....	54
7.4	Responsibility.....	55
<b>8</b>	<b>Consultation &amp; Next Steps.....</b>	<b>56</b>
	<b>Appendices.....</b>	<b>I</b>
<b>A</b>	<b>Appendix -Summary the other plans, policies and programmes of relevance to the Arterial Drainage Scheme and Maintenance .....</b>	<b>I</b>

## List of Figures

Figure 2-1. SEA Process .....	4
Figure 5-1. Summary of 2006-2012 Landcover Change (Source: EPA, CORINE Infosheet, 2012) .....	21
Figure 5-2. Surface water ecological status for rivers, lakes, transitional and coastal waters (2010-2012) .....	32
Figure 5-3. Percentage breakdown of the monitored river waterbodies (RWB) within each RBD showing ecological status (2010-2012) .....	34
Figure 5-4. River quality 2010-2012: Biological Pollution Assessment (Source: EPA, 2015). .....	34
Figure 5-5. 2007-2009 WFD (a) Percentage lakes and (b) percentage of lake area surveyed assigned to each category (Source: EPA, 2015) .....	35
Figure 5-6. 2010-2012 WFD (a) Percentage lakes and (b) percentage of lake area surveyed assigned to each category (Source: EPA, 2015) .....	35
Figure 5-7. Ireland's greenhouse gas emissions by sector for 2009 (Source EPA, 2011). 40	
Figure 5-8. Total greenhouse gas emissions and CO2 emissions as Tonnes CO2 per person by Country in 2009 (Source: EPA, 2015) .....	41

## List of Tables

Table 3-1. OPW Schemes carried out under the Arterial Drainage Acts 1945 & 1995 .....	6
Table 4-1. Legislation, policies, and plans/programmes adopted at the European Union, National or Regional level .....	15
Table 5-1. CSO Statistical Release: August 2015 (Source: CSO, 2015) .....	17
Table 5-2. Private households in permanent housing units (number) by province, Type of Private Accommodation and Census Year (2011) (Source: CSO, 2014) .....	18
Table 5-3. Population ages over 15 years and over in the labour force (number) by Province, broad industrial group, and Census year (2011). (Source: CSO, 2014). .....	18
Table 5-4. Summary of existing 2006, revised 2006, and 2012 level 1 land cover statistics (Source: EPA, CORINE Info sheet 2012) .....	21
Table 5-5. Summary of Designated Nature Conservation Sites in Ireland .....	27
Table 5-6. Waters protected for conservation of Irish Fresh Water Pearl Mussel ( <i>Margaritifera Margaritifera</i> ) .....	27
Table 5-7. OPW Channels identified as containing FWPM .....	27
Table 5-8. Designated sites with qualifying interest (White-clawed Crayfish) and presence of OPW drainage work .....	28
Table 5-9. Designated sites with qualifying interest (Lamprey) and presence or absence of OPW drainage work .....	29
Table 5-10. Salmonid Designated Waterbodies with OPW Schemes (Source. OPW, 2011) .....	30
Table 5-11: Summary of WFD water surface water (ecological status) and groundwater (chemical status) 2010-2012 (Source: EPA: 2015) .....	31
Table 5-12. Ecological Status of monitored rivers by RBD. ....	33
Table 5-13. The breakdown of ecological status from the periods of 2007-2009 and 2010-2012 .....	35

Table 5-14. Groundwater chemical status (Source: EPA, 2015).....	36
Table 5-15. Summary of December 2014 status update results with summary of 2011 results for comparison (Source: EPA, 2015).....	36

## Abbreviations

AA.....	Appropriate Assessment
AADT.....	Annual Average Daily Traffic
ACA.....	Architectural Conservation Areas
AFA.....	Area for Further Assessment
ASPC.....	Area of Special Planning Designation
ATC.....	Automatic Traffic Counter
CFRAM.....	Catchment-based Flood Risk Assessment and Management
CFRMP.....	Catchment-based Flood Risk Management Plan
CORINE.....	Coordination of Information on the Environment
CSO.....	Central Statistics Office
DoAHG.....	Department of Art Heritage & the Gaeltacht
DLHG.....	Demense Landscape and Historic Gardens
ED.....	Electoral Division
EIA.....	Environmental Impact Assessment
EIS.....	Environmental Impact Statement
EPA.....	Environmental Protection Agency
EPO.....	Environmental Protection Objectives
EREP.....	Environmental River Enhancement Programme
EU.....	European Union
GIS.....	Geographic Information System (mapping software)
GWB.....	Groundwater Body
HSE.....	Health Service Executive
FRMP.....	Flood Risk Management Plan
FRS.....	Flood Relief Scheme
ICPSS.....	Irish Coastal Strategy Study
LCCC.....	Limerick City and County Council
LCDP.....	Limerick City Development Plan
LRFIP.....	Limerick Regeneration Framework Implementation Plan
IPPC.....	Integrated Pollution and Prevention Control
OSI.....	Ordinance Survey Ireland
OPW.....	Office of Public Works
NIAH.....	National Inventory of Architectural Heritage
NHA.....	Natural Heritage Areas
NIS.....	Natura Impact Statement

NPWS .....	National Parks and Wildlife Service
NRA .....	National Road Authority
NSS.....	National Spatial Strategy
PCD.....	Public Consultation Day
PCU.....	Passenger Car Units
PFRA .....	Preliminary Flood Risk Assessment
pNHA .....	Proposed Natural Heritage Areas
RBD .....	River Basin District
RMBP.....	River Basin Management Plan
RMP .....	Record of Monuments and Places
RPS.....	Record and Protected Structures
SAC.....	Special Area of Conservation
SAG.....	Stakeholder Advisory Group
SEA.....	Strategic Environmental Assessment
SEAI.....	Sustainable Energy Authority of Ireland
SMR .....	Sites and Monuments Record
SPA.....	Special Protection Area
RLO.....	Resident Liaison Officer
WFD.....	Water Framework Directive
WMU .....	Water Management Unit
WWTP.....	Waste Water Treatment Plant

# 1 Introduction

## 1.1 Background

This is the Scoping Report for the Strategic Environmental Assessment (SEA) of the Arterial Drainage Maintenance Activities (2016-2021). Its purpose is to set out the likely significant environmental effects of the Arterial Drainage Maintenance Activities for the period 2016-2021. This report identifies the likely significant environmental impacts of drainage maintenance activities and outlines appropriate mitigation measures to reduce these effects.

The SEA process for the Arterial Drainage Maintenance Activities (2016-2021) is being conducted in compliance with national legislation and guidelines to ensure an environmentally sound assessment. The Office of Public Works (OPW) carried out a screening activity in 2006 which concluded drainage maintenance activities was exempt from SEA requirements. However subsequent consultations with the Environmental Protection Agency (EPA) determined ongoing Arterial Drainage Maintenance Activities within the state could be interpreted as requiring SEA, hence it is prudent to complete the same.

The Scoping Report was conducted and prepared by JBA Consulting Engineers and Scientists Ltd. JBA Consulting Engineers and Scientists Ltd. will be referred to as JBA in this report.

This Scoping Report will go on public display during the consultation process and be issued to statutory consultees and interested stakeholders. Submissions received during this time will be reviewed and any submissions or comments received will be incorporated into the Environmental Report (next stage of the SEA process).

Strategic Environmental Assessment is a systematic process for predicting, evaluating and mitigating, at the earliest appropriate stage, the environmental effects of a national, regional plan or programme before it is adopted. Its purpose and in accordance with the requirements of the Aarhus Convention, is to give the public and other interested stakeholders an opportunity to comment, and to be kept informed of decisions about a strategic programme and how they evolved. It will facilitate the integration of environmental considerations into environmental decision making at an early stage and allow for a sustainable solution.

In subjecting the Arterial Drainage Maintenance Activities (2016-2021) to a SEA, appropriate measures for activities and works can be directed to where they are sustainable and compatible with the environment but still ensuring protection of welfare of humans.

## 1.2 Legislation and Guidelines

The SEA process is a requirement of European law. The EU enacted the Strategic Environmental Assessment (SEA) Directive under Council Directive 201/42/EC on the 'Assessment of the Effects of Certain Plans and Programmes on the Environment'. The purpose of the Directive is to undertake an environmental assessment to assess the likely significant impacts of the plan or programme on the environment before it is adopted. The Directive was transposed into Irish legislation under S.I. No. 435 of 2004 - the European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations, 2004 and S.I. No. 436 of 2004 the Planning and Development (Strategic Environmental Assessment) Regulation. These statutory instrument were amended under S.I. No. 200 of 2011 and S.I. No. 201 of 2011 respectively.

A SEA is required for the Arterial Drainage Maintenance Activities (2016-2021).

A number of Irish and European governmental departments have prepared guidance documents to assist SEA practitioners in interpreting the requirements of the SEA Directive and their associated Regulations. The key guidance documents are:

- Department of Environment, Heritage and Local Government 2004: Implementation of SEA Directive: Assessment of the Effects of Certain Plans and Programmes on the Environment. Guidelines for Regional Authorities and Planning Authorities (224)
- Environmental Protection Agency: SEA Pack (2008)
- Environmental Protection Agency: Consultation Draft of the GISEA Manual (2009).
- European Commission: Guidance on Integrating Climate Change and Biodiversity into Strategic Environmental Assessment (2013).

### 1.3 The SEA Process

In the context of preparing a SEA for the Arterial Drainage Maintenance Activities (2016-2021), the following stages are implemented in the process:

- Screening: to determine the requirement for a SEA for the Arterial Drainage Maintenance Activities (2011-2015) was carried out by the OPW and reviewed by various statutory bodies including the Environmental Protection Agency (EPA). The EPA screened in the SEA for Arterial Drainage Maintenance Activities (2011-2015). This SEA process relates to the next five year cycle of Arterial Drainage Maintenance Activities for 2016-2021.
- Scoping: to liaise with the Statutory Consultees and other interested stakeholders to identify key issues of concern that should be addressed in the Environmental Report
- Assessment and Evaluation: the identification, prediction, evaluation of the impacts of the activities on the environment
- **Consultations:** Consultations with the Statutory Bodies, Stakeholders and the public on the proposed activities
- Revisions and Amendments to the Environmental Report: Based on the comments received, they may influence the programme and consequently the Environmental Report
- Post Adoption: Preparation of the SEA Statement and subsequent monitoring of the maintenance activities during its implementation.

### 1.4 Objectives of the SEA

The objectives of the SEA for the Arterial Drainage Maintenance Activities (2016-2021) are to:

- Determine baseline environmental data
- Identify, predict, and evaluate the impact of the drainage maintenance activities
- Define mitigation measures to alleviate effects
- Allows stakeholders and the public to participate in the development of the Arterial Drainage Maintenance Activities (2016-2021).



## 2 Methodology

### 2.1 Strategic Environmental Assessment (SEA)

Strategic Environmental Assessment (SEA) is now an integral part of the development of any large scale plan, programme or strategy. The legislative requirements for a SEA are discussed in Section 1.2 of this report.

The overall aim 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 into the preparation and adoption of plans and programmes with a view to promoting sustainable development.'*

SEA is a formal, systematic method which is used to consider likely effects of implementing a plan or programme on the environment before a decision is made to adopt it. It also ensures environmental considerations are addressed as early as possible and in balance with technical and economic factors. The process also requires the delivery of multiple objectives and stakeholder inclusion. In summary the proposed Arterial Drainage Programme will be assessed against a number of Environmental Objectives to determine if the Programme supports or conflicts with these objectives. A monitoring programme will be initiated when the Arterial Drainage Programme is adapted by the OPW. This monitoring programme will facilitate early intervention if it is determined that the Programme is impacting on the environment.

By its nature the SEA process identifies the impacts or potential impacts of a Programme on the environment. The SEA that will be prepared by JBA will be environmentally objective led and where conflict is identified JBA will, using the hierarchy of mitigation, suggest mitigation measures. Our environmental monitoring programme for the Programme will be designed to identify, at an early stage, the success or otherwise of the suggested mitigation measures.

The SEA process is a key part of the national Arterial Drainage Maintenance Activities (2016-2021). In 2015 the OPW in discussion with the EPA determined that the SEA process should be applied to the Arterial Drainage Maintenance Activities (2016-2021). The screening statement for the Arterial Drainage Maintenance Activities (2011-2015) concluded that a SEA was required.

#### 2.1.1 SEA Process

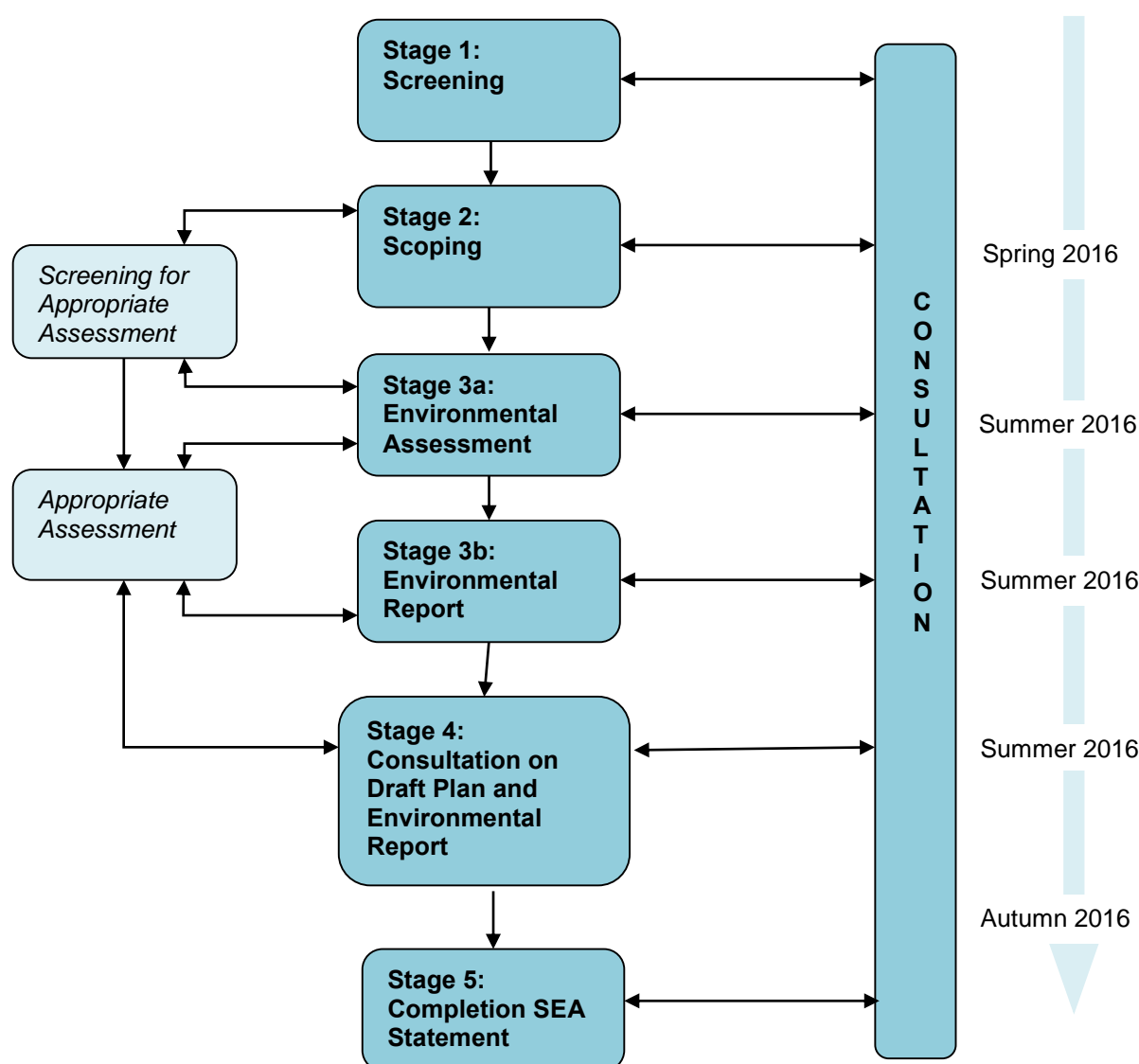
The SEA process comprises the six main stages shown in Figure 2-1, along with an indicative guideline for the Arterial Drainage Maintenance Activities (2016-2021). We are currently at Stage 2 of this process – the scoping stage. The purpose of scoping is to determine the extent and level of detail to be included in the SEA, including the identification of issues that are not relevant to the Arterial Drainage Maintenance Activities (2016-2021) and can therefore be 'scoped out' of further consideration.

The scoping stage defines the baseline environmental conditions (both current and future) against which the effects of the proposed Arterial Drainage Maintenance Activities (2016-2021) can be assessed and also SEA objectives can be developed, along with indicators and targets, for use later in the study.

The third stage of the SEA will involve the environmental assessment of the proposed Arterial Drainage Maintenance Activities (2016-2021) and reasonable alternatives using the SEA environmental objectives. This will inform the choice of preferred alternative, the identification and assessment of likely significant effects of the preferred option(s) requiring mitigation and monitoring. This will be reported during stage 3b which involves production of the SEA Environmental Report.

The last stages of the SEA process will involve finalisation of the Environmental Report and preparation of a post-adoption SEA Statement to outline how environmental considerations and the views of stakeholders and the general public were incorporated into the SEA for the Arterial Drainage Maintenance Activities (2016-2021).

Figure 2-1. SEA Process



This process is consistent with the recommendations of the Environmental Protection Agency (EPA) publication entitled Development of SEA Methodologies for Plans and Programmes in Ireland – Synthesis Report (Scott and Marsden, 2003) and the 2004 SEA Guidelines produced by the DEHLG.

Newly constructed Flood Relief Schemes are outside the scope of the Arterial Drainage Maintenance Activities (2016-2021) and will be recommended through other programmes such as the Catchment Flood Risk Assessment and Management Studies (CFRAMS) programme. New Flood Relief Schemes will carry out a project specific Environmental Impact Assessment (EIA) in accordance with the EIA Directive (EU Directive 85/337/EEC) as required.

### 2.1.2 Consultation

This Scoping Report forms the first step in the consultation process. The consultation meets the requirements of the SEA Regulations and the Aarhus Convention.

Consultation will continue throughout the SEA process to allow the statutory bodies and interested stakeholders an input in the process. The draft Environmental Report (Stage 3b in Figure 2.1 above) will be put on public display along with the draft Arterial Drainage Maintenance List of Activities (2016-2021) to allow for public consultation and comment. Submissions received from the statutory consultees or other stakeholders will be reviewed and amendments made to the draft Environmental Report to reflect same. The final adapted Environmental Report and SEA Statement will demonstrate where and how stakeholders concerns were addressed

### 2.1.3 Appropriate Assessment

As shown in Figure 2-1 above, a further aspect of the SEA and plan development process is to ensure compliance with the provisions of the Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora) and Birds Directive (Council Directive 79/409/EEC on the conservation of wild birds) through the undertaking of an Appropriate Assessment.

The requirements of these directives are transposed into Irish law through the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011).

The Habitats Directive requires that, in relation to European designated sites (i.e. Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) that form the Natura 2000 network), *"any plan or project not directly connected with or necessary to the management of the 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"*.

The initial, screening stage of the Appropriate Assessment is to determine whether; (a) the proposed Arterial Drainage Maintenance Activities (2016-2021) are directly connected with or necessary for the management of the European designated site for nature conservation; and (b) it is likely to have a significant adverse effect on the European designated site, either individually or in combination with other plans or projects. As the proposed works or maintenance activities are not connected with or necessary for the nature conservation management of European designated sites, the screening exercise will focus on assessing the likely significant adverse effects of the proposals on European designated sites. This screening process has already begun, through the collation of baseline information, and will be finalised in a Screening Statement.

For those sites where potential adverse impacts are identified, either alone or in combination with other plans or projects, further assessment is necessary to determine if the proposals will have an adverse impact on the integrity of a European designated site, in view of the sites conservation objectives. This process requires a more in-depth evaluation of the proposals and potential direct and indirect impacts of them on the interest features of the European designated site and where required, mitigation or avoidance measures are suggested. The information from this assessment will be detailed in a Natura Impact Statement (NIS), which will allow the competent authority to conduct an Appropriate Assessment. The competent authority can only agree to the proposals only after having ascertained that it will not adversely affect the integrity of the site concerned. If this cannot be determined then alternative solutions will need to be considered, if none can be found, the plan will only be allowed to progress if imperative reasons of overriding public interest for allowing the plan to have an adverse impact on a European designated site can be demonstrated; it is likely that compensatory measures would be necessary in this situation.

The Appropriate Assessment will be carried out in parallel to the SEA process, the findings used to guide the development of alternative options for the Arterial Drainage Maintenance Activities. The assessment will consider possible impacts on European designated sites that could be affected by recommendations of the plan, including consideration of potential downstream impacts on internationally designated conservation sites. The process consultation will be undertaken with the National Parks and Wildlife Service (NPWS).

## 3 Programme Description

### 3.1 Introduction

There is no statutory requirement under the Arterial Drainage Acts 1945 & 1995, for the production of a 'Plan' or Programme', for Arterial Drainage Maintenance. Following SEA screening and consultation with the Environmental Protection Agency (EPA), it was decided that a SEA for the ongoing Arterial Drainage Maintenance Activities in the state was required.

Where the commissioner of Public Works has completed a drainage scheme under the Arterial Drainage Acts, 1945 and 1995, there is a statutory requirement to maintain the drainage works forming part of the Scheme. These drainage works include watercourses, embankments, and other structures. Watercourses are subject to siltation and erosion, while embankments are subject to settlement and erosion.

An annual programme of maintenance is compiled to maintain the drainage watercourses which are prioritised based on the rate of deterioration and the risk arising. Every year approximately one-fifth of the watercourses are maintained.

The draft Arterial Drainage Maintenance Activities (2016-2021) are included in full in Appendix **Error! Reference source not found.** of this document. The remainder of this section of the scoping report summarises the key points.

#### 3.1.1 Timescale

The 2016-2021 timescale has been adopted to facilitate the coordination with the River Basin Management Plans (RBMP) and Catchment Flood Risk Assessment and Management Studies (CFRAMS). In the water management sector, the Water Framework Directive (WFD) and the Floods Directive set six year cycles. The current WFD programme covers 2016-2021.

### 3.2 Arterial Drainage Maintenance

#### 3.2.1 The Arterial Drainage Schemes

The Office of Public Works (OPW) is the body which exercises the statutory responsibility in respect to river drainage and flood relief works. The scope of the Arterial Drainage Maintenance Activities (2016-2021) covers all of the schemes listed in Table 3-1, which forms the spatial extent of the activities for the SEA.

Table 3-1. OPW Schemes carried out under the Arterial Drainage Acts 1945 & 1995

Scheme	Duration of Works	Areas Benefiting (hectares)
<b>Major Schemes (River Catchments over 100,000 acres in extent)</b>		
Brosna	1948-1955	34883
Glyde & Dee	1950-1957	10643
Feale	1951-1959	10724
Corrib-Clare	1951-1959	10724
Maine	1954-1964	30310
Inny	1959-1963	4694
Deel	1962-1968	20234
Moy	1960-1971	4816
Corrib-Headford	1967-1973	24685
Boyne	1969-1986	48157
Maigue	1973-1986	12343
Corrib-Mask	1979-1986	9712
Boyle	1982-1992	10845
Blackwater (Monaghan)	1984-1992	2367
<b>Minor Schemes (River Catchment 25,000-1000,000 acres)</b>		
Nenagh	1955-1960	2630
Ballyteige/Kilmore	1959-1961	931
Broadmeadow & Ward	1961-1964	2995
Killimor/Cappagh	1962-1968	5099
Bonet	1982-1992	1295
<b>Other Small Schemes (River Catchment less than 25,000 acres)</b>		



Scheme	Duration of Works	Areas Benefiting (hectares)
Clareen	1959-1961	445
Ouvane	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
Deel and Swillyburn	1957-1961	1416
Cloonburn	1967-1968	162
<b>Estuarine Embankment Schemes</b>		
Shannon (Limerick)	1962-1971	4897
Shannon (Clare)	1958-1960	728
Fergus	1959-1960	728
Owenogarney	1955-1959	850
Swilly etc	1961-1968	1295
<b>Flood Relief Scheme</b>		<b>Year Completed</b>
Belclare, Clare River		1995
Gort Town, Co. Galway		1997
Sixmilebridge, Co. Clare		1997
Lacken (Ardraham), Co. Galway		1997
Nanny River, Duleek, Co. Meath		1998
Mulkear River, Newport, Co. Tipperary		1998
Ballymakeogh, Co. Tipperary		1998
Mulkear River, Cappaghmore, Co. Limerick		2000
Bridge End, Co. Donegal		2000
Dromcollogher, Co. Limerick		2000
Bandon River, Dunmanway, Co. Cork		2001
Shinkeen Stream, Hazelhatch, Co. Kildare		2001
Maam Valley, Co. Galway		2001
Morrell River, Maynooth, Co. Kildare		2003
Suir River, Carrick-on-Suir, Co. Tipperary		2003
Nore River, Kilkenny		2006
Leixlip, Co. Kildare		2009
Ennis, Co. Clare		2013
Carlow, Co. Carlow		2013
Johnstown, Co. Meath		2012
Mornington, Co. Meath		2012
Tullamore, Co. Offaly		2013
Clonmel, Co. Tipperary		2014
Fermoy, Co. Cork		2015
Mallow, Co. Cork		2016

### 3.2.2 OPW Roles and Responsibilities

Under Section 37 of the Arterial Drainage Act 1945, the OPW is statutorily obliged to maintain rivers, embankments and urban flood defences on which it has executed works since the 1945 Act. Maintenance referred to under the Arterial Drainage Act 1945 Act includes:

1. 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.
2. The maintenance of river and coastal embankments, in a condition that protects benefitting lands to the extent defined in the Scheme, from risk of flooding.
3. 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 Arterial Drainage Act uses the terms "proper repair and effective condition". The performance criteria relate to the design standard of the original Scheme works, its condition and performance of the various watercourses, embankments, etc.

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

It is important to note, that maintenance activities are necessary because the original drainage works has resulted in unstable catchment sediment regimes, where upstream sediment load has increased as drained land is used for agriculture and increased in-channel sediment deposition through widening and deepening river channels. Over time, the channels will experience increased deposition and nutrient input resulting in deficiency of the overall scheme due to changes in the conditions of the channels and the risk that drained channels will revert to their pre-drainage condition.

### 3.2.3 List of Activities

The National Arterial Drainage Maintenance 2016-2021 activities include:

- Channel Maintenance Activities
- Embankment Maintenance Activities
- Structural Maintenance Activities
- Flood Relief Scheme Maintenance Activities

The OPW is responsible for the maintenance of 11,500 km of channel, 730 km 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 an average channel requiring maintenance every four to six years. Some channels may require annual maintenance and others only require maintenance once every twenty years.

#### Channel Maintenance

Channel Maintenance is required on average every four to six years. Channels with prolific weed growth may require maintenance every year, while channels with self-cleaning characteristics may only need maintenance every 20-years. The activities involve the following:

- Removal of water-entrained silt and associated vegetation from the bed of the channel by hydraulic excavators
- Bank Protection: Re-profiling the bank in-situ or importing protection material such as rock armour or log poles in case of channel breaches due to erosion.
- Bush cutting/branch trimming/tree cutting: Trimming or removal of trees or branches that may be impinging on channel.
- Aquatic Vegetation Cutting: For wide channels weed-cutting boats are used.

When developing a programme, consideration is given to impacts on fisheries and Natura 2000 Sites, through the consultation of an ecological consultant and consultation with Inland Fisheries Ireland and National Parks and Wildlife Services.

#### Embankment Activities 2016-2021

A programme of embankment strengthening was introduced to reverse the damage which resulted from limited monitoring and increased deteriorating conditions of embankments. The programming of works consists of inspections of sections of embankments known to be at high risk. Repair works consist of topping up clay embankments to design height and structural strengthening by importing rock/soil material or utilising in-situ material. The works are carried out by direct labour or contract.

#### Structural Maintenance Activities 2016-2021

Around 18,500 bridges provide farmers with farm vehicular or foot access across Arterial Drainage Scheme Channels. Inspections are carried out to assess necessity of repair or replacement of

structures. Approximately 170 bridges are repaired/replaced annually. Other structures such as gates, barrages, and pumping stations are also maintained or repaired.

### **Flood Relief Scheme Maintenance Activities 2016-2021**

All Flood Relief Schemes have a statutory maintenance requirement. The need for maintenance is identified at a regional level on an annual basis. Activities vary depending on the characterisation of the Scheme, durable structural works may require minimum maintenance, and however other schemes may require continued maintenance. Activities may vary, and include:

- Periodical silt removal
- Riparian vegetation management
- Maintenance of designed channel capacity

### **Programme Exclusion**

The National Arterial Drainage Maintenance Activities 2016-2021 activities does not include maintenance of the following:

- Newly constructed Arterial Drainage Scheme
- Catchment Flood Risk Assessment & Management Studies (CFRAM)
- New Flood Relief Schemes, which entail public exhibition and Ministerial Approval.
- Drainage Districts that are the responsibility of Local Authorities

## **3.3 Environmental Management and Maintenance Planning**

All maintenance operations are carried out in accordance with OPWs Environmental Management Protocols and Standard Operating Procedures (SOP).

The maintenance function of the OPW is divided into three regions for the purpose of programming and executing the work. The East Region main office is in Newtown, Trim, Co. Meath with four sub-offices in Ardee, Monaghan, Mullingar and Wexford. The South West region main office is in Templemungret, Co. Limerick with two sub-offices in Listowel and Portumna. The West region main office is in Headford, Co. Galway with two sub-offices in Ballina and Lifford.

Every year, each Arterial Drainage Maintenance Region produces a draft Annual Drainage Maintenance Programme for the upcoming year. The proposed works are indicated for each channel under the headings A-F:

- A-Silt and vegetation management
- B-Aquatic Vegetation Cutting
- C-Bank Protection
- D-Bush Cutting Branch Trimming
- E- Tree Cutting
- F- Bridge/ Structure Repairs

The OPW Environmental Section reviews the draft programme for the upcoming years including timing, season, month, and duration of the works.

The frequency of maintenance is usually driven by a 5 year cycle or specific landowner requests. Prior to maintenance activity, the site foreman and machine operators walk the reach to be maintained and review health and safety aspects and the 10 point Environmental Drainage Maintenance (EDM) Guidelines (see below, Section 3.4). The operators and foremen are provided with maps and details of the information in the OPWs drainage maintenance species and habitats layers. It is the decision of the driver how to undertake the maintenance using established maintenance access corridors or whether further access to the watercourse or embankments are required.

## **Communication with stakeholders**

The draft Regional Arterial Drainage Maintenance Programmes are forwarded to the Inland Fisheries Ireland (IFI) Environmental River Enhancement Programme (EREP) project manager who reviews the programme for appropriate sites and study locations for EREP projects.

The Arterial Drainage Maintenance Region forwards the relevant sections of its final Annual Drainage Maintenance Programme for the upcoming year with a copy of appropriate scheme maps, to the National Parks and Wildlife Services (NPWS) Regional Managers and the IFI Directors.

The Arterial Drainage Maintenance Regions offer the opportunity for a meeting with stakeholders to discuss the Annual Drainage Maintenance Programme.

## **Environmental River Enhancement Programme (EREP)**

Sites identified for river enhancement projects will be subject to hydromorphological surveys to ensure the enhancements are technically feasible, along with other screening processes (i.e. Water Framework Directive Programme of Measures under the requirements for morphology). Some sites will be prioritised on the basis of best return for investment. In all cases, Inland Fisheries Ireland (IFI) is the statutory authority to give design guidance to the OPW. Angling Clubs or other sectoral funding source can liaise with IFI authorities in respect to the design and environmental monitoring requirements.

As part of EREP projects, team members are required to carry out walkover surveys as an opportunity to discuss in detail on site the potential options for river enhancement. In attendance are members of IFI and OPW, as well as, a NPWS ranger.

## **Appropriate Assessments**

All Arterial Drainage Schemes are subject Appropriate Assessment of the five year drainage maintenance programme. The OPW issues relevant completed assessments directly to the NPWS District Conservation officer and issue all assessments to the Development Applications Unit (DAU), Department of Arts, Heritage and the Gaeltacht.

Management staff are responsible for implementing all prescribed mitigating measures and ensuring that operational staff are made aware of all relevant site specific mitigating measures.

## **National Recording Process**

Record Cards are used by the operators and management staff to record information on the presence of Lamprey, Crayfish, Kingfishes, Mussels, Otter, and other site specific environmental information. When recorded these cards are sent to the Environmental Section of the OPW. All of the information is recorded into national database. Each drainage office is responsible to fill out the Weekly Record Cards. Once input is reviewed and approved, the database are accessible to all offices. Any additional information in relation to a particular species such as mitigating agreements for a particular channel, or individual observations (i.e. protected species present) will be included in the database.

## **3.4 OPW Standard Operating Procedures (SOP)**

There are a total of seven SOPs that are applied during the operational works (See Appendix **Error! Reference source not found.**).

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

## **Environmental Drainage Maintenance (EDM) Guidelines**



Operational crews are audited annually for implementation of the EDM guidelines and environmental operating procedures (SOPs). The 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.

The OPW and IFI, summarised the Environmental Strategies for Channel Maintenance into the following 10 steps:

1. Protecting bank slope
2. Confining works to channel centre
3. Spoil Management
4. Vegetation Management
5. Skipping sections
6. Tree Management
7. Berm Management
8. Replacing stone and boulders back in the channel
9. Gravel bed channels
10. New excavations in the channel

There are also additional mitigation measures recommended for different stages of maintenance works. These include skipping sections of the channel in order to retain intact habitat, avoidance of secondary disturbance downstream, proposal of longer periods between maintenance, timing maintenance to accommodate spawning or breeding seasons, among others.

### **Salmonids**

Maintenance of the channel must be in accordance with Salmon and Trout Spawning Season. The location of the works must accommodate spawning areas. Activities on spawning beds are carried out from July to September. Prior to works, the local IFI must be consulted. River enhancement works to improve fisheries and broader ecology are covered under the EREP programme.

### **Lamprey**

The presence of Lamprey must be checked before any in-channel work takes place. If Lamprey are encountered, several members of staff should be notified (Foreman, Engineer) and the location and abundance of Lamprey should be noted in a Weekly Record Card. In order to reduce potential impacts three approaches are suggested such as skip a defined stretch of channel, confine maintenance to 2/3 of the channel in order to retain marginal vegetation and silt intact, and maximise the use of weed cutting buckets.

### **Crayfish**

The presence of Crayfish must be checked before any in-channel work takes place. If Crayfish are encountered, several members of staff should be notified (Foreman, Engineer) and the location and abundance of Crayfish should be noted in a Weekly Record Card. In order to reduce potential impacts, three approaches are suggested: skip a defined stretch of channel, confine maintenance to 2/3 of the channel in order to retain marginal vegetation and silt intact, and maximise the use of weed cutting buckets.

### **Otter**

Otters are widespread across all sizes of drainage channels nationally. Operational staff should walkover the site one week before the maintenance commences. Dense areas with access directly to water should be noted and avoided where feasible. If there are any recognisable signs of otter presence observed such as spraints, footprints, or suspected Holts. If any features have been found, no maintenance activities should take place within 30m or 150m if a breeding holt is found.

### **Freshwater Pearl Mussel (FWPM)**

According to NPWS, there are 91 known FWPM populations in Ireland, nine of which are OPW channels (See Section 5.5 Flora, Fauna, and biodiversity). There are no in-stream works allowed in an area recognised as a FWPM habitat, typically only non in-stream works adjacent to the channel are acceptable. Simple activities require special precaution in order to minimise channel bed disturbance. There is a need for silt management procedures for works upstream of the FWPM habitat.

## **Kingfisher**

In areas known to hold populations of Kingfishers, the mitigation measures include avoiding nesting areas, and visual sighting of kingfisher must be recorded on Weekly Report Cards. All sightings must be recorded on the Record Database in accordance with the National Recording Process.

## **Birds**

The removal of any abnormally dense layer of vegetation is to be executed between September and February to minimise impacts on nesting birds. If the channel is located within a Natura 2000 site containing valuable over-wintering bird populations, consultation with the NPWS must be undertaken to determine the timing and phasing of the works to limit disturbance.

## **Bats**

In the case that the removal of a large tree is necessary for the maintenance works in an area known to have bats, it is essential to contract a bat specialist to carry out a survey before the works, in order to avoid disturbance.

## **Invasive Species**

Multiple invasive species are spread nationally and it can be assumed that one or more of these are present on any work sites. The most common species of invasive plants include Japanese Knotweed, Giant Hogweed, and Himalayan Balsam. The OPW does not have any direct responsibility for the management of invasive species. However, in order to ensure OPW operations are not a vector for these invasive, measures are required to reduce the risk of spreading. The OPW SOPs for invasive species are found in Appendix X- Invasive Species SOP Arterial Drainage Maintenance.

Zebra Mussels are present in the River Shannon, Grand Canal, L Derg, L.Ree, L Garra, L. Derravaragh, L.Sheelin, and L.Corrib. Due to the quick spread of the species, any proposed work close to a river or lake that has potential to contain Zebra Mussels must be flagged and staff should pay special attention to cleaning procedures for all equipment, prior to removal from site.

There are other proposed activities which fall outside of the SOPs, which include:

- Wetlands - Bogs, Fenlands and Turloughs
- Tree Management
- Maintenance Access Corridor

## **Wetlands - Bogs, Fenlands and Turloghs**

All channels located within an SAC must be checked against the list of channels that impinge on Raised Bog, Fen habitat, Turlough and have regard to any NPWS agreements. In the case where impact is likely, conduct necessary site visit in consultation with NPWS to determine mitigation measures, such as: skipping channel in questions, while recognising the flood risk management requirements, maximising use of weed bucket, and inspection by OPW line management to determine the likelihood of over-digging the channel below the original design datum.

## **Tree Management**

Site with dense tree cover may require maintenance for conveyance or fisheries purposes. Removal of dense layers or vegetation can only be executed between September and February, to minimise disturbance on nesting birds. IFI requests to reduce "tunnelling" on drainage channels. In order to facilitate the request, OPW management staff and IFI officer carry out a site visit, where they propose a selective approach to tree removal, which maintains a dappling of shade along the channel.

## **Maintenance Access Corridors (MAC)**

The OPW is statutory required to maintain all Arterial Drainage Schemes in `proper repair and effective condition` to reduce to flood risk. The Maintenance Access Corridor (MAC) to allow for drainage maintenance operations is provided along each channel on both riverbanks. However, the MAC to allow for drainage maintenance is generally only maintained from one side of the channel and this allows for periodic access to the channel for maintenance.

## 3.5 Mitigation and Monitoring

### 3.5.1 Environmental Management System

All of the maintenance works carried out as part of this programme are done with OPWs Environmental Management Protocols and SOPs. There are various approaches taken by the OPW to promote environmental management such as the introduction of EREP and the provision of ongoing environmental training to staff. The most recent formal environmental training took place in 2010 and focused on the most recent environmental practices. In addition, in 2008, the operational staff received a training course in Otter Awareness.

Geographic Information Systems (GIS) tools are significant tool to manage both existing and future environmental data, which allows for a rapid and accurate transfer of geographical environmental information.

The Arterial Drainage Programme is screened for potential impacts on Natura 2000 sites, if channels are identified as having the potential to impacts a Natura 2000 site are subject to Appropriate Assessment under Article 6(3) of the Habitats Directive. A national framework has been set up where Arterial Drainage Maintenance activities undergo an Appropriate Assessment for a 5-year period. Each scheme undergoes an AA and all prescribed mitigation measures are disclosed in programme plan.

The ecological consultant carries out walkover surveys for pre and post maintenance works for a representative number of sites. The completed assessment will be issued to NPWS and the Department of Arts, Heritage, and the Gaeltacht.

An Ecological Impact Assessment (EclA) is needed if the works are not within the Natural 2000 site but if they still have influence over the broader protected habitat.

### 3.5.2 Monitoring Programme

The monitoring of Arterial Drainage Maintenance Activities is made-up of two components:

- On-site implementation of OPWs Environmental Management Protocols and Standard Operating Procedures.
- Scientific monitoring programme carried out under EREP, assessing impacts of routine maintenance and capital enhancement projects on the river corridor biodiversity.

The OPW in coordination with Inland Fisheries Ireland (IFI) has an ongoing research programme to assess the impacts of Arterial Drainage Maintenance Activities and the Environmental River Enhancement Programme (EREP) on the river corridor biodiversity and hydromorphology. In addition, a Series of Ecological Assessments (EclA) on Arterial Drainage Maintenance has been published of the effects of drainage maintenance activities on various ecological receptors including otter, Atlantic salmon, raised bogs, etc.

### 3.5.3 Auditing

Auditing (both internal and external) is carried out in compliance with Environmental Management Protocols and SOPs. These audits are carried out by IFI, as part of EREP, to assess the extent by which the Environmental Drainage Maintenance (EDM) Guidance Notes are followed. These external audits cover approximately one-third of the OPW drainage machine crew annually. A rating system was developed by the OPW and monitored by IFI and OPW to identify any particular issues, with particular machine crews.

All audit results are forwarded to the relevant engineer for that drainage scheme within two working weeks. In the event of an audit showing non-compliance with EDM guidelines and SOPs, the relevant engineer is notified within one working day.

### 3.5.4 Scientific monitoring

The EREP biological monitoring programme assesses the impacts of routine maintenance and capital enhancement projects on the ecology of the river corridor. Flora and fauna (fish, birds, macro-invertebrates, lamprey, and crayfish) are monitored across various sites. The physical changes of the channels are also monitored. The monitoring programme is reviewed periodically and altered as required.

### 3.5.5 Physical monitoring

Physical monitoring includes pre and post works monitoring of a number of variables such as bank-full width, wetted perimeter width, channel length, depth, velocity, and canopy cover.

EREK has included monitoring of hydromorphological conditions in its programme. The River Hydromorphology Assessment Technique (RHAT) monitoring system has been approved as the appropriate method to determine hydromorphological status. Other monitoring activities include:

- Floral monitoring: Aquatic (in-channel), marginal vegetation, and riparian vegetation. A walkover survey comprised of a species inventory, as well as, tree survey.
- Macro-invertebrate monitoring: Sampling is carried out at both experimental and control sites, where species inventories are compiled.
- Fish sampling: The primary focus of EREK fish stock survey is salmon and sea trout, however, data from all species encountered during survey are recorded.
- Bird population studies: Key objective of bird surveys are to record abundance, species richness, and distribution of bird species in OPW channels and assess the impact of drainage on bird species.
- Lamprey and fish studies: OPW funded studies carried out by Central Fisheries Board to examine effects of Arterial Drainage Maintenance Activities on lamprey and white-clawed cray fish. Ecological Impact Assessment (EclA) were carried out for both species which recommended further studies. The surveys include monitoring population size and age structure, prior to and in a series of years post maintenance.



## 4 Plan and Policy Context

### 4.1 Introduction

In addition to gathering data on the existing environmental baseline of the Republic of Ireland, a key part of the SEA process is to determine the plan and policy context in which the Arterial Drainage Maintenance Activities (2016-2021) will be implemented. The Arterial Drainage Maintenance Activities (2016-2021) will influence, and will in turn be influenced by, a number of external statutory and non-statutory plans, strategies and policies and ongoing studies. The interaction of the environmental protection objectives within these documents, with the proposals of the Arterial Drainage Maintenance Activities (2016-2021), must therefore be considered. It is necessary to consider these interactions at all levels of the plan and policy-making hierarchy; European, National, Regional and Local.

This chapter, and supporting Appendix A, provides an overview of the plans, policies and programmes influencing the Arterial Drainage Maintenance Activities (2016-2021). Any identified actions from this study will also need to comply with relevant international and national legislation such as the Water Framework Directive and the Habitats and Birds Directives; these requirements will be expressed in the environmental objectives developed (See Chapter 6).

### 4.2 Plan and Policy Context

As part of the SEA process, the relationship of the Drainage Maintenance operations with regard to other plans and programmes have been considered and reviewed for this study. Table 4-1 displays the legislation, policies, and plans/programmes adopted at the European Union (EU), National or Regional level, which could influence the Arterial Drainage Maintenance Activities (2016-2021), further details are provided in Appendix A.

Spatial plans are a key plan type for consideration during the process as an understanding of the potential future land-use changes, over the short to medium term, will be based on published statutory and non-statutory spatial planning documents. An understanding of this is also important to enable future revisions of these plans to positively address issues identified in the Arterial Drainage and Maintenance Activities (2016-2021), which provides opportunity to inform future development proposals.

Table 4-1. Legislation, policies, and plans/programmes adopted at the European Union, National or Regional level

Level	Plans, Policies and Programmes Reviewed
<b>International</b>	EU Drinking Water Directives
	EU Common Agricultural Policy
	EU Strategic Environmental Assessment (SEA)
	Bathing Water Directive (2006/7/EC)
	EU Bird Directive (2009/147/EC)
	EU Biodiversity Action Plan – Halting the loss of Biodiversity by 2010.
	The Habitats Directive (Council Directive 92/43/EEC)
	EU Water Framework Directive
	The Clean Air for Europe (CAFE) Directive
	The Fourth Daughter Directive (2004/107/EC)
<b>National</b>	Arterial Drainage Act 1945
	National Development Plan 2007 – 2013: Transforming Ireland
	National Spatial Strategy (NSS) 2002 – 2020
	A Framework for Sustainable Development for Ireland (Public Consultation Draft, 2011)
	Actions for Biodiversity 2011-2016. Ireland's 2nd National Biodiversity Plan
	National Species Action Plans (SAPs) (for relevant species)
	National Report for Ireland on Eel Stock Recovery Plan (2008)
	National Heritage Plan (2002)
	Conserving Ireland's Maritime Heritage, 2006
	OPW Arterial Drainage Maintenance & High Risk Channel Designation: Draft Programme 2011 – 2015
	OPW Minor Flood Mitigation Works Programme
	Second Nitrates Action Programme 2010-2013
	Ireland Rural Development Programme 2007-2013

Level	Plans, Policies and Programmes Reviewed
	Rural Environmental Protection Scheme (REPS)
	Ireland National Climate Change Strategy 2007 - 2012
	Code of Best Forest Practice
	Tourism Product Development Strategy, 2007 – 2013
	GRID25: A Strategy for the Development of Ireland's Electricity Grid for a Sustainable and Competitive Future
	National Renewable Energy Action Plan to 2020
	Strategy for Renewable Energy: 2012 – 2020
	Food Harvest 2020: A vision for Irish Agri-food and fisheries
	SI No. .46 [No. 2.] [2012.]Water Services (Amendment) Act 2012
	Waste Water Discharge (Authorisation) Regulations, 2007 (S.I. No. 684 of 2007)
	Draft National Peatland Strategy
	The National Monument Acts 1930-2004
	Architectural Heritage (National Heritage) and Historic Monuments (Miscellaneous Provisions) Act 1999
	The Planning and Development Acts (2000-2014)
	National Emissions Ceiling (NEC) Directive 2010
	<i>Delivering a Sustainable Energy Future for Ireland</i>
	The National Bioenergy Action Plan
	The National Energy Efficiency Action Plan
	Smarter Travel - A Sustainable Transport Future.
<b>Regional</b>	Draft Regional Planning Guidelines for the West Region 2010 – 2022
	The Border Regional Authority: Draft Regional Planning Guidelines (2010-2022)
	Mid-West Regional Planning Guidelines 2010 – 2022
	River Basin Management Plans
	Groundwater Protection Schemes
	Environmental River Enhancement Programme
<b>Local</b>	County Development Plans
	Local Area Plans
	County Biodiversity Action Plans
	Freshwater Pearl Mussel Sub-basin Management Plans
	Shellfish Water Action Programmes
	County Heritage Plans
	County Wind and Renewable Energy Strategies
	Sub-regional study for Galway Transportation and Planning (2002)
	Coillte District Strategic Plans
	Town Development Plans
	Water Based Tourism – A strategic Vision for Galway (2002)

#### 4.2.1 Related Studies

A number of other studies are currently ongoing have the potential to influence and be influenced by the Arterial Drainage Maintenance Activities (2016-2021). These are detailed below:

- Catchment based Flood Risk Assessment and Management (CFRAM) Studies
- Inland Fisheries Ireland (IFI's) ongoing studies
- Environmental River Enhancement Programmes (EREPs)
- River Basin Management t Plans (RBMP)
- Food Harvest 2020-A Vision for Irish Agri-Food and Fisheries

## 5 Baseline Environment

### 5.1 Introduction

The following section outlines the environmental baseline, in line with the SEA Directive. The purpose of this part of the Scoping Report is to identify the current environmental quality baseline for a number of environmental aspects. Based on baseline data and predicted trends, either positive or negative, JBA has established a number of measureable Environmental Objectives against which the maintenance activities can be assessed. We have developed suitable indicators to measure the trends in the Environmental Objectives in the future. The purpose of the indicators is that they are measureable and trends can be identified easily. The current trends of each receptor and interactions with the Arterial Drainage Maintenance Activities (2016-2021) is discussed.

### 5.2 Human Beings

The Republic of Ireland population estimate, based on the CSO statistical release on August 2015, is 4,635,400. The general trends witnessed between the 2006 and 2011 Irish census were (Table 5-1):

- Decrease in immigration and increase in emigration,
- Slight increment in the rate of natural increase (the subtraction of crude birth rate and crude death rate),
- Overall population growth from 4.2 million (2006) to 4.5 million (2011).

The 2014 and 2015 (CSO year ending estimates) show a less significant variation in population change with (Table 5-1):

- Increase in immigration
- Slight decrease in emigration and natural increase

Statistics show that since 2011, the overall population has increased approximately 1-2% annually (Table 5-1; CSO, 2012).

Table 5-1. CSO Statistical Release: August 2015 (Source: CSO, 2015)

	Census		Year Ending	
	2006	2011	April 2014	April 2015
Immigration	107,800	53,300	60,600	69,300
Emigration	36,000	80,600	81,900	80,900
<b>Net Migration</b>	71,800	-27,300	-21,400	-11,600
Of which Irish Nationals			-29,200	-23,200
<b>Natural Increase</b>	34,200	47,500	37,900	37,400
<b>Population Change</b>	106,000	20,100	16,500	25,800
<b>Population</b>	<b>4,239,848</b>	<b>4,588,252</b>	<b>4,609,600</b>	<b>4,635,400</b>

### Housing

In comparison with the rest of Europe, the population of Ireland continues to be relatively sparse, with approximately 60 persons per square kilometre as opposed to the EU's average of 116 persons per square kilometre (Eurostat, 2011). In more recent years, the Irish population has become more urbanised, especially around major cities.

The number of private households in permanent housing units in 2011 are displayed in Table 5-2 and account for 1.6 million and accommodate approximately 4.5 million people. Rural areas would likely have more detached houses, as opposed to towns or cities which would have a mixture of housing units (semi-detached houses, terraced houses, flats, etc).

Table 5-2. Private households in permanent housing units (number) by province, Type of Private Accommodation and Census Year (2011) (Source: CSO, 2014)

House Type	Private households	All Persons in private household
Detached house	699,869	2,080,563
Semi-detached house	456,651	1,289,109
Terraced house	281,825	709,956
Flat in purpose built block	149,921	295,153
Flat in house or building	27,781	47,197
Bed Sit	5,695	8,005
Caravan/Mobile/ Temp	4,800	9,840
N/A	27,781	70,585
<b>Total</b>	<b>1,654,208</b>	<b>4,510,409</b>

The Arterial Drainage Maintenance Activities (2016-2021) aims to contribute to viable and sustainable communities through its contribution to flood risk management and land drainage. The activities related to embankments and flood relief schemes are intended to preserve or maintain the level of flood risk to existing property, land and material assets. For arterial drainage channels the maintenance activities preserve the Arterial Drainage Scheme drainage function to enable productive land use. Maintenance of structures ensures continued access to land and road networks. Arterial Drainage Scheme channels, in general, do not provide any significant flood protection and so maintenance to the channels has no direct influence on flood risk, however may impact upon the flood response elsewhere in the catchment.

New developments and housing units should not be developed in floodplains or areas of high flood risk, especially if located in low-lying zones. The Irish Government recognises the threat of climate change and Local Authorities are required to implement measures, particularly in Development Plans and Strategic Development Policies, to adapt to climate change. Current Development plans contain a number of policies and objectives dealing with climate change. Current housing shortages will create pressure for rapid development and precautions (i.e. flood risk assessments) should be taken.

## Workforce

Employment and industry in Ireland is constantly changing due to economic variations. The broad industry groups in the labour force in the 2006 and 2011 census are listed below (Table 5-3). The major industry groups based on census year are health and social work; education; wholesale and retail trade; and real estate, renting, and business activities. An industry that evidently has not recovered from the recession is construction, whose numbers remain less than half of those in 2006. The Arterial Drainage Maintenance Activities (2016-2021) could contribute to local and rural employment by helping maintain access to local services and transport networks as well as maintain the productivity of agriculture and forestry land and in placed also protect these from flooding. Programmes that work in conjunction with the Arterial Drainage Maintenance Activities (2016-2021) such as EREP (Environmental River Enhancement Program) aim to help improve channel conditions to enhance fisheries, benefiting the tourist and recreation sectors.

Table 5-3. Population ages over 15 years and over in the labour force (number) by Province, broad industrial group, and Census year (2011). (Source: CSO, 2014).

Employment	2006	2011
Agriculture, forestry and fishing	89,277	<b>94,247</b>
Mining, quarrying and turf production	7,751	5,674
Manufacturing industries	243,182	<b>193,080</b>
Electricity, gas and water supply	11,290	13,116
Construction	215,184	90,357
Wholesale and retail trade	257,309	<b>265,751</b>
Hotels and restaurants	100,731	<b>103,560</b>
Transport, storage and communications	105,705	97,569
Banking and financial services	85,413	93,151
Real estate, renting and business activities	180,973	<b>184,251</b>
Public administration and defence	101,264	113,521
Education	127,476	<b>163,728</b>
Health and Social Work	191,219	<b>203,379</b>



Employment	2006	2011
Other community, social and personal service activities	80,358	84,665
Industry not stated	132,910	101,311
<b>Total at work</b>	<b>1,930,042</b>	<b>1,807,360</b>
Unemployed - looking for first regular job	29,372	34,166
Unemployed - having lost or given up previous job	150,084	390,677
Total in labour force	2,109,498	2,232,203

## Flooding

Water is a resource but it can also act as a threat to human beings in the form of flooding which results in extensive environmental, economic and social problems. Ireland has experienced periods of extreme weather conditions in the past years that have resulted in coastal, fluvial, and pluvial flooding around the country, affecting buildings, residences, and causing extensive economic damages. The EU introduced the Flood Directive [2007/60/EC] that addressed management of flood risk and required member states to carry out Preliminary Flood Risk Assessments (PFRA), flood maps, and flood risk management plans. It was transposed into Irish law as SI 122 of 2010. The OPW and other bodies were given the responsibility of implementing the Directive through various programmes. As a result, the national Catchment Flood Risk Assessment and Management (CFRAM) programme started in 2011 in Ireland, made up of three phases: Preliminary Flood Risk Assessments (PFRAs), Catchment Flood Risk Assessment and Management (CFRAM) studies, and implementation and review. Since flooding has a moderate to severe effect on human beings, prevention measures and appropriate management plans are necessary and should continue to be implemented in local, regions, or county development plans.

Arterial Drainage Maintenance Activities (2016-2021) aim to maintain the channels that were introduced in catchment areas for the purpose of preventing or substantially reducing the periodical flooding of lands or improving by drainage lands (OPW, 2009). There have been substantial social and economic benefits from the drainage of marginal land. Property, roads, and annual floods have been mitigated in areas where the Arterial Drainage Programme has been implemented. These channels need continuous monitoring over time due to changes in flow rates, sediment loading or accumulation, which could potential increase flood risk. Arterial Drainage Maintenance Activities (2016-2021) involve the removal of build-up of foreign or natural material that impedes the free flow of water such as the removal of water-entrained silt and associated vegetation, or repairing channel breaches from erosion (OPW, 2009). These activities prevent the channel from deteriorating in the long-term and potentially increasing the risk of flooding. It should be noted that the design standard of flood alleviation schemes is usually the 1% AEP (Annual Exceedence Probability) in comparison to the 2% or 5% AEP level of protection provided by Arterial Drainage Schemes.

## Landscape

Ireland is a popular tourist destination due to its beautiful landscape and views. Several policies, plans and strategies have been introduced in order to ensure that these views are recognised and protected. The Planning and Development Act 2000 contains provisions that relate to the preservation and conservation of the landscape. Sections 10, 202, and 204 of the Act, which give local authorities the discretion to include objectives on the conservation of landscapes in Development Plans or the power to designate areas for protection. Other plans in place that recognise the importance of Irish landscapes are: the National Landscape Strategy for Ireland 2015-2025, National Spatial Strategy (NSS) and National Guidelines. Many scenic views and routes in rural and urban landscapes around Ireland have been acknowledged in Development Plans. The Arterial Drainage Maintenance Activities (2016-2021) protect where possible and enhance the landscape character and visual amenity within the river corridor.

## Amenity/Tourism/Recreation

The Tourism Trends report (CSO, 2008) assessed the international and domestic tourist patterns of visitors to the Republic of Ireland. According to the assessment, in bound tourism traveling to the Republic of Ireland increased by 19% to 7,839,000 between 2004 and 2008, with an average length of stay of 8 days (CSO, 2008). The majority of visitors come from the EU, closely followed by the US and Canada. Dublin continues to be the most popular destination by international tourists, followed by the South West Region. Domestic tourism in Ireland is most commonly to the southern or eastern regions of the country. One-third of the trips are for family/friend visits and the rest are holidays or special occasions (CSO, 2008).

Rivers, lakes, and coastal areas are key components to tourism and recreation supporting activities such as bathing, sailing, recreational boating, bird watching, nature walks, and kayaking/canoeing. There are 135 designated bathing areas in Ireland with majority of the achieving a high quality of water and meeting the required EU standards. The revised Bathing Water Directive (2006/7/EC) prioritises human health, proactive management of water quality, and increased public participation. Inland recreational activities consist of golf, horse racing, hurling and Gaelic football, which are spread out throughout the country and have their own facilities throughout.

Arterial Drainage Maintenance Activities (2016-2021) aim to protect existing waterside access for recreational and community facilities.

### 5.2.1 Future Trends

The general trend in terms of population growth and distributions in Ireland continues to be a slight annual increase in population and a movement towards larger towns and cities. Immigration numbers continue to increase and emigration numbers are slowly declining, as the Irish economy is improving. The growth of population will create a pressure in urban fringes and rural areas. A rise in housing and infrastructure development will be needed to accommodate the population numbers and movement. This includes water infrastructure and the associated demand for abstraction and discharges of waste water. The growing population will also require a demand for amenity and recreation areas. Waterbodies are likely to be areas of potential opportunity for informal and formal development. It is crucial to consider risk of flooding in future housing of recreational developments.

Domestic and international tourism will continue and there will be a potential for more development and promotion of outdoor, adventure, and cultural destinations. Tourism points in rural areas can be beneficial socially and economically, as well as, they will require access road improvement and potentially more development.

Agriculture plays a significant part in Ireland's economy and the adaptation of the Harvest 2020 has strengthened Ireland's vision of producing more 'green' food and dairy products. Harvest 2020 has placed ambitious targets on food exports over the coming years and all agricultural land is now premium for food production. The OPW's Arterial Programme will help to ensure that flooding on agricultural land is minimised.

At the moment, Arterial Drainage Schemes benefit rural populations as it allows landowners to install field drainage, which reduces waterlogging of land and enables it to carry more livestock or produce higher crop yields. If the shift from rural to urban continues, it may be worth considering a shift of maintenance regime to more urban areas, however, this could conflict with agricultural productivity goals. Maintaining a close look at population dynamics will be essential for planning future Arterial Maintenance Activities.

### 5.2.2 Key Environmental Issues

In accordance with the SEA Regulations [S.I. 435 of 2004], considerations have been given to whether the environmental effects, both positive and negative, of the Arterial Drainage Maintenance Activities (2016-2021) are likely to be significant on each receptor. The following are key environmental issues to consider:

Some flood risk alleviation for residences in close proximity to channels as a result of drainage and maintenance.

Arterial Drainage cannot eliminate the risk of flooding. Most of the schemes carried out by the OPW aimed to reduce flooding of agricultural fields from the main channel on average at a 'three-year return' flood period. Therefore, flood risk from climate change and changes in land management practices (new developments in flood sensitive area) may not be mitigated through Arterial Drainage Maintenance Activities on channels.

It is important to consider the areas where the works are being carried out and its susceptibility to flooding. Consider residences/housing locations both upstream and downstream of the works. It is necessary to ensure that the works will not increase the risk of flooding (i.e. complete removal of treeline, increases erosion and in turn rate at which runoff and sediment can discharge to watercourses) by impacting the flows or removing areas of water accumulation/storage. The

consideration for areas both upstream and downstream of the potential works is crucial. It is also important to recognise the benefit of drainage and its impact in flood risk management.

Recreational use of water related tourism (fishing, bathing, navigation).

Reliance on tourism and recreation on natural, cultural, and heritage resources including landscape, rivers, Loughs, and coasts. Increased or improved recreation fishing as a results of better water quality.

### 5.3 Land-Use

The Irish Landscape has been shaped by hundreds of years of human intervention and land-use change. The overall area of artificial surfaces remains low in comparison with the rest of Europe and agriculture continues to be the dominant land use in Ireland.

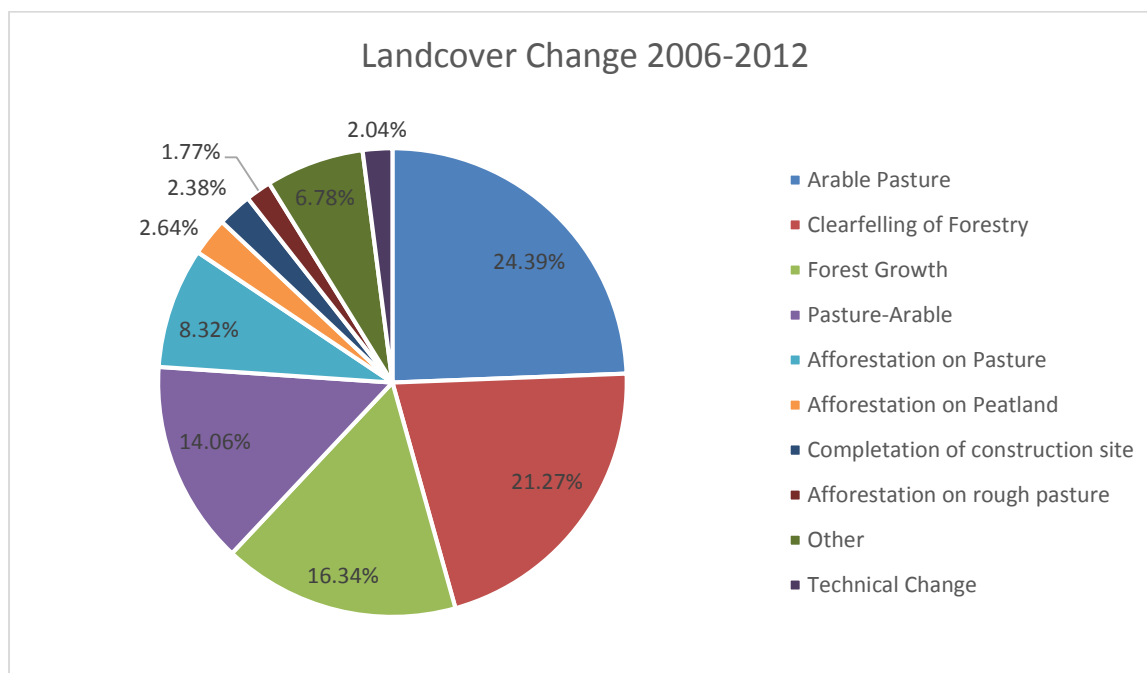
Land use and land cover (LULC) describe the form and function of the natural land surface. Land cover is the physical description of the land and land use describes the terrestrial use from a human perspective based on socio-economic usage (EPA, 2012). In Ireland, the main source of LULC is the EPA and EEA CORINE (Co-Ordinated Information on the Environment) land cover data series, which have delivered maps in 1990, 2000, 2006, and 2014. Table 5-4 Summarises the percentage of land use cover and Figure 5-1 summarises land cover change in 2006 and 2011.

The main land cover type in Ireland is agriculture which accounts for two-thirds of the national landmass (CORINE, 2012). The majority of the agricultural land is permanent grassland pasture, followed by peatlands and wetlands, which cover one-fifth of the country, while forestry covers one-tenth of the country (CORINE, 2012). In spite of increased development in Ireland, the country's landscape is predominately rural and agricultural.

Table 5-4. Summary of existing 2006, revised 2006, and 2012 level 1 land cover statistics (Source: EPA, CORINE Info sheet 2012)

CORINE Level 1	Pre-Existing CLC 2006 % National Area	Revised CLC 2006 %National Area	CLC 2012 % National Are
Artificial Surface	2.29	2.45	2.49
Agricultural Areas	66.83	68.25	68.13
Forest and semi-natural areas	12.06	11.37	11.49
Wetlands	16.52	15.79	11.49
Water	2.29	2.14	2.14

Figure 5-1. Summary of 2006-2012 Landcover Change (Source: EPA, CORINE Infosheet, 2012)



## Agriculture

Arterial Drainage Schemes were implemented in Ireland by the Office of Public Works (OPW) to bring long-term improvement to agricultural incomes in river catchments. The works were designed to allow landowners to install field drainage, which reduced waterlogging of land, allowing for more areas for livestock grazing or production of higher crop yields. The scheme has the effect of reducing the duration and in some cases, incidences of flooding. Depending on the type of soil and the nature of the flooding problems, some land may improve directly as a result of the drainage, however, in most cases, waterlogged land will only improve, if field drainage is installed. Projections of improvement due to Arterial Drainage estimated that approximately 88% of the target damaged land would be improved to the extent that it could carry extra livestock.

Agriculture continues to be the largest use of land in Ireland, with two thirds of the land devoted to it (CORINE, 2012). The land is primarily used for silage, rough grazing, or grass for pasture and it sustains various types of farming (dairy, meat, tillage). The Single Payment System (SPS), as part of the EU Common Agricultural Policy (CAP), places obligations on land managers to sustain good environmental conditions. For that reason, the Department of Agriculture, Food, and the Marine (DAFM) proposed the Rural Environmental Protection Schemes (REPS) for farmers to integrate environmental consideration with agricultural objectives in order to prevent negative impacts to the environment REPS is a scheme aimed to rewards land managers for carrying out their farm management strategies in an environmental sound manner and to attempt to improve the environment in the existing farms (DAFM, 2008). There have been various schemes in places, REPS, AEOS (Agri-Environment Options Scheme), and most recently GLAS (Green, Low, Carbon, Agri-environmental Scheme). GLAS is the new agri-environmental scheme under the Rural Development Plan 2014-2020, which rewards farmers for carrying out environmentally sound practices that meet the criteria set out by the scheme. DAFM also promotes enhancement of farm management procedures and strategies, with production in mind, they proposed the Food Harvest 2020 Plan. The guidelines suggest increasing productivity and primary output in the agriculture, fisheries, and forestry sector, enhancing market position, while also increasing export target (DAFF, 2010). Arterial Drainage Maintenance is not a direct element of Food Harvest 2020, as the focus of the plan is increase of productivity and more efficient agricultural practices; however, the upkeep of the channels from degradation (vegetation and silt accumulation, obstruction, bank slippage), is necessary to ensure the drainage scheme channels maintain their original design condition to facilitate the drainage purpose.

Siltation and nutrient loading are impacts of agricultural practices caused as a result of bank erosion, cattle access to streams, and losses from tillage land. Runoff of pesticides, fertilisers, and animal nutrients are threats to water quality from agriculture, especially with the presence of field drainages. In order to determine the interaction of agricultural land use with watercourses various receptors should be monitored: responses to rainfall, water quality (pesticides, fertilisers, animal nutrients), and sediment regime change.

## Peatland

Deposition of peat occurred in post-glacial periods associated with the start of warmer and wetter climatic conditions. Peat is an unconsolidated brown and black organic material made-up of decomposed and undecomposed plant matter accumulated in a waterlogged environment. Peat characterises for having a high water content averaging over 90% by volume.

There are three main types of peat deposits:

- Blanket Bog - is composed of a carpet of flat, sloped, or undulating peat over a large area of land that is recharged by rainfall (in areas with >1,200 mm annually). The bog can be further divided into lowland blanket bogs (below 200mAOD) and mountain blanket bog (above 200mAOD). The soil tends to be acidic (approximate pH of 4.2) and can be 2 to 6m deep.
- Raised Bog - comprising dome shaped bogs that have developed in former lake basins (on top of fens) and recharged by rainfall (in areas with an annual rainfall between 800 to 900mm). The soil is acidic (pH 3.5).
- Fens - Made-up of flat bogs that are found around lake margins and in water-logged areas where there is supply of mineral rich groundwater. They developed into raised bogs when the supply of mineral rich water is cut off. Soil is alkaline (approximate pH of 7 to 8) and can be around 2m deep.

Approximately one-fifth of land in Ireland is Peatland, including raised bogs, blanket bogs, and fens (as discussed in Section 5.5: Flora, Fauna, and Biodiversity). The Blanket Bog found in the West of Ireland is rare on the European scale. Peatlands are valuable ecosystems with rich flora and fauna. Natural peatlands act as long-term carbon storage, however, when peatland is cut, carbon dioxide (CO<sub>2</sub>) and other greenhouse gases are released into the atmosphere. In addition, damage to peatland impacts water quality due to silt release from mechanical peatland harvesting, increases nutrient loading from drained bogs and acidification from afforestation on bogs. The EPA Strive-funded bog land study on sustainable management of peatland in Ireland determined that up to 95% of all peatland exists in a degraded state (EPA STRIVE, 2007-2013). The National Parks and Wildlife Services (NPWS) have prepared a National Peatland Strategy (2015), a Draft Raised Bog Special Area of Conservation and a Draft Raised Bog Natural Heritage Areas (NHAs) Review, as a national approach to mitigate damages and encourage better management of Peatland. These species are designated under EU and National Legislation.

The construction of the Arterial Drainage Schemes required major hard engineering such as widening, deepening, and even opening new channel reaches. A common effect was the drop of the water table depending on the local conditions. The capacity of the channel will reduce over time as both silt and vegetation accumulate and obstructions develop. The need for maintenance is to return the channel to its intended original design conditions. Maintenance is achieved by the removal of obstructions, excess silt and vegetation, and repairing bank damage or slippage. These activities are confined to a direct corridor along the drain there the direct impacts are not assumed to be significant, however, some Arterial Drainage Maintenance Activities may impact on the hydrology of the bog. The lowering of the local water table can benefit and encourage peat cutting which can result in the drying out of the uppermost peat, increasing temperature, oxygen levels, and hence decomposition rate within surface peat. Subsidence of raised bog can occur as a result of both drainage and peat cutting. There seems to be a deterioration of bog and a decline in the ecological status of the raised bog in close proximity to raised bog.

### **Wetlands**

Wetlands cover around 15% of the surface area of Ireland. The majority of this land cover is comprised of over 12,000 lakes. Wetlands such as lakes, rivers and estuaries provide significant habitat for migratory birds and form significant landscape features.

The west of Ireland is one of the few locations globally where turloughs are also present. Turloughs are topographic depressions in geologically karst regions that are intermittently inundated on an annual basis, mainly from groundwater, that drain without overland stream outflow, and that have a substrate and/or ecological communities that are characteristic of wetlands (NPWS, 2015<sup>1</sup>). Turloughs have been subject to drainage and agricultural intensification and many are degraded. The continued maintenance of drainage channels has the potential to continue to degrade the status and condition of turloughs.

### **Forestry**

Forestry in Ireland accounts for 9.2% of the land cover (EPA, 2012 and CORINE, 2012). The forests in Ireland are young, with approximately 40% planted since 1990. However, about 75% of these forested areas are coniferous, mainly of commercial timber species. The Rural Development Programme 2007-2013 set a target of 30% annual broadleaf afforestation, which was accomplished primarily through the reduced plantation of coniferous trees. The appropriate management of forest land is crucial to mitigate environmental impacts, while maintaining their commercial requirements. The period between 2006 and 2012 experienced the largest land cover change with afforestation on agricultural land and peatland having the biggest influence. The DAFM prepared a Draft National Forestry Programme and a National Policy Review to promote better forest management practices around Ireland.

Arterial Drainage Maintenance Activities can maintain the productivity and soil conditions of forestry land close to drainage channels. Maintenance of embankments preserves the level of flood protection offered to some commercial forestry land.

### **Artificial surface and Benefiting Lands**

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<sup>1</sup> Waldren, S. 2015, Ed. Turlough Hydrology, Ecology and Conservation. Unpublished Report, National Parks & Wildlife Services. Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.



Artificial surfaces account for 2% of the land surface, which is half the Europe wide average of 4% (EPA, 2012).

Lands identified as being liable to flooding are categorised as "benefiting lands". Benefiting lands are defined by the Office of Public Works (OPW) identifying land that might benefit from the implementation of Arterial (Major) Drainage Schemes (under the Arterial Drainage Act 1945) and indicating areas of land subject to flooding or poor drainage. The Arterial drainage scheme and drainage districts facilitated the improvement of extensive areas of agricultural land, through the drainage of flooded land. The Arterial Drainage Maintenance Activities ensure that the channels remain in a good condition, which ensure that the productivity of these agricultural lands and social benefits continue to be exhibited. If arterial drainage schemes, embankments and flood relief schemes fall into disrepair there is the potential for claims for financial losses from landowners within benefitting lands.

### 5.3.1 Future Trend

It is unlikely that the land use in Ireland will substantially change in the short to medium term. Agriculture will continue to be the dominant land-use, with the more intensive arable production continuing to be restricted to better quality soils.

The Food Harvest 2020 agricultural strategy put forward in 2010 by the Department of Agriculture sets out a range of objectives for the entire agricultural sector for the next decade. The aim of the plan is to achieve a competitive critical mass in the international marketplace and target consumers who value 'green output'. Although the strategy provides some environmentally sound advice in terms of technology, it also promotes increased productivity and quotas which can counter the environmental schemes (REPs, AEOS, GLAS). Agriculture is considered to be responsible for 32.1% (one-third) of Ireland's total climate emissions and it is important that sustainable agricultural practices continued to be promoted and practiced.

Forest management practices particularly afforestation have potential to provide environmental and economic benefits if managed sensibly. Potential impacts of afforestation on water quality should be included in forestry schemes such as the Afforestation Scheme, the Forest Environmental Protection Scheme (FEPS), and the Native Woodland Scheme (Forest Service, 2011a, b. c).

Peatland and wetland areas are of important environmental and ecological importance, the protection and appropriate management of these are crucial for their short-term and long-term conservation. Climate change impacts such as changes in rainfall and temperature and sea level rise have the potential for significant impacts on wetlands in Ireland, such as squeezing coastal and estuarine wetlands.

### 5.3.2 Key Environmental Issues

In accordance with the SEA Regulations [S.I. 435 of 2004], considerations have been given to whether the environmental effects, both positive and negative, of the Arterial Drainage Maintenance Activities (2016-2021) are likely to be significant on each receptor.

There are several issues that should be considered while planning and carrying out the Arterial Drainage Scheme and maintenance works:

The extent and intensity of land drainage in both the uplands and lowlands could have an impact on the regime of the waterways, and increase flood risk.

Inappropriate land management practices, especially on more sensitive soil types could reduce water infiltration into the soil resulting in an increase of surface water runoff.

The management of grassland, semi-natural vegetation, wetlands, and woodlands can assist in the storage of rapid surface runoff and floodplain flows upstream of flood risk receptors.

Natural flood storage areas on flood plains including wetlands should be protected from development pressures.

Inappropriate or intensive land-use practices can result in erosion, modification of channel geomorphology, or discharge of receiving sediments.

## 5.4 Soil and Geology

The underlying bedrock geology varies throughout the country. However, there is a large extent of limestone bedrock covering the north western section of the island. The west and south of Ireland are composed of sandstone, siltstone, and mudstone bedrock underlain. The south east of the Island is mostly siltstone and mudstone, and a mixture conglomerates, schists, slates, muddy limestone and slates. The east of island contains predominantly limestone, shale, and sandstone. The bedrock in the midlands are made-up of limestone among shale, and mudstone. There are areas which are karstic and may contain heritage or nature conservation significance such as turloughs, which are seasonably dry lakes, which fill up and drain with water (often very quickly), through a series of sink holes and fissures. There are also caves and underground water channels in these areas. Groundwater aquifers are very vulnerable in karstic soils due to potential for polluting sources seeping through and contaminated the water. Counties with areas of karstified limestone are the coastal/estuarine areas of Galway, Clare, Kerry, Limerick, Wicklow and Carlow

Lands used predominately for tillage need free-draining soil of the south and east. The best soils for intensive livestock farming are limestone rich soils in lowland areas, which are found in the midlands and the south. The acid and peat soils of the western seaboard are most suitable for extensive hill farming and forestry (Creatmer *et al*, 2007). Calcareous limestone underlies large areas of the mid-lands, while acidic sandstones and shales are found in the south-west. Acid igneous rocks such a granite are found in the Wicklow mountains and the north and west are composed of metamorphic rocks such as gneiss, schist, and quartzite, which deliver beautiful landscapes such as Connemara, West Mayo and Donegal.

According to Gardiner and Radford (1980), Irish soil types could be associated with particular geology and landscape.

- Mountain landscape like those seen in the west of Ireland are made-up of shallow soils located on steep slopes (>500m); on less steep slopes, wet soils (groundwater and surface water gleys) and acidic soils are present. Peatland tend to occur on gently undulating landscapes.
- Hill Landscape (150-360m) developed from shale, sandstone, or occasionally granite. These soils are mainly acidic in nature and they include brown podzolics, brown earths and surface-water-gleys.
- Drumlin Landscapes developed after the most recent glacial advance. They are small oval-shaped hills that stand out as undulating landscape. The soil depend on the thickness of the glacial deposits but generally consists of luvisols, brown earths, and brown podzolics.
- Flat undulating lowland landscapes are usually limestone dominated, with shallow soils and bedrock close to the surface. However, deeper soils tend to develop on glacial till that covers most of the limestone bedrock.
- Acidic lowland landscape: are underlain glacial deposits composed of sandstones and shales, or granite, or igneous rocks and metamorphic materials. These soils are more acidic than those above limestone. Acidic brown earths and brown boszolics.
- Alluvial Valley Landscape: are found in areas at the base of hills or mountains and on the floodplain and terrace of major rivers. Alluvial soils and peats are associated with these areas.

Arterial Drainage Maintenance Activities (2016-2021) will have no interaction with geology but can influence soils through sediment transport regime and land drainage.

### 5.4.1 Future Trends

Land use changes have a direct impact on soil, geology, and morphology. Climatic conditions and rainfall shape landscape through weathering and erosion. Increased flooding has resulted in sediment loading into river channels. Management of land-use practices directly impacts the soils.

### 5.4.2 Key Environmental Issues

In accordance with the SEA Regulations [S.I. 435 of 2004], considerations have been given to whether the environmental effects, both positive and negative, of the Arterial Drainage Maintenance Activities (2016-2021) are likely to be significant on each receptor.

Natural flood storage and attenuation areas on floodplains including wetlands, should be further protected from maintenance activities.

Erosion and influence on land-use practices.

Effect on hydromorphology (i.e. river channel and catchment flow and sediment regimes).

## 5.5 Flora, Fauna, Biodiversity

Ireland is committed in a national and international level to protect biodiversity. It comprises of a variety of terrestrial, wetland, freshwater, estuarine, and coastal habitats that support a range of species. Ireland's wetlands and aquatics systems sustain internationally significant populations of birds, fish, and invertebrates, as well as, supports seabird breeding colonies, cold-water coral communities, among many other valuable species. National Parks and Wildlife Services (NPWS) estimates that Ireland is home to 28 species of land mammal, over 400 species of birds, more than 4000 plant species and over 12,000 species of insects.

Ireland is required under the terms of the EU Birds Directive (2009/147/EC) to designate Special Protection Areas (SPAs) for the protection and conservation of endangered species of wild birds. 140 of Ireland's 154 SPA sites have been protected by Statutory Instruments (NPWS, 2016). The Statutory Instrument is the last step in the designation process, however, all SPAs are considered protected from their date of classification (NPWS, 2016). Special Areas of Conservation (SAC) are main wildlife areas in Ireland, considered to be of significant importance in a National and European Level. The Habitats Directive (Council Directive 92/43/EEC) was adopted in 1992 with the aim of protecting wild fauna and flora, as well as, its habitat. In Ireland, the directive was transposed and amended in 1998 and 2005. The Irish habitats include raised bogs, blanket bogs, turloughs, sand dunes, machair, heaths, lakes, rivers, woodlands, estuaries, and sea inlets. There are 25 Irish species protected, these include Otter, Salmon, Freshwater Pearl Mussel, Bottlenose Dolphin, and Killarney Fern. There are 424 SACs areas around Ireland. SPAs and SACs make-up the Natura 2000 network.

The most basic designation for wildlife is Natural Heritage Area (NHA) given to areas considered important habitats or which hold species of plants and animals whose habitat require protection. 75 raised bogs and 73 blanket bogs have received legal protection. In addition, there are approximately 630 Proposed NHAs (pNHAs), which were published on a non-statutory basis in 1995 but have not since statutorily proposed or designated (NPWS, 2016). Prior to designation pNHA receive limited protection. Under the Wildlife Amendment Act (2000), NHAs are legally protected from damage from the date they are formally proposed for designation.

The Wildlife Act 1976 (as amended 2000) is the principle mechanism for the legislative protection of wildlife in Ireland. It outlines strict protection for species that have significant conservation value. The Act protects species from injury, disturbance and damage to breeding and resting areas. All the species protected under the Act must be subject to material consideration in the planning process. The Flora protection Order 1999 makes it illegal to cut, uproot, or damage listed species in any way.

Unfortunately, Ireland's most important habitats are reported to be in poor or bad conservation status, especially raised and blanket bogs, dune systems, oligotrophic lakes, fens and mires, natural grassland, and woodlands. It is believed that a mere 9 percent of habitats listed under the Habitat's Directive have been found to be in a favourable position. Species are doing better in conservation terms, as approximately 52 percent of the listed species are in a favourable state. However, NPWS have identified some species in their Red List of species in need of conservation intervention, these include: Irish bee species, non-marine mollusc, Irish water beetle, damselflies, dragonflies, and butterfly species. From the 199 bird species assessed in the population status of Ireland's birds (2007-2011), 25 were placed on the red list, including the kestrel and skylark.

The Arterial Drainage Scheme has been implemented throughout Ireland and majority of the channels are located in close proximity or within SAC and SPA sites. There are approximately 6,000km of Arterial Drainage channels that cross through an SAC or are located within an SAC and around 3,000km of Arterial Drainage Channels that overlap with an SPA.

All designated nature conservation sites in Ireland are listed in the table below (Table 5-5).

Table 5-5. Summary of Designated Nature Conservation Sites in Ireland

Site	Legislation	Number in Ireland
Special Area of Conservation	European Communities (Natural Habitats) Regulations, 1997 (as amended) and consolidated by the European Communities (Birds and Natural Habitats) Regulations 2011	~424
Special Protection Area	European Communities (Natural Habitats) Regulations, 1997 (as amended) and consolidated by the European Communities (Birds and Natural Habitats) Regulations 2011	~154
Ramsar Site	The Convention on Wetlands of International Importance especially as Waterfowl Habitat (i.e. the Ramsar Convention)	~25
Natural Heritage Area	Wildlife (Amendment) Act, 2000	~148
Proposed Natural Heritage Area	Wildlife (Amendment) Act, 2000	~630
Nature Reserve	Wildlife Act, 1976 and the Wildlife (Amendment) Act, 2000	~75
Wildfowl Sanctuaries	Wildlife Act, 1976 and the Wildlife (Amendment) Act, 2000	~68
OPSAR Marine Protected Areas	No relevant legislation	

### Freshwater Pearl Mussels.

Fresh Water Pearl Mussel (FPM) are widespread in Ireland, particularly in the South West, South East, West and North West of the country. The population range significantly, from a small community with few elderly mussels that have not recruited successfully, to some of the largest pearl mussel populations in the world. There are 96 populations of pearl mussels in the Republic of Ireland, some which include two or more rivers in proximity to them one single population (Moorkens et al., 2007). However, only 27 populations (26 for *M. margaritifera* and 1 for *M. durrovensis*) have been designated within 19 SACs areas for *Margaritifera margaritifera*. From the 96 populations, only those in Bundorragha catchment are considered to be in favourable condition; the rest have been found in an unfavourable status as reproduction and juvenile survival is not meeting adult mortality and population numbers are significantly declining (Moorken, 2011). The main reasons for the population decrease is decline in water quality due to nutrient enrichment, pollution incidents, river bank erosion, forest plantation, road building, bog drainage, arterial drainage schemes, river modification, and over-grazing. The FPM need an environment with well-oxygenated water, low in minerals and nutrients, a clean riverbed, included well oxygenated gravel and sand substrate (Moorken, 1999).

The Freshwater Pearl Mussel (FPM) sub-basin management plan for water designated for protection under the European Communities (Fresh Water Pearl Mussel) Regulation 2009 S.I 296 of 2009 includes the rivers listed in the table below (Table 5-6). Areas surrounding the river catchment are considered to be *Margaritifera* sensitive areas and should be recognised and protected from degradation of water quality.

Table 5-6. Waters protected for conservation of Irish Fresh Water Pearl Mussel (*Margaritifera Margaritifera*)

Water designated for protection of Fresh Water Pearl Mussel			
Bandon	Owenriff (Corrib)	Leanna	Owenea
Aughavaud (Barrow)	Currane	Allow (Munster Blackwater)	Owenmore
Ballymurphy (Barrow)	Dawros	Licky	Owagappul
Mountain (Barrow)	Eske	Munster Blackwater	Cloon (Shannon Estuary)
Bundorragha	Kerry Blackwater	Newport	Derreen (Slaney)
Caragh	Gearhameen (Laune)	Nore	Clodiagh (Suir)
Clady	Glaskeelan (Leannan)	Owencarrow	

The OPW channels listed in Table 5-7 have been identified as containing FWPM. Any works carried out in the vicinity will have to follow procedures recommended by NPWS.

Table 5-7. OPW Channels identified as containing FWPM

Channel	Scheme	Location	Most Recent Record
CH9	Corrib Headford	Oughterard	2009
C1/21/3	Moy	Approx 500yards from outfall to into L.Cullin	2004
C1 Sect M &N	Moy	Ballygallagart	2004
C1/21/14	Moy	Crossmolina	2008

Channel	Scheme	Location	Most Recent Record
C1	Dunmanway FRS	d/s of the Long Bridge	2003
C1	Owvanme	Approx 1400 yards from outfall	2002
C1	Feale	d/s Listowel near Scartleigh cementary	2006
**Owenaher	Moy	u/s of C1/54	1996
**Brown Flesk River	Maine	Trib of C1 Maine near Farranfore	1987
** Galey River	Feale	Approx 1400 yards u/s of C1/18 near Ahavoher Br.	1950
** River Liffey	Ryewater	(Lucan) Approximately 3.5 d/s C1 Ryewater outfall	1894
** Although not on OPW channels- these channels may or may not contain populations of FWPM. Works in vicinity which could impact on a possible population need to be considered in close consultation with local FWPM knowledge.			

### White-clawed Crayfish

White-clawed crayfish (*Austropotamobius pallipes*) are protected under Annex II of the EU Habitat Directives. These species are believed to be dispersed around central Ireland. The Various OPW channels are believed to contain crayfish, as the species are known to inhabit a range of drainage channels in many catchment areas, nationwide. The following SACs have white-clawed crayfish as a qualifying interest and also are intersected by channels maintained by the OPW (Table 5-8)

Table 5-8. Designated sites with qualifying interest (White-clawed Crayfish) and presence of OPW drainage work

Site Code	Site Name	Intersected by OPW Channels
000297	Lough Corrib	Yes
000688	Lough Owel	Yes
001976	Lough Gill	Yes
002120	Lough Bane and Lough Glass	Yes
002298	River Moy	Yes
1810	White Lough, Ben Lough, & Lough Doo	Yes
2121	Lough Lene	Yes
002137	Lower River Suir	Yes
002162	River Barrow and River Nore	Yes

### Lamprey

Three species of Lamprey exist in Irish waters: lamprey (*Petromyzon marinus*), the river lamprey (*Lampetra fluviatilis*), and the brook lamprey (*Lampetra planeri*). The brook lamprey is an entirely freshwater animal, while the other two species, spend most of their adult life in the sea, but migrate upstream to spawn.

Legislation for the protection of lamprey was introduced by the European Union through the Directive on the Conservation of Natural Habitats and Wild Fauna and Flora (92/43/EEC). Ireland to set aside special areas for the conservation (SAC) for the three species of lamprey found here. The objective of SACs in regards to Lamprey is to ensure 'the maintenance or restoration, at a favourable conservation status of lamprey populations'. Freshwater sites under the protection of lamprey populations must be characterised by good water quality, clean sediments at spawning grounds, and the presence of stable sandy silt beds (Kurz and Costello, 1999). To conserve lamprey, the known spawning grounds need protection and maintenance, as well, lamprey migrating upstream need unhindered access to spawning grounds (Kurz and Costello, 1999). 14 SAC sites recognise lamprey as a species of qualifying interest, and from these, ten are located near or within a maintained OPW channel (See Table 5-9). Any changes in the drainage patterns of relevant river catchments for the Arterial Drainage Programme, thus require careful control and should preserve good water quality.



Table 5-9.Designated sites with qualifying interest (Lamprey) and presence or absence of OPW drainage work

Site Code	Site Name	Species	Intersected by OPW Channels
000297	Lough Corrib	<i>Petromyzon marinus</i> <i>Lampetra planeri</i>	Yes
000343	Castlemaine Harbour	<i>Petromyzon marinus</i> <i>Lampetra fluviatilis</i>	Yes
000365	Killarney National Park, Macgillicuddy's Reeks and Caragh River Catchment	<i>Petromyzon marinus</i> <i>Lampetra planeri</i> <i>Lampetra fluviatilis</i>	No
000458	Killala Bay / Moy Estuary	<i>Petromyzon marinus</i>	Yes
000627	Cummeen Strand/ Drumcliff Bay (Sligo Bay)	<i>Petromyzon marinus</i> <i>Lampetra fluviatilis</i>	No
000781	Slaney River Valley	<i>Lampetra fluviatilis</i> <i>Lampetra planeri</i> <i>Petromyzon marinus</i>	No
001976	Lough Gill	<i>Petromyzon marinus</i> <i>Lampetra planeri</i> <i>Lampetra fluviatilis</i>	Yes
002137	Lower River Suir	<i>Petromyzon marinus</i> <i>Lampetra planeri</i> <i>Lampetra fluviatilis</i>	Yes
002162	River Barrow and River Nore	<i>Petromyzon marinus</i> <i>Lampetra planeri</i> <i>Lampetra fluviatilis</i>	Yes
002165	Lower River Shannon	<i>Lampetra fluviatilis</i> <i>Lampetra planeri</i> <i>Petromyzon marinus</i>	Yes
002170	Blackwater River (Cork/Waterford)	<i>Petromyzon marinus</i> <i>Lampetra planeri</i> <i>Lampetra fluviatilis</i>	No
002171	Bandon River	<i>Lampetra Planeri</i>	Yes
002298	River Moy	<i>Petromyzon marinus</i> <i>Lampetra planeri</i>	Yes
002299	River Boyne and River Blackwater	<i>Lampetra fluviatilis</i>	Yes

### Salmon (*Salmon Salar*)

Wild salmon in Ireland are part of our national identity and Ireland has been one of the largest producers of wild salmon in the North Atlantic. Ireland traditionally operated a commercial offshore fishery, an estuarine draft net fishery and in-river angling. Due to the declining number of salmon returning to the Irish Coast, conservation initiatives were introduced to address the decline in stock.

Salmon is now managed on a river by river basis, as opposed to a national or district level. Rivers that have an excess of 65% of the conservation limit are granted catch and release status subject to approval. Rivers that have insufficient scientific information or have a rod catch of less than 10 salmon remain closed.

Conservation limits have been set for the 148 Irish Salmon Rivers and recreational and commercial inshore fisheries are now regulated relative to these conservation limits being met on a river by river basis. The standing Scientific Committee (SSC) of Inland Fisheries Ireland (IFI) reviews all data for salmon rivers to provide scientific advice on the compliance levels (i.e. CL attainment levels).

Wild Salmon and Sea Trout Tagging Schemes regulate salmon and sea trout fishing in Ireland and is administered by Inland Fisheries Ireland (IFI). Anglers are prohibited from selling salmon (any size) or sea trout (any size) caught by rod and line. The protected areas of 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. There are 12 designated salmonid waters overlapping with OPW Scheme Channels, 11 rivers and one lake, as displayed in Table 5-10. Salmon inhabit extents outside these areas and may use habitat in close proximity to other OPW channels.

Table 5-10. Salmonid Designated Waterbodies with OPW Schemes (Source. OPW, 2011)

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
Gweestion	Moy
Manulla	Moy
Castlebar	Moy
Deel River	Moy
Trimoge River	Moy
Yellow River	Moy
Nore River	Kilkenny FRS
Feale River	Feale

## Invasive Species

Alien species are plants or animals that have been introduced, usually by people, outside their natural range. These species can sometimes become 'invasive' when they spread rapidly and outcompete the native flora and fauna, pushing out native species or leading to environmental degradation.

There are many non-native invasive species recorded along OPW Arterial Drainage Channels. Species of concern are Giant Rhubarb (*Gunnera tinctoria*), Japanese Knotweed (*Persicaria wallichii*), Giant Hogweed (*Heracleum spondylium*), Himalayan Balsam (*Impatiens glandulifera*), Rhododendron (*Rhododendron ponticum*), Waterweeds (*Elodea* spp) and Curly Waterweed (*Lagarosiphon major*). Highly invasive zebra mussels are also a significant threat, especially in lakes, although rivers can be affected as well. Extreme flooding events result in further dispersal of invasive species, upstream and downstream, as well as onto land through the waterway. Many of these invasive species thrive in highly disturbed environments, where soils are routinely disturbed and transported. Machinery or equipment can also be a pathway for invasive species to spread. During the Arterial Drainage Maintenance Activities, work within stands of non-native invasive species should be avoided and the maintenance crew must strictly adhere to the OPW Invasive Species SOP.

### 5.5.1 Future Trend

The EU Habitats and birds directives have enforced legislation in European countries that provide recognition and protection to European flora and fauna. It is likely to expect benefits to protected species and sites and the wider aquatic environment with the implementation of measures to achieve good ecological status under the WFD. The continuous development of proposals and action plans to protect biodiversity should help improve future framework and recommendations. Climate change has the potential to change the range of habitats and species in Ireland.

Changes in land-use (i.e. urbanisation, afforestation, intensive agriculture) will continue to threaten biodiversity both in designated and non-designated sites.

### 5.5.2 Key Environmental Issues

In accordance with the Irish SEA Regulations [S.I. 435 of 2004], considerations have been given to whether the environmental effects, both positive and negative, of the Arterial Drainage Maintenance Activities (2016-2021) are likely to be significant on each receptor.

The Arterial Drainage Scheme and maintenance works could potentially impact flora, fauna, and biodiversity by:

Causing effects on Natura 2000 sites and its protected flora and fauna. For that reason assessments under the Habitats and Birds Directive should be implemented in order to assess if adverse impacts are being caused to the SACs and SPAs.

Causing effects on sensitive habitat NHAs or pNHAs (ie:peatlands, limestone habitats).

Riparian areas such as alluvial forests and wetlands, should not be altered, as they provide habitats, support species, and increase biodiversity.

Effects of maintenance operations on salmonid, other protected fish, and shellfish species.

Freshwater Pearl Mussel, Atlantic Salmon, lamprey species, and White-clawed Crayfish will be particularly sensitive to pollution and in-channel maintenance works, which may also contradict objectives of the WFD.

Protect and where possible enhance the integrity of fisheries within Arterial Drainage Scheme catchments, Flood Relief Scheme channels and designated channels.

Maintain or expand habitat supporting salmonid fisheries and carry out enhancement works where possible.

Potential introduction or spread of invasive species.

Protecting and enhancing biodiversity on a national, regional, and local level.

## 5.6 Water

Water is a very important resource and appropriate management is crucial to secure our current needs and the needs of future generations. Water quality in Ireland faces a threat from pollution, caused by sewage discharge and diffuse agriculture. The European Union (EU) Water Framework Directive (WFD) is a major driver for achieving sustainable management of water in Ireland. The WFD was implemented in 2000 as a European-wide law that encouraged a communal goal to protect all water and water dependent ecosystems; groundwater systems, rivers, lakes, transitional waters, coastal waterbodies, and wetlands (EC, 2000). The main goals of the WFD are to maintain high and good status waters where they already exist and restore waters that are unable to support aquatic ecosystems sufficiently (EPA, 2012). In order to satisfy the requirements of the WFD, Ireland was divided into seven River Basin Districts (RBD) and River Basin Management Plans (RBMP) were developed to assess and monitor surface water and groundwater of each RBD. The RBMP plans aimed to classify the water by their quality status and setting objectives with the aim to protect and improve water quality in accordance with the WFD goals. The RBMP use data collated by the EPA and partner organisations (i.e. Inland Fisheries Ireland)

The water quality assessment for Ireland (2010-2012) concluded that (see Table 5-11 and Figure 5-2).

- 52.8% of river channels are at high or good status
- 43% of lakes monitored are at high or good status
- 43.4% of transitional waters are at high or good status
- 93.4% of coastal waters are at high or good status
- 99% of the area of groundwater aquifers are at good status.

Water quality in Ireland is reasonably good compared to other EU countries, however, there are still challenges such as point source pollution, as well as, nutrient and sediment loading that have to be addressed through legislative measures and administrative systems.

Table 5-11: Summary of WFD water surface water (ecological status) and groundwater (chemical status) 2010-2012  
(Source: EPA: 2015)

Status of Irish Waters (2010-2012)	High	Good	Moderate	Poor	Bad
Groundwater (% area) (interim status)	n/a	99	n/a	1	n/a
Rivers (% water bodies)	11.8	41	28.6	17.9	0.7
Lakes (% water)	11	32	33	15	9

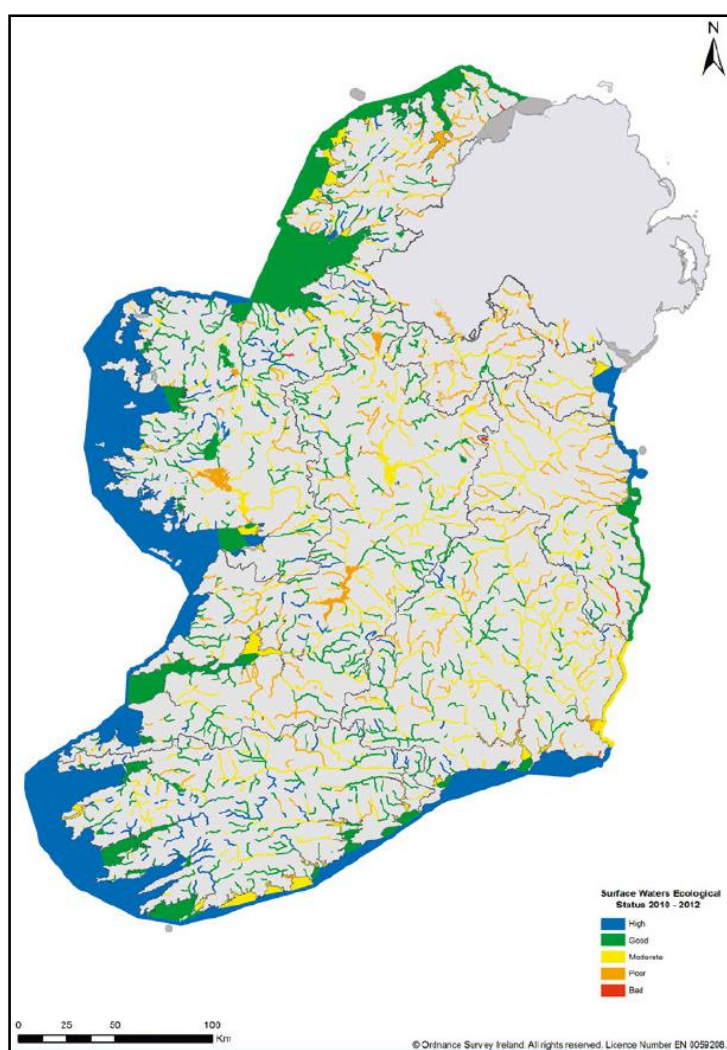
bodies)					
Transitional (% area)	2.3	41.1	43.4	11.4	0.5
Coastal (% area)	63.4	30	4.4	<0.01	0.0

## Surface Water

The ecological status of surface water is based on the assessment of specified biological quality elements, as well as supporting hydromorphological, chemical (specific pollutants), and physical-chemical elements (EPA, 2015). Hydromorphological pressures are relevant in relation to potential impacts on benthic invertebrates and fish populations, but the link between these pressures and ecological status in Irish waters needs further investigation. Many surface waters (rivers, lakes, and coastal waters) are controlled or have been modified to support flood protection, navigation, freshwater supply, drainage or hydropower production, yet the ecological impacts of these alterations are difficult to quantify (EPA, 2015). Arterial Drainage Maintenance Activities proposed on the river channels have the potential to change the hydromorphological condition of the waterbodies resulting in alterations in water quality through increased sediment loading from dredging or similar works.

The OPW Arterial Drainage channels are mostly located in the Western RBD, the Shannon RBD, and the Eastern RBD, although there are flood relief schemes, embankments, all around the country. The assessments of surface water and groundwater in Ireland conducted by the Environmental Protection Agency in Ireland have been summarised below.

Figure 5-2. Surface water ecological status for rivers, lakes, transitional and coastal waters (2010-2012)



## Rivers

The rivers in Ireland are regularly monitored to assess water quality, trends, ecological and physio-chemical status. Parameters for water quality measures include nitrate, phosphate, BOD, and ammonia. The water status assessment for 2010-2012 displayed that over fifty-percent (53%) of the waterbodies monitored (858) were at satisfactory ecological status as displayed in Table 5-12 and Figure 5-3.

The biological pollution assessment used to monitor water quality is macroinvertebrate monitoring and assessment method (Q-values) because it is the most sensitive ecological assessment method available for detecting organic pollution and nutrient enrichment impacts on Irish Rivers (European Commission, 2013). Approximately 13,300 kilometres of river channel were examined using biological Q value scheme. Water quality results of rivers with high or good condition were roughly 73% of the monitored channels displaying satisfactory or unpolluted conditions (Figure 5-4Figure 5-7).

The majority of the rivers fulfilled the Environmental Quality Standard (EQS) for specific pollutants (0.035mg/l P). The main threat continued to be naturally occurring metals present in mineral-rich mining areas (EPA, 2012). The EQS for 'priority and priority hazardous substances' were polyaromatic hydrocarbons (PAHs) and mercury, among others. Another trend observed was the decline of nitrate concentrations in rivers, especially those located in proximity to intensive agricultural areas. However, nutrients (phosphorus/nitrogen) remain the main impact of eutrophication as a result of nutrient loading and oxidising conditions. Pollution caused by urban wastewater discharge and industrial pollution decreased from 53 km to 17 km of river channel, since the previous assessment in 2007-2009. However, agriculture and municipal sources remain the main cause of pollution, accounting for 53% and 34% respectively (EPA, 2015).

Water quality is not only affected by the inflow of pollution, but it can also be altered by alterations to the river (widening of the channel, the introduction of weirs, creation of embankments or flood walls), which can change the hydromorphological conditions of the river. The Arterial Drainage Schemes in Ireland have involved the deepening and widening of river channels to increase their capacity to contain floodwaters and to provide an outfall for drainage from agricultural land. Channelisation of the rivers results in significant modifications to channel morphology through engineering works to produce a structurally simplified and hydraulic efficient channel. However, the ecology of the river environment can be disrupted and impaired due to changes in flow regimes, increased sediment loads, and reduction in habitat diversity. It is hard to attribute a poor ecological status, solely, to the Arterial Drainage Schemes or Maintenance activities, but appropriate monitoring of turbidity, suspended solids and sedimentation, could present a picture of the extent of hydromorphological pressure caused by these works.

Table 5-12. Ecological Status of monitored rivers by RBD.

River Basin District	Number of Water bodies	High	Good	Moderate	Poor	Bad	Total
South-Western	278	71	132	62	13	0	278
		26%	47%	22%	5%	0%	100%
Western	276	52	139	62	21	2	276
		19%	50%	22%	8%	0.7%	100%
North-Western	213	21	72	45	71	4	213
		10%	34%	21%	33%	1.9%	100%
Shannon	393	25	176	108	81	3	393
		7%	45%	27%	21%	0.8%	100%
South-Eastern	285	17	103	117	47	1	285
		6%	36%	41%	16%	0.4%	100%
Eastern	144	5	37	58	43	1	144
		3%	26%	40%	30%	0.7%	100%
Neagh Bann	35	1	7	12	15	0	35
		3%	20%	34%	43%	0%	100%
<b>National</b>	<b>1,624</b>	<b>192</b>	<b>666</b>	<b>464</b>	<b>291</b>	<b>11</b>	<b>1,624</b>
		11.8%	41.0%	28.6%	17.9%	0.7%	100%



Figure 5-3. Percentage breakdown of the monitored river waterbodies (RWB) within each RBD showing ecological status (2010-2012)

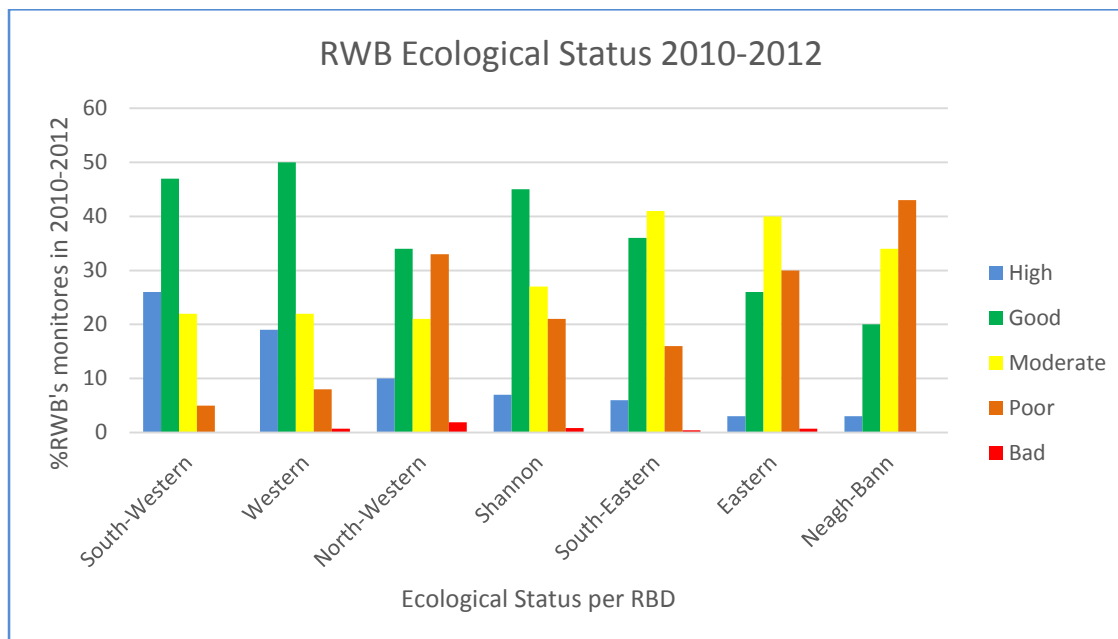
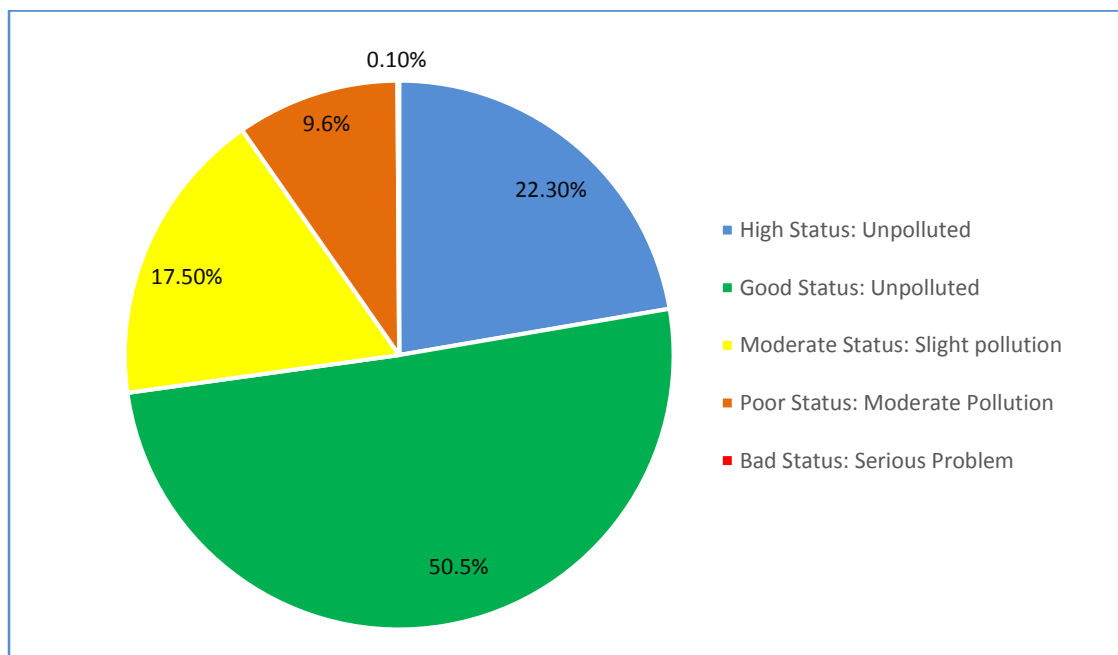


Figure 5-4. River quality 2010-2012: Biological Pollution Assessment (Source: EPA, 2015).



## Lakes

There are over 12,000 lakes in Ireland, primarily located at the west and the centre of the island. 213 were monitored for the WFD assessment (2010-2012). Biological and chemical parameters were evaluated with 43% (91 lakes) of the monitored lakes achieving 'high' or 'good' status targets of WFD (EPA, 2015). Between 2007 and 2009, 48% (101 lakes) were considered high/good status, which means that a 5% decline was experienced in the 2010-2012 assessment (EPA, 2012), as illustrated in Table 5-13; Figure 5-5, and Figure 5-6. There was also an increase in the numbers of lakes that fell into the poor ecological status category. The monitoring programme and classification criteria needs further investigation in order to account for variability of the results and changing conditions of each lake.

The assessment of hydromorphological condition was responsible for the downgrade of four otherwise high-status lakes: Doo Lough, Guitane, Nahasleam, and Pollacappul. However there was no evidence that these four lakes were actually impacted by enrichment. Lough Guitane was assigned a good status in 2010-2012 because hydromorphology was not taken into account. However, when considered, it became evident that the lake was subject to water level fluctuations and it only contained a soft engineering bank protection structures, both which resulted in a hydromorphological pressures.

Table 5-13. The breakdown of ecological status from the periods of 2007-2009 and 2010-2012

Ecological Status	2007-2009				2010-2012			
	Number of Lakes	% of Lakes	Surface Area	% Area	Number of Lakes	% of Lakes	Surface Area (km <sup>2</sup> )	% Area
High	27	13	111	12	23	23	38	4
Good	74	35	309	33	68	68	257	27
Moderate	75	35	285	30	70	70	287	30
Poor	22	10	189	20	33	33	354	37
Bad	14	7	52	2	19	19	19	2
<b>Total</b>	<b>214</b>		<b>946</b>		<b>213</b>	<b>213</b>	<b>955</b>	

Figure 5-5. 2007-2009 WFD (a) Percentage lakes and (b) percentage of lake area surveyed assigned to each category (Source, EPA, 2015)

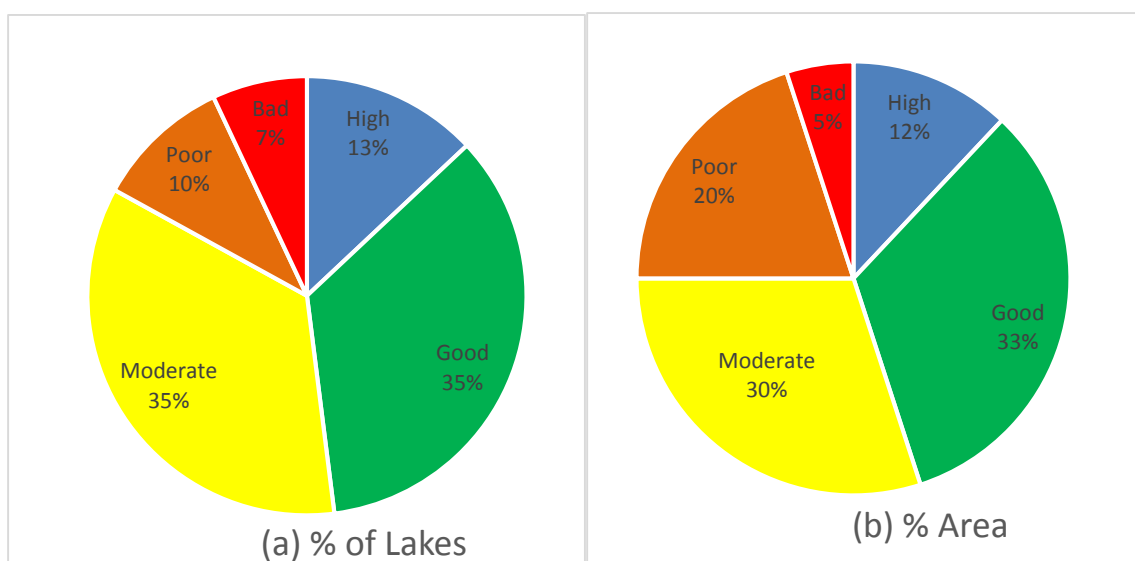
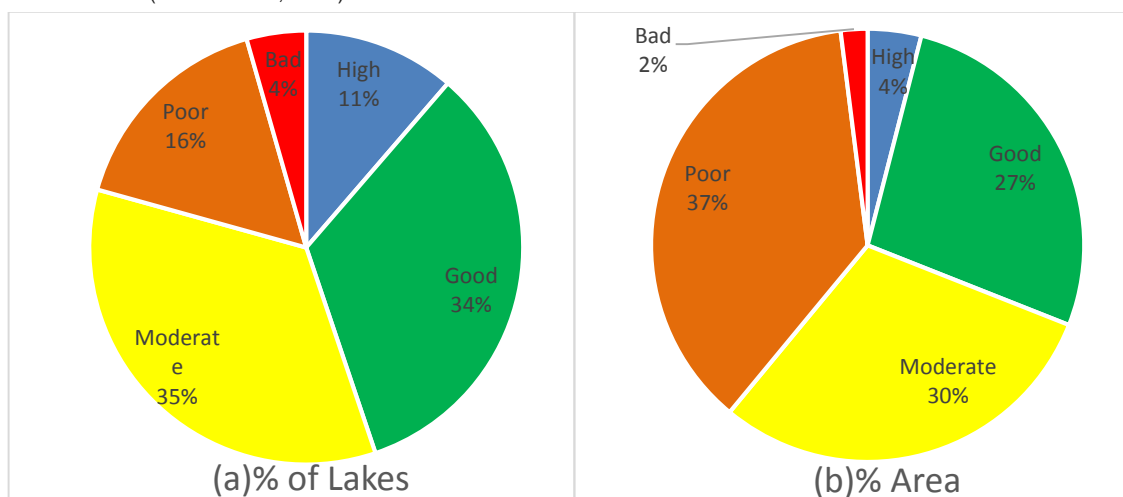


Figure 5-6. 2010-2012 WFD (a) Percentage lakes and (b) percentage of lake area surveyed assigned to each category (Source: EPA, 2015)



## Transitional and Coastal Waters

Coastal and Transitional Waters are under a range of human threats such as discharge from industrial and municipal waste water treatment plants, inputs from diffuse agricultural sources, harbour and port activities, and discharge of marine vessels. The EPA assessed 193 transitional water bodies between 2010 and 2012 and discovered that over one-third (36 percent) was found to be at good or high ecological status (EPA, 2012). Coastal waterbodies were also assessed, the study between 2010 and 2012, looked at 101 coastal waterbodies from which majority (93 percent) received a high or good ecological status (Refer to Table 5-11), which demonstrate that these waters have the capacity to support ecologically diverse marine communities (EPA, 2015). Transitional waters, on the other hand, have a much lower percentage of high or good waterbodies demonstrating greater human influence and activity, directly affecting water quality (See Chapter 5.8 Infrastructure and Material Assets). From the transitional and coastal bodies assessed in Ireland, 27% of the waterbodies may be at risk of not being capable of supporting the biological element due to the degree of structural modification (hydromorphological pressures).

## Groundwater

Groundwater is an important source of drinking water in Ireland, providing approximately 25 percent of drinking water nationally (EPA, 2015) (see Chapter 5.8 Infrastructure and Material Assets- Water Supply). In 2012, the EPA's assessment of the groundwater bodies in Ireland determined that only 1.5 % (11) groundwater bodies were classified as poor chemical status based on the best available data. Table 5-14 summarises the status of groundwater in all the RBD and Table 5-15 displays a comparison of the status of groundwater body in May 2011 and December 2014.

Table 5-14. Groundwater chemical status (Source: EPA, 2015)

Qualitative Status	Good		Poor	
RBD	Waterbodies (No.)	Area km2	Waterbodies (No.)	Area km2
Eastern	73	5,789	2	477
South-Eastern	149	12,869	2	24
South-Western	83	11,284	1	6
Shannon	236	17,503	6	97
Western	104	11,732	0	0
North-Western	72	7,421	0	0
Neagh Bann	28	1,805	0	0
<b>National Total</b>	<b>754 (99%)</b>	<b>68,403 (99%)</b>	<b>11 (1%)</b>	<b>604(1%)</b>

Table 5-15. Summary of December 2014 status update results with summary of 2011 results for comparison (Source: EPA, 2015)

Groundwater Test	May 2011 Summary		December 2014 Summary	
	Good Status	Poor Status	Good Status	Poor Status
Overall Chemical Status	653	103	745	11
Overall Quantitative Status	753	3	754	2

On average the nitrate and phosphate concentration in groundwater was below the threshold on monitoring locations 2007-2012. A reduction in detection of faecal coliforms was also observed during the study period, however, its presence continues to be a threat in vulnerable karst areas. 51% of groundwater samples were contaminated with faecal coliforms, which pose a challenge to protect public and private drinking water (EPA, 2012).

## Pollution

Agriculture, primarily diffuse agricultural pollution, results in eutrophication was the main suspected cause of slight pollution, indicated a moderate status under the WFD assessment (EPA, 2015). Municipal sources such as municipal wastewater, urban run-off, landfills, and water treatment work are the major causes for nutrient losses. Industrial and forestry pollution are another source of slight pollution resulting in eutrophication, which is enhanced by phosphorus and nitrogen input. Siltation is an effect caused by municipal sources as well as engineering works such as dredging, civil works, and peat harvesting. Sensitive species such as Freshwater Pearl Mussel or fish can be impacted by the smothering effect of inert organic silt from the activities mentioned previously.

Siltation is also caused as a result of bank erosion, cattle access to streams, and losses from tillage land.

Drainage works may cause deterioration of water quality due to the introduction of more direct routes for polluted water to enter the stream, by-passing natural purification processes which occur on the soil. In some cases, drainage works contribute directly to pollution through the introduction of eroded bank material or creating outflow from highly mineralised groundwater zones (Whiteley, 1979).

### 5.6.1 Future Trends

Surface water and groundwater are an important resources in Ireland. There are drivers and pressures that threaten this resource such as municipal point source pollution, nutrient and sediment loading from agriculture, among other; however, better management and sustainable practices could help mitigate potential impacts. The implementation of RBMP has started to demonstrate favourable results. Although the progress is slow, continued monitoring and development of catchment plans will affect the rate of change. With climate change the demand for irrigation and abstraction may increase and the need for acceptable flows for waterbodies to receive discharges may restrict the potential for wastewater discharges.

The target to achieve 13.6% improvement in ecological status for surface waters from the 2009 baseline by 2015 were not likely achieved. The second cycle of RBMPs will have to include to targets for those waterbodies that did not reach their aim.

Further work, tests, risk characterisation of groundwater dependent terrestrial ecosystems, and groundwater body boundary review were carried out in 2015 and will be included in the 2017 RBMP (EPA, 2015).

Development of biological tools which are sensitive to hydromorphological pressures.

### 5.6.2 Key Environmental Issues

In accordance with the Irish SEA Regulations [S.I. 435 of 2004], considerations have been given to whether the environmental effects, both positive and negative, of the Arterial Drainage Maintenance Activities (2016-2021) are likely to be significant on each receptor.

Arterial Drainage Maintenance Activities (2016-2021) works must ensure that the objectives align with those of the WFD and that the Arterial Drainage Activities proposed will not interfere in accomplishing the goals set out by the WFD, RBMP objectives, and achievement of good ecological status/potential.

Water quality and biological potential of surface water is comprised by hydromorphology, especially in relation to the WFD. For that reason, Arterial Drainage Maintenance Activities may have a direct or indirect impact on water quality; due to the changes they produce in the hydromorphological condition of the waterway. However, it is difficult to determine the extent to which Arterial Drainage Maintenance Activities may affect water quality in relation to the rest of the activities that could potentially pollute the waters.

The flooding of important water treatment plants could pose a significant pollution risk with associated impacts on human health, water quality, and ecology.

Changes in water quality could create pressure and impacts on the ecological and chemical status of waterbodies: river, lakes, ponds, standing waters, and other wetlands including peatlands

Potential impacts on water supply (including potable) and water conservation.

Water quality could be improved through flood risk management. Potential to improve waterbody status, including heavily modified and artificial water bodies

Climate change impacts on water quality due to increase storm events, rainfall and flooding with the potential to change hydromorphology of river beds, cause bank erosion, and re-suspended nutrients.

## 5.7 Cultural Heritage (Architectural and Archaeological Heritage)

Ireland's earliest archaeological sites date back to the end of the last Ice Age, 10,000 years ago. They consist of evidence of temporary settlements of fishermen, hunters and gatherers that survived as scatters of stone implements and shell mounds or middens (National Monument

Service, 2016). However, structures and remains from any time period can be considered of archaeological interest.

Monuments of archaeological importance are protected under the National Monuments Acts 1930-2004. The National Monuments Service of the Department of Arts, Heritage, and Gaeltacht (DAHG) maintains a record of all known monuments and this forms the Records and Monuments and Places (RMP). There are approximately 120,000 RMPs and these are published county-by-county. These include burial grounds, standing stones, medieval churches, tower houses, ring forts, among many other sites. Any work proposed in close proximity to the RMP requires written notice to the Minister. The Planning and Development Act 2000 (as amended) requires that development plans contain objectives for the protection of the archaeological heritage and architectural conservation areas and conditions relating to archaeology to be attached to individual planning permissions (National Monument Service, 2016).

The National Inventory of Architectural Heritage (NIAH) is a state initiative under the administration of the DAG and established on a statutory basis under the provision of the Architectural Heritage (National Heritage) and Historic Monuments (Miscellaneous Provisions) Act 1999 (Buildings of Ireland, 2016). The NIAH aims to identify, record, and evaluate post-1700 architectural heritage in Ireland, as a measure to protect built heritage.

Early human inhabitants on the island settled near bodies of water (coast, lakes, and rivers) because watercourses provided sources of food, communication, and transportation, while also historically demarcating territories. Ports, bridges, ferries, and settlement on Irish Rivers evolved over time, tributaries of main watercourses were altered to provide power, drinking water, and for draining land. For that reason, there are sites and evidence of human life adjacent to river bodies or arterial drainage schemes. Peatlands and estuaries are known for their ability to preserve artefacts, therefore, works carried out in these environments must follow special precautions, as the likelihood of encountering objects of cultural or historical importance is higher than in other landscapes. During the construction and excavation of the original arterial drainage scheme, features of archaeological importance were recovered. For that reason, during the Arterial Drainage Maintenance Activities (2016-2021), it is important to be sensible when carrying out the works and to be aware if there are any RMPs or NIAH in proximity, as appropriate methodologies should be followed.

### 5.7.1 Future Trends

Cultural heritage and archaeological features face a growing threat posed by development pressures and urbanisation. The protection of existing designated sites, structures, buildings and unknown or buried archaeological interests will be required, for any new designations. There are important areas, structures, or buildings that could be at risk of flooding.

### 5.7.2 Key Environmental Issues

In accordance with the SEA Regulations [S.I. 435 of 2004], considerations have been given to whether the environmental effects, both positive and negative, of the Arterial Drainage Maintenance Activities (2016-2021) are likely to be significant on each receptor.

Arterial Drainage Maintenance Activities will be constrained by the need to protect the setting of areas of existing archaeological and architectural value (i.e. Monuments, RMP, and NIAH).

Ensure that areas adjacent to the works are not of cultural, architectural, or archaeological significance. If so, appropriate measure and guidelines to be used in order to protect these.

## 5.8 Infrastructure and Material Assets

Ireland has thousands of kilometres of road and active rail routes across the country. The National Motorways consist of a network of approximately 1,017 kilometres that connect Dublin to major cities such as Cork, Limerick, Galway, and Waterford. They generally consist of two-lane dual carriageways. The Republic of Ireland has an extensive network of national and public roads divided into Motorways, National roads, Regional roads, and Local roads. As of December 2007, there was approximately 5,427 km of national roads, 11,630 kilometres of regional roads, and 78,972 kilometres of local roads. Some of these roads are located in low-lying areas and could be at risk of flooding during intense and prolonged rainfall.



Many urban areas and industries have been centred on rivers or coastlines. There are 10 commercial ports in the Republic of Ireland: Port of Cork/ Cork Dockyard/ Ringaskiddy, Shannon Foynes Port, Dublin Port, Killybegs Harbour Centre, Rosslare- Europort, Port of Waterford, Galway Harbour, Drogheda Port, and Port of Arlow. These create pressures to the water quality of coastal and transitional water bodies (See Ch.5.6. Water: Transitional Water).

There are four international airports in the Republic of Ireland: Dublin Airport, Cork Airport, Shannon Airport, Knock Airport and five domestic airports : Kerry Airport, Waterford Airport, Galway Airport, Donegal Airport, and Sligo Airport.

Arterial Drainage Maintenance Activities (2016-2021) help sustain the drainage works and channels, resulting in economic, social, and strategic benefits to areas that belong to the scheme.

### **Water Supply**

Majority of the tap water in Ireland is extracted from surface water sources (rivers and lakes), with the remainder drawn from groundwater sources and springs

For the population living in urban areas the water is supplied by the local authority following extensive treatment. In smaller communities, private water schemes are implemented, and in rural areas, individual houses tend to rely on groundwater wells with little to no treatment (EPA, 2012) (See Chapter Water: Groundwater).

The EU Drinking Water Directive sets quality standards for water supplies using indicators such as microbiological content in particular *Escherichia Coli*. The presence of *E.coli* provides an indication that the water has been contaminated by faecal pollution or inadequate operation of treatment plant. Large water supply systems in Ireland are well monitored have found a negligible amount of *E.coli*, approximately 3 million people are dependent on public water supplies. Approximately, 200,000 people are served by private group water schemes, although the quality of the water is inferior to public water supplies. Not a lot is known about the quality of the water supplied by private wells in rural areas, however approximately 200,000 persons in Ireland are dependent on it as a source of drinking water (EPA, 2012). In July 2013, a company under the Water Services Act 2013, combined public water and wastewater services of the 21 Local Authorities together under one national provider, Irish Water.

### **Waste Water Treatment Plant**

Sewage and other waste waters pose a human health and environmental threat. Pollution from wastewater treatment plants can occur if there is inadequate treatment and/or combined storm water overflows. Since 2007, local authorities and private companies are required to obtain a Waste Water Discharge License or Certificate of Authorisation from the EPA in order to control and monitor the discharge levels and mitigate the potential effects to the waterways (EPA, 2012).

Septic Tanks are ordinarily used in rural areas, if these are poorly sited and/or not properly maintained, they could pose a threat to surface water, groundwater, and local drinking water. The Department Environment, Community, and Local Government (DECLG) published the Water Services (Amendment Act) to control wastewater discharges from houses not connected to the sewer network (EPA, 2015). The EPA and local authorities are responsible enforcement of the legislation.

Arterial Drainage Maintenance Activities (2016-2021) will ensure that the drainage channels continue to protect against low order flooding, as well as, ensuring that embankments and flood relief schemes are maintained and able to protect highly sensitive infrastructure such as water treatment plants.

#### **5.8.1 Future Trends**

With the slight yearly population increase there may be some growing pressures on infrastructure and resources and these are more likely to be experienced in urban fringes and suburbs in close proximity to urban centres. As the population increases and a shift in population dynamics is experienced, there will be a need for further development of infrastructure.

The future of Irish Water is uncertain and dependant on the agenda of the new 2016 Irish Government. The demand for water abstractions and discharges of wastewater are likely to change with regional population changes. Climate change may add further pressure to these demands.

### 5.8.2 Key Issues

In accordance with the SEA Regulations [S.I. 435 of 2004], considerations have been given to whether the environmental effects, both positive and negative, of the Arterial Drainage Maintenance Activities (2016-2021) are likely to be significant on each receptor.

Drinking water supply, both groundwater and surface water should always be considered.

Surface water and groundwater continue to be a crucial resource and its connectivity and quality should be maintained in order to ensure water supply.

Wastewater treatment plants and septic tanks in low-laying areas at risk of flooding.

Water shortages in major cities may result in plans to pump water from the River Shannon to provide potable water to the citizens of Dublin.

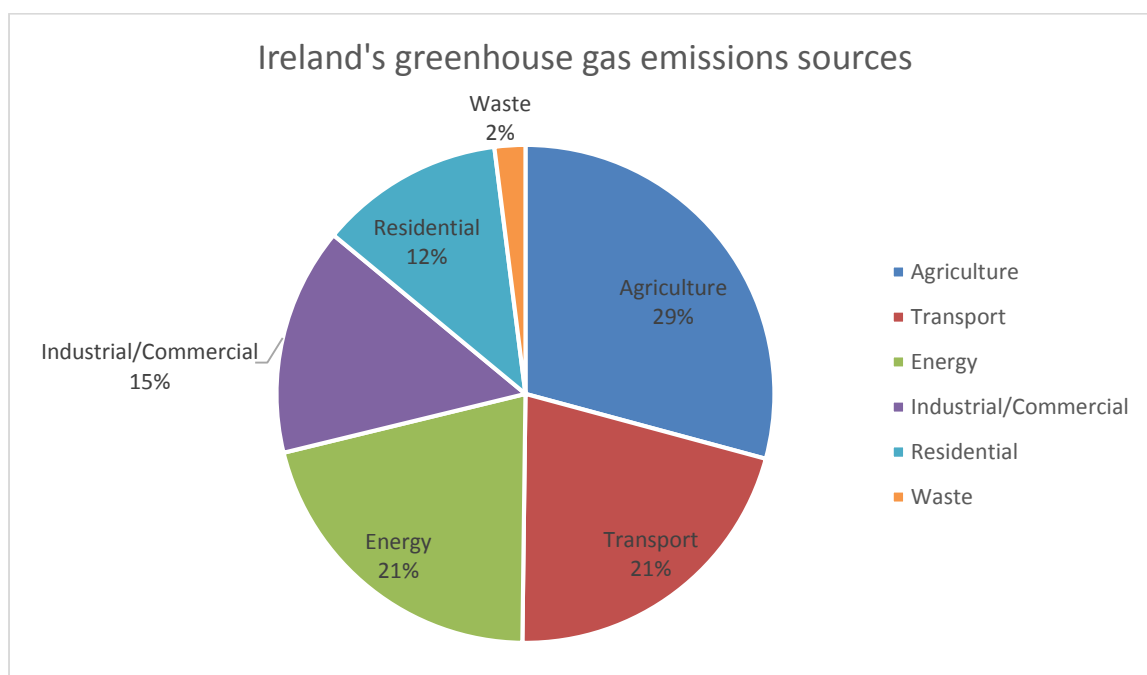
## 5.9 Air and Climate Change

Climate change is described by the scientific community as a significant change in the average weather around the world, these involves variations in temperature, rainfall, wind, lasting for an extended period of time. Natural climate change has occurred during the planets history, with events ranging from ice ages to periods of higher temperature. The problem is that anthropogenic changes are influencing climate change through emissions of greenhouse gases. Human interference increases air and ocean temperatures, which result in droughts, melting ice and snow, rising sea levels, increased rainfall, and flooding. It is also believed an increase of extreme weather events (annual hurricanes, tornadoes, and earthquakes) is related to the variation of weather around the planet.

Both human and natural processes influence climate change. Natural processes include changes in the sun's intensity, volcanic eruptions, or processes within the climate system such as ocean current circulation. Human activities that impact the composition of the atmosphere include: carbon dioxide (CO<sub>2</sub>) emissions from the burning of fossil fuels (coal, oil, peat); methane and nitrous oxide from agriculture; and emissions through land use changes (deforestation, afforestation, urbanisation, and desertification). The International Panel of Climate Change (IPPC) believe that the observed increase in global temperature is a result of anthropogenic contributions to climate change.

Ireland's greenhouse gas emissions arise from a mixture of activities. The EPA compiled greenhouse gas figures for Ireland in 2009, these are displayed in the Figure 5-7 below.

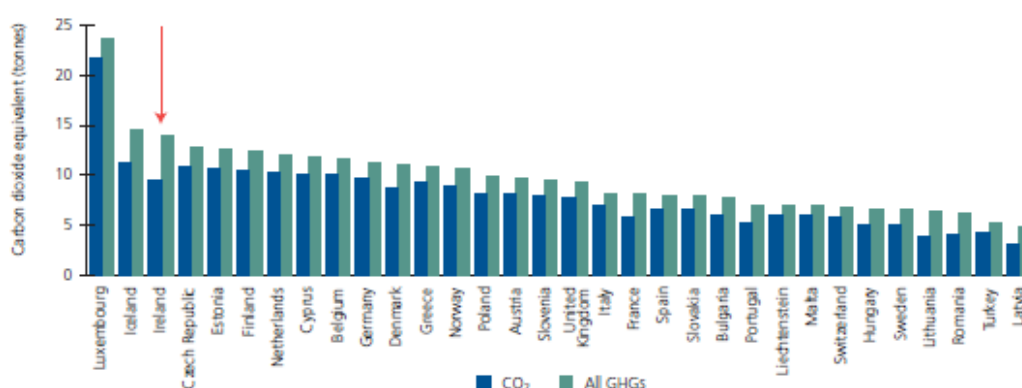
Figure 5-7. Ireland's greenhouse gas emissions by sector for 2009 (Source EPA, 2011).



The main sources of greenhouse gas emissions are agriculture (29%), energy (21%), and transport (21%). Although there may have been some changes in the levels of greenhouse gas emission with the implementation of policy and legislation, it is likely that these will still dominate as the main source of emissions. Land use change is also a factor that contributes to greenhouse gas release, the deforestation, afforestation, removal of peat for fuel or the draining of peatland, all have significant effects on the environment such as release of greenhouse gases, especially when cutting or removing peatland, and contamination of surrounding surface or groundwater (See Chapter 5.3 Land-Use). For that reason the conservation of some of these habitats is crucial to help mitigate climate change.

Ireland is considered to be a small country with a small population, however, the level of greenhouse gas emissions per person are amongst the highest in Europe (See Figure 5-8).

Figure 5-8. Total greenhouse gas emissions and CO<sub>2</sub> emissions as Tonnes CO<sub>2</sub> per person by Country in 2009 (Source: EPA, 2015)



Ireland has had various improvements in its ambient air quality since the introduction of a number of legislative measures around acid rain, and photochemical smog, beginning in the early 1990s. There are two EU Legislations which require the comprehensive monitoring of air quality, the Clean Air for Europe (CAFE) Directive and the Fourth Daughter Directive (2004/107/EC) which set limits and target values for ambient concentrations of air pollutants harmful to human health and the environment (EPA, 2015).

Ireland has introduced various monitoring strategies and policies in order to control and maintain 'good' air quality and fulfil EU and international commitments. The EPA implemented a measure to assess air quality called the Air Quality Index for Health (AQIH). The AQIH is a number from one to 10 that rates the air quality of an area at a particular time; AQIH is calculated every hour. A ban on the sale and distribution of bituminous fuel (or 'smokey coal') has been introduced in 27 cities and towns, which have experienced a reduction in particulate matter (PM<sub>10</sub>), as opposed to those towns where the ban does not apply.

Emission reductions from road traffic have been applied through new standards and cleaner technologies, however, pollutants from car emissions continues to be one of the main threats to air quality in Ireland. Continued decrease of nitrogen oxides from road transport is required if Ireland is to meet its commitments under the National Emissions Ceiling (NEC) Directive 2010.

Climate change is likely to influence Ireland through the fluctuation of river flows and tide levels and its impact on flood frequency, extent, distribution, and patterns (EPA, 2012). This assessment will examine the potential impact of climate change on flood events in Ireland and consider the need for outfalls for the drainage of agricultural lands.

There are various carbon sinks in Ireland such as peatlands, forestry, and other soils, grasslands, and habitats. Natural peatlands act as long-term carbon storage, however, when peatland is cut, carbon dioxide (CO<sub>2</sub>) and other greenhouse gases, specifically methane, are released into the atmosphere. According to Wilson *et al* (2007), there are 270-455 billion tonnes of carbon stores in boreal and sub-arctic peatlands around the world. The ability of peatlands to continue to actively remove and store carbon and act as a buffer to climate change depends on the degradation status of individual peatlands. Irish peatlands make up approximately 17% of the country's land area and store 1.2 billion tonnes of carbon, which is equivalent to 4.4 billion tonnes of carbon dioxide. Unfortunately, approximately 80% of Irish peatlands have been damaged to some extent (Reour-

Wilson et al, 2011). For that reason the restoration of peatland around the country is crucial for meditating climate change and meeting annual target. Similarly, Irish forests also have the ability to store and sequester carbon and should play an important role in climate mitigation.

Arterial Drainage Maintenance Activities have the potential to drain peatlands which directly and in combination with associated changes in land use of peatlands can release sequestered carbon dioxide and methane.

### 5.9.1 Future Trends

Since climate change is the most significant challenge facing future generations significant declines in greenhouse gas emissions are necessary to avoid irreversible impacts. The UN Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol are international conventions addressing causes, consequences, and potential mitigation measures for climate change. In the European Union, the Climate and Energy Package and the Adaptation Strategy provide guidelines for Irish action. The National Climate Change Strategy (DEHLG, 2007) focuses on developing a strategy for Ireland to meet the GHG emissions limits set under the Kyoto Protocol. Ireland utilises several policy instruments, both domestic and EU, to help mitigate GHG emissions such as EU Emissions Trading Scheme and CAP Reform, and national carbon tax and policies to promote low emissions. There are other actions and plans in place in various sectors in Ireland including the *Delivering a Sustainable Energy Future for Ireland*, the National Bioenergy Action Plan, the National Energy Efficiency Action Plan, Smart Travel-A Sustainable Transport Future, and the Government's White Paper on Low Carbon Future for Ireland (2015). The Food Harvest 2020 plan should be carried out in a sensible way to ensure that any potential rise in greenhouse gasses from the agricultural sector is recognised and mitigated. According to the EPA's State of the Environment Report (2015), Ireland is believed to be on track to meet the Kyoto commitment. Strategies and plans to protect important habitats in Ireland have been introduced such as the National Peatland Strategy (2015) produced by NPWS and the DAHG, in hopes of implemented better management guidelines for Ireland's peatlands and prevent further degradation, similarly the Draft National Forestry Programme 2014-2020 (see Section 5.3: Land-Use).

The Climate Action and Low Carbon Development Bill (2015) and the National Climate Change Adaptation Framework (2013) and the OPW Climate Change Sectoral Adaptation Plan for Flood Defence, all address the potential predictions of climate change and potential strategies to mitigate and adapt to climate change impacts. Reducing the carbon emissions of public sector activities is included in the Low Carbon Development Bill.

#### Climate predictions

The Met Eireann publication of 'Ireland's Climate: the Road Ahead' (2013) based on downscaled global climate simulation models for Ireland predicts potential changes in climate. It is anticipated that mean temperatures will increase by 1.5 degrees by 2050. These warm temperatures will become more evident in winter and summer, which will experience a 3 degree and 2 degree rise, respectively. Winters are expected to be wetter with increases of up to 14% in precipitation (under the high emissions scenario) and the frequency of heavy rainfall events will rise to up to 20%. Summers are also expected to be drier (approximately 20% in reduction of precipitation under the high emissions scenario). These climate change impacts vary by region with the South East likely to experience the greatest increase in summer temperatures and the West experiencing the increase in winter rainfall. The changes in precipitation are likely to alter the river catchment hydrology. Expected mean height of waves is estimated to reduce while winter and spring storms wave heights are likely to rise. Mean sea level is also predicted to increase.

Arterial Drainage Maintenance Activities need to adapt to the potential changes in climatic conditions that may be experienced in Ireland. These variations will impact the Arterial Drainage Programmes differently (Arterial drainage scheme (major and minor), Embankments, Flood relief schemes). Each programme must be considered individually when determining potential adaptation strategies to climate change. Future performance will depend on the adaptive capacity of the Arterial Drainage Schemes, embankments, and flood relief schemes.

A significant amount of Arterial Drainage Schemes are located in the west of the country or comprise of small coastal outlets. Therefore, an increase in rainfall and winter flow, as well as, high sea levels and frequency of storms, will impact the effectiveness and suitability of the Arterial Drainage assets. For smaller arterial drainage schemes, sea level rise alone could result in the existing scheme being unable to provide its intended function. It is important to consider how the

climate change predictions could prompt a change in land-use in order to adjust accordingly. The potential challenges that could be faced are the following:

- Increased flood risk from embankments and schemes through asset failure.
- Decreased drainage of benefitting lands due to increased rainfall.
- Importance of adaptive capacity of arterial drainage channels, embankments and flood relief schemes to continue to provide their intended function and also other as yet unknown functions, such as water storage for irrigation or human water supply.

Potential adaptation alternatives can range from (1) do nothing; (2) contain; (3) increase standard ;( 4) refurbish assets.

Monitoring of current receptors (flow regime, agricultural practices, discharges, irrigation, and flood risk) in terms of the adaptive capacity can help determine the best course of action to adapt to climate change projections in the most sustainable manner.

### 5.9.2 Key Environmental Issues

In accordance with the Irish SEA Regulations [S.I. 435 of 2004], considerations have been given to whether the environmental effects, both positive and negative, of the Arterial Drainage Maintenance Activities (2016-2021) are likely to be significant on each receptor.

Greenhouse gas emissions from plant and machinery.

Climate change mitigation and adaptation of Arterial Drainage Assets and Maintenance Activities are needed, including effects from severe weather event.

Increased likelihood of river and coastal flooding.

Potential for increased fluvial and coastal flooding resulting from climate change.

Increased rainfall and sea level influencing the ability of arterial drainage schemes and embankments to function as designed.

The release of greenhouse gases as a result of altering or cutting bog should be avoided.



## 5.10 Interrelationships

In accordance with the SEA Directive, the inter-relationship between the SEA environmental topics must be taken into account.

Human Being	✓								
Land-Use	✓	✓							
Flora, Fauna, Biodiversity	✓	✓	✓						
Water	✓	✓	✓	✓					
Cultural Heritage	✓	✓	X	✓	✓				
Infrastructure and Material Assets	✓	✓	✓	✓	✓	✓			
Air and Climate Change	✓	✓	✓	✓	X	✓	✓		
Soil and Geology	✓	✓	✓	✓	✓	✓	✓	✓	
	Human Being	Land-Use	Flora, Fauna, Biodiversity	Water	Cultural Heritage	Material Assets	Air and Climate Change	Soil and Geology	

✓=Interrelationship anticipated

X=No Interrelationship anticipated

Key interrelationships arise between water, biodiversity, flora, and fauna, geology and soils, land use, and human beings. It is important to recognise that the impact on one receptor will directly or indirectly influence the rest. A sustainable approach to management is necessary for a comprehensive methodology for the Arterial Drainage Maintenance Activities (2016-2021).

The relationship between biodiversity, flora, and fauna and water resources in Ireland is very important because the aquatic environment (eg. Freshwater Pearl Mussel, Atlantic Salmon) directly depends on the quality and quantity of water resources. Terrestrial/wetland habitats rely indirectly on water to sustain environments such as turlough, peatlands, wetlands, and fens, which supports high levels of biodiversity (flora and fauna). Good water quality also supports fisheries populations, which in turn delivers a valuable amenity resource, along with direct recreational use of the water environment. In addition, water quality is crucial for human health as it provides drinking water to nearby populations.

Humans, land-use, and infrastructure are interconnected since they are influenced by population dynamics, growth, and movement (urbanisation etc). These receptors are also dependent on the Irish and European economy, as well as, the political agenda of the country at the time. These receptors cause anthropogenic changes to the natural environment, therefore, directly impacting water, flora, fauna, and biodiversity, soil and geology, and in the long-term impacting air and climate change.

Cultural heritage sites and artefacts are crucial to understand human evolution and history, for that reason, the maintenance and protection of these are very important. Land-use changes, infrastructure change/construction, urbanisation, and flooding are all developments that could cause potential threat to these areas or items.

## 6 Draft Environmental Objectives and Targets

### 6.1 Introduction

The concept of the objectives are that they can form a set of performance reporting criteria for arterial drainage maintenance, as well as a robust set of objectives for repeat assessments. All objectives must be measurable, strategic and not tactical, and something arterial drainage maintenance has an influence upon.

The objectives are similar to outcome measures reported by the Environment Agency on a quarterly basis and the CFRAM Flood Risk Management objectives.

For the five year arterial drainage maintenance programme to be sustainable it must:

- Balance positive and negative environmental, social, economic and cultural heritage impacts. To assess this each objective should be weighted for relative importance and the impacts of the proposed programme and alternatives should be compared.
- Be cost effective and an optimal use of public funds. It is unsustainable to allocate public funds where there is insufficient return on investment or the returns are not being realised.
- Have no long term impact on the most sensitive environmental indicators. The importance of irreversible impacts in relation to the Habitats Directive, WFD and cultural heritage must be considered.
- Reduce climate change impacts and contribute to climate change mitigation.
- Allow for adaptation to future climate change.

Aspect	Objective	Sub-objective	Target (Minimum) timescale in italics	Indicator	Monitoring	Responsibility	SEA Topic
Environmental (Water)	Support the objectives of the Water Framework Directive (WFD).	Enhance natural fluvial processes in support of WFD objectives, through delivery of new, and maintenance of existing, EREP and other river restoration works that are part of the arterial drainage maintenance programme.	Improved biological status and hydromorphological conditions of all arterial drainage channels influenced by EREP and other river restoration works.	Biological status and hydromorphological conditions of channels influenced by EREP and river restoration works (both new and existing EREP projects).	Annual change in biological and chemical status, hydromorphological conditions and water body status of relevant waterbodies.	EPA monitoring programme.  OPW supplementary monitoring programme.	Flora, Fauna & Biodiversity, Water (Hydromorphology)
		Provide no impediment to the achievement of water body objectives and contribute to the achievement of water body	Provide no constraint to the achievement of water body objectives during and beyond this 5 year	Numbers of water bodies, with connectivity to channels, embankments and flood relief schemes,	Ensure that the arterial drainage works will not conflict with	OPW to report.	

Aspect	Objective	Sub-objective	Target (Minimum) timescale in italics	Indicator	Monitoring	Responsibility	SEA Topic
		objectives.	maintenance period.	maintained within the 5 year Arterial Drainage Maintenance period failing to achieve GES/GEP due to hydromorphology.  (indicator is designed to remove other variables which influence water body status, and focus on hydromorphology which is strongly linked to arterial drainage maintenance and historic channel works)	achieving good water quality status of the waterbodies.  A pre-survey check of the water quality upstream and downstream of the active area would give indication of pre and post works water quality in the waterbody. Seasonal variations in water quality must be considered.		
		Ensure water quality remains adequate to support a healthy aquatic biological community and that it meets environmental standards established for general physiochemical conditions and specific pollutants of concern.	Ensure no deterioration of physiochemical conditions or an increase of specific pollutants of concern, maintain adequate biological environment in the rivers and channels. Ensure that dissolved oxygen levels remain at acceptable levels.	Ecological and chemical status of rivers and channels influenced by maintenance activities (on channels, embankments and flood relief schemes) that are part of the Arterial Drainage Programme.			
Environmental (Flora, Fauna & Biodiversity)	Protect the flora and fauna within the river, river corridor and along vehicular access points and where possible enhance biodiversity.	Support the objectives of the EU Habitats and Birds Directives by avoiding detrimental effects to, and where possible enhance, Natura 2000 network, protected species and habitats.	No deterioration in the conservation status of designated sites screened in for Appropriate Assessment (level 2 Natura Impact Statement) as a result of maintenance activities on channels, embankments and completed flood relief schemes during and beyond this 5 year	Annual change in conservation status of designated sites screened in for Appropriate Assessment (i.e. Arterial Drainage channels and embankments which require level 2 Natura Impact Statement of maintenance activities).  Loss of, or significant	Annual change in conservation status of relevant designated sites.  Change in status of relevant annexed priority habitats and species on a national basis.	NPWS monitoring programme.  OPW supplementary monitoring programme.  OPW to report.	Flora, Fauna & Biodiversity

Aspect	Objective	Sub-objective	Target (Minimum) timescale in italics	Indicator	Monitoring	Responsibility	SEA Topic
			maintenance period.	changes to habitat of, priority habitats and species where Arterial Drainage Schemes have the greatest impact or where significant proportion of the annexed habitats or species are located in the proximity to Arterial Drainage scheme catchments, channels or embankments.	Area of Annex I habitat created.  Area of Annex I habitat restored or enhanced.		
		Avoid damage to, and where possible enhance, legally protected sites/habitats and species of national, regional and local conservation importance.	No deterioration in the conservation status of designated sites as a result of maintenance activities on arterial drainage schemes, embankments or flood relief schemes during and beyond this 5 year maintenance period.	Reported changes in population sizes and/or areas of suitable habitat maintained or created for target species.	Annual change in conservation status.  Area and coverage of habitat and species of interest.	NPWS monitoring programme.  OPW supplementary monitoring programme.  OPW to report.	Flora, Fauna & Biodiversity
		Protect existing riverine, wetland and peatland habitats to maintain naturally functioning ecosystems and hydromorphological conditions.	Protection or enhancement of existing habitats during and beyond the 5 year maintenance period.	Support delivery of the National Peatlands Strategy.  Area of habitat/length of river & river corridor enhanced through implementation of maintenance programme activities.	Annual review of maintenance activity impacts upon peatlands.  Annual reporting and change	OPW, NPWS and IFI monitoring programme.  OPW to report.	Flora, Fauna & Biodiversity, Water (Hydromorphology)
		Protect, and where possible enhance, hedgerows and woodlands within the riparian corridor.	No net loss of hedgerow and woodland within the riparian corridor during and beyond the 5 year maintenance period.	For channels, embankments and flood relief schemes programmed for maintenance works, the	Annual reporting and change	OPW and NPWS monitoring programme.	Flora, Fauna & Biodiversity, Water

Aspect	Objective	Sub-objective	Target (Minimum) timescale in <i>italics</i>	Indicator	Monitoring	Responsibility	SEA Topic
				lengths of hedgerow and woodland within the riparian corridor removed, created or re-established		OPW to report.	
		Minimise the risk of spread of any invasive aquatic or terrestrial species.	No increase in the spread of invasive aquatic species during the 5 year maintenance period.	Length of arterial drainage river corridor affected by invasive species.	Annual reporting of change (length channel where invasive species is reported to now be present or no longer present)	OPW and NPWS monitoring programme.  OPW to report.	Flora, Fauna and Biodiversity (Fisheries)
Environmental (Fisheries)	Protect and, where possible, enhance the integrity of fisheries within the Arterially Drained catchments.	Maintain existing habitat supporting salmonid fisheries and carry out enhancement where possible.	No decrease in area or detriment to existing salmonid habitat as a result of maintenance activity during and beyond the 5 year maintenance period.	Areas of suitable habitat supporting salmonid fisheries.  IFI assessments on biodiversity and hydromorphological improvements following river enhancement works.	Annual reporting	OPW and IFI monitoring programme.  OPW to report.	Flora, Fauna and Biodiversity (Fisheries)
		Ensure no adverse effects on commercial shellfisheries.	No deterioration in existing EPA classification due to upstream maintenance activity during and beyond the 5 year maintenance period.	EPA classification of shellfish waters.	Annual reporting	OPW, IFI, NPWS and EPA monitoring programme.  OPW to report.	Flora, Fauna and Biodiversity (Fisheries)
Environmental (Climate Change)	Minimise the climate change impacts of Arterial Drainage maintenance activities	Reduce greenhouse gas emissions from machinery and equipment used in Arterial Drainage maintenance activity	To operate machinery with low carbon emissions  Annual reduction in greenhouse gas emissions from machinery and other arterial drainage	CO2 emissions from machinery, plant and vehicles. Can be inferred from emissions estimates, duration of operation or mileage.	Annual reporting	OPW	Climate change



Aspect	Objective	Sub-objective	Target (Minimum) timescale in <i>italics</i>	Indicator	Monitoring	Responsibility	SEA Topic
			<i>maintenance activities.</i>				
		Minimise release of sequestered greenhouse gases from sinks such as peatlands and forests.	No release of sequestered greenhouse gases during this 5 year maintenance period.	Area of peatland drained. Area of forest soils drained.  Tonnes of greenhouse gases (CO2 equivalent) emitted versus tonnes of greenhouse gases sequestered	Annual reporting  Calculation based on fuel used, peat removed and trees planted	OPW	Climate change
	Adaptation to climate change	Performance of arterial drainage scheme channels, embankments and flood relief schemes over time.	Monitoring and assessment of asset performance and condition informs asset management and maintenance plans.  Allocation of resources is optimised to benefits and risks.	Conveyance capacity (in % AEP) of Arterial Drainage Scheme Channels.  Standard of Protection of embankments and flood relief schemes.  Asset condition to indicate risk of failure of channels, embankments and flood relief scheme elements.	Monitoring programme of asset performance, standard or protection and condition.  Performance and condition under climate change scenarios to be assessed as a baseline.  Continued monitoring of performance, sea level rise, river flows and rainfall/drainage regime.	OPW	Climate change
		Adaptive capacity <sup>2</sup> of ongoing maintenance activities to	Maintenance activity does not restrict the adaptive	Measure of adaptability (performance of existing	Monitoring of adaptive	OPW with input from	Climate change

<sup>2</sup> The ability of a system to adjust to climate change (including climate variability and extremes), to moderate potential damages, to take advantage of opportunities and to cope with the consequences. (CLIMATE-ADAPT Glossary)

Aspect	Objective	Sub-objective	Target (Minimum) timescale in italics	Indicator	Monitoring	Responsibility	SEA Topic
		current and potential future demands.	<p>capacity of arterial drainage channels, embankments and flood relief schemes in relation to climate change scenarios and uncertainty.</p> <p>Maintenance activity is no-regret<sup>3</sup> or low-regret, in that it does not restrict adaptation of catchments and watercourses to future demands or changes:</p> <ul style="list-style-type: none"> <li>- Reduce potential for irrigation and increased abstraction.</li> <li>- Reduce potential of receiving waters for discharges.</li> <li>- Restrict potential for natural flood management or other flood management measures.</li> <li>- Reduce adaptive capacity for changes in agricultural practice.</li> </ul>	assets) under climate change scenarios.	<p>capacity.</p> <p>Monitoring changes in demands on watercourses and catchments.</p>	EPA, Teagasc and others.	
Social	Public access and recreation	Avoid negative impacts to existing water-based leisure activities.	Maintain level of existing water-based leisure activities during this 5 year maintenance period.	Level of compliments/ complaints from Community Councils and concerned residents or their spokesperson.	Annual reporting	OPW to report.	Material Assets (Tourism & Recreation)

<sup>3</sup> 'No-regret' measures are worthwhile now (in that they would deliver net socio-economic benefits which exceed their costs) and continue to be worthwhile irrespective of the nature of future climate change. (EC non-paper Guidelines for Project Managers: Making vulnerable investments climate resilient)

Aspect	Objective	Sub-objective	Target (Minimum) timescale in <i>italics</i>	Indicator	Monitoring	Responsibility	SEA Topic
	Contribute to viable and sustainable local communities	Contribution to health and wellbeing of local communities including local employment	TBC	<p>No. of people living in benefitting lands.</p> <p>Proportion of vulnerable people (elderly, young and in poor health) residing within benefitting lands.</p> <p>No. of hospitals, nursing homes, residential homes, schools and local community facilities in benefitting lands.</p> <p>No. of commercial, industrial and agricultural enterprises in benefitting lands.</p>	Baseline developed at start of programme. Annual reporting of flooding impacts.	OPW	Population & Human Health
		Maintain access to local services and transport networks up to the design standard of protection.	No road flooding in benefitting lands to the current standard of protection of Arterial Drainage Schemes (between the 50% and 20% AEP) during this 5 year maintenance.	<p>Length of local roads within benefitting areas.</p> <p>Number of local roads flooded annually.</p> <p>Number of local roads impassable by car.</p>			Population & Human Health
Economic	Avoid damage to, and where possible improve, the function and quality of the soil resource.	Maintain soil quality and function for productivity on agricultural lands.	No reduction in average agricultural yield in benefitting lands over this 5 year maintenance period.	TBC	Annual progress report.	OPW and Teagasc monitoring.  OPW to report	Soil & Land-use
	Support agricultural activity without conflicting with	Maintain lands available for economic activity and no change as to render existing economic activity unviable.	Maintain benefitting lands at current economic activity potential.	<p>Area of agricultural land in benefitting land.</p> <p>Area of agricultural land in</p>	Baseline developed at start of programme.	OPW	Material Assets

Aspect	Objective	Sub-objective	Target (Minimum) timescale in <i>italics</i>	Indicator	Monitoring	Responsibility	SEA Topic
	environmental objectives.		No flooding of agricultural land in benefitting lands to the current standard of protection of Arterial Drainage Schemes (between the 50% and 20% AEP) during 5 year maintenance period.	benefitting lands flooded annually.	Annual reporting of flooding impacts.		
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).	No detrimental impact upon architectural features as a result of arterial drainage maintenance activities during and beyond this 5 year maintenance period.	No. of architectural buildings and structures listed on the RPS and ACAs within zone of influence of the 5 year maintenance programme (per year).  No. of architectural buildings and structures listed on the RPS and ACAs with impact assessments prior to maintenance works.	Baseline developed at start of programme. Annual reporting	OPW to monitor and report.	Cultural Heritage (Architectural and Archaeological Heritage)
		Protect archaeological features listed on the Record of Monuments and Places (RMP) or other listed National Monument and Archaeological Sites.	No damage to or loss of features listed on the RMP as a result of Arterial drainage maintenance works during and beyond the 5 year maintenance period.	Numbers of archaeological features registered on the RMP within the zone of influence over this 5 year maintenance period (per year)  No. of RMPs with archaeological assessment prior to maintenance works.	Baseline developed at start of programme. Annual reporting	OPW to monitor and report.	Cultural Heritage (Architectural and Archaeological Heritage)

Aspect	Objective	Sub-objective	Target (Minimum) timescale in italics	Indicator	Monitoring	Responsibility	SEA Topic
	Protection of unknown features of cultural heritage	Protect undiscovered archaeological features.	Maintenance activity causes no detrimental impact upon or loss of unknown cultural heritage features during and beyond this 5 year maintenance period.	Percentage of arterial drainage channel reaches or embankments in peatlands, estuaries or through towns in maintenance programme with archaeological impact assessment screening study.	Annual reporting	OPW to monitor and report.	Cultural Heritage (Architectural and Archaeological Heritage)



## 7 Proposed Monitoring Programme

### 7.1 Introduction

The SEA Directive requires that the significant environmental effects of the implementation of plans and programmes are monitored. This section details the measures which will be used in order to monitor the likely significant effects of implementing the Operational Programme.

Monitoring can enable, at an early stage, the identification of unforeseen adverse effects and the undertaking of appropriate remedial action.

### 7.2 Updating Monitoring Measures

In line with the requirements in the legislation the likely significant effects on the environment will be assessed, such as cumulative, short term, medium term, long term, permanent, temporary, positive or negative effects as well as the interrelationship between affected areas. When possible and practical, assessment of these impacts will be quantitative.

In order to ensure implementation of the proposed measures, monitoring arrangements will be provided and will include, where feasible, details as to the frequency of the monitoring programme, and analysis and reporting on monitoring. As part of the monitoring programme, relevant and appropriate thresholds will be included to determine when remedial action is required for the particular aspect of the environment being monitored. Existing environmental monitoring is currently undertaken throughout Ireland by the OPW and other organisations like the EPA, IFI, and NPWS, for a number of environmental elements in accordance with environmental legislation, these sources will be used as baseline data or reference.

The Monitoring Strategy contains various levels of monitoring:

- Nationwide monitoring (conducted by other organisations and agencies, as well as OPW)
- Site/Channel Survey to describe general conditions associated with environmental receptors.

The performance of arterial drainage scheme channels, embankments and flood relief schemes is vulnerable to climate change impacts, specifically sea level rise, changes in temperature and rainfall patterns. The monitoring strategy needs to measure the adaptive capacity of these features and the maintenance programme. Monitoring of relevant climate change impacts and changes in the demands and pressures on catchments and watercourses in response to climate change (e.g. irrigation, abstraction, discharges, agricultural change, and flood risk management) should enable the planning and implementation of maintenance activities to adapt in a timely and appropriate response. Examples of such adaptations could range from stopping maintenance of embankments to allow for increased flood storage or adjusting the maintenance of channels to allow for changes in abstraction or discharge rates.

Further monitoring of asset (channel, embankment and flood relief scheme element) performance and condition should be undertaken to inform the most optimal use of resources. The assessment of performance should consider current and a range of possible future climate change projections. This should determine the need to adaptation of existing features or maintenance activities and with the condition reports identify which assets will need major refurbishment or replacement and when. The benefits provided by schemes (see below) can be used to understand the risk and implications to prioritise planning maintenance activity.

### 7.3 Indicators

Monitoring is based on receptors and indicators which allow quantitative measurements of trends and progress over time relating to the Strategic Environmental Objectives identified in Section 6 and used in the evaluation. The process of monitoring is ongoing and will be refined when the findings emerge.

#### 7.3.1 Water

In order to fulfil and support the objectives of the Water Framework Directive (WFD) there should be continuous monitoring of the water quality. Since Arterial Drainage works are being assessed it is important to remove all other variables (ie. other land uses, industrial or commercial pollution).

The EPA has a national monitoring programme to meet the requirements of the WFD as well as other EU and national obligations. It covers all surface water and underground water bodies in river, lakes, canals, estuarine/coastal waters, and groundwater. The programme monitors water quality by examining biological, chemical, and ecological status of surface waters, coastal waters, and groundwater. The EPA water quality assessment reports and annual updates could be used as baseline data. They could provide annual change in biological and chemical status, hydromorphological conditions and water body status of relevant waterbodies.

In order to assess the Arterial Drainage Programme only, a supplementary OPW monitoring programme may be necessary. Indicators that can display changes in hydromorphology which are strongly linked to arterial drainage maintenance and historic channel works will be sought.

### 7.3.2 Flora, Fauna, Biodiversity

Any changes in conservation status of relevant designated sites, as well as, status of relevant annexed priority habitats and species on a national basis will be updated by National Parks and Wildlife Services (NPWS). NPWS monitoring programme will determine if any new Annex I habitats are created, restored, or enhanced, or if there are any changes in conservation status.

IFI monitoring programme will identify the fisheries species and status within the surveyed channels.

An OPW supplementary monitoring programme could carry out walkover surveys of Arterial Drainage Channels in order to provide annual reporting of change (length of channel, invasive species reporting etc). A large baseline of river corridor habitat information and digital photos has been established on arterial drainage channels within Natura Sites over the last few years, and this could be used to track long-term change.

### 7.3.3 Human Beings

Annual reporting on relevant social receptors (No. of people in benefitting lands, proportion of vulnerable people within benefitting lands, no. of hospitals, nursing homes, schools, and local community facilities in benefitting lands) can be completed using resources such as Central Statistics Office (CSO).

In order to protect existing waterside access for recreational and community facilities during the Arterial Drainage Works the indicator can be the level of compliment or complaints from Community Councils and concerned residents or their spokesperson, which can be accounted for in an OPW annual report.

In order to prove that the Arterial Drainage Maintenance Activities are cost-effective, baseline receptors like average cost per kilometre of arterial drainage maintenance activities by type of activities; should all be estimated. Arterial drainage maintenance as a public service is benchmarked in terms of cost effectiveness against private sector operations and these cost effective figures can be used to track cost effectiveness.

Flood risk benefits of arterial drainage maintenance activity (assume protection is the difference in damages between the benefitting lands (with maintenance) and 50% (no maintenance) AEP standards of protection). Base assessment on simple unit costs of flood damage per property per ha of productive agricultural land used in Minor Works Schemes.

### 7.3.4 Climate Change

The OPW could annually report the tonnes of greenhouse gases (CO<sub>2</sub> equivalent) emitted. This calculation can be based on fuel used. CO<sub>2</sub> emissions from machinery plant and vehicles can be inferred from emissions estimates duration of operation or mileage.

A baseline would need to be developed with reporting of change over the five year period.

## 7.4 Responsibility

Responsibility for monitoring will fall to the Office of Public Works (OPW), however this is reliant on monitoring programmes and data from a number of third parties including: Environmental Protection Agency (EPA), National Parks and Wildlife Services (NPWS), Inland Fisheries Ireland (IFI) and Teagasc.

## 8 Consultation & Next Steps

This scoping report forms the first formal consultation on the draft Arterial Drainage Maintenance Activities (2016-2021). Comments are invited on this SEA scoping report by **17th June 2016**. All comments received will be recorded and acknowledged, and if appropriate changes will be made to our understanding of the environmental baseline, planning and policy context and SEA objectives.

### Consultation Questions

1. Are there any key constraints/issues that you feel have been missed out?
2. Are you aware of any other sources of environmental data or plans/policies/programmes that would be of use for this study?
3. Do you agree with the draft SEA objectives and monitoring proposals?

Following the consultation phase, the finalised SEA objectives will be used to assess the proposed activities and alternatives. The outcome will be a SEA Environmental Report.

## **Appendices**

### **A Appendix -Summary the other plans, policies and programmes of relevance to the Arterial Drainage Scheme and Maintenance**

Topic	Level	Plan / Programme / Policy	Description	Influence on / Relevance for Arterial Drainage Maintenance Scheme
<b>Biodiversity Flora and Fauna</b>	International	EU Bird Directive (2009/147/EC)	Europe has more than 500 wild bird species and at least 32% of these are not in a good conservation status. The Bird Directive aims to protect all 500 wild bird species naturally occurring in the EU. All member states must abide by the requirements of the Directive which includes reporting on the status and trend of bird populations, as well as potential designations. (European Commission)	These Directives are directly relevant to the Arterial Drainage Maintenance Programme because any work that is carried out within existing waterbodies, or the creation of new waterbodies or embankments, can alter or damage habitat, directly or indirectly affecting species of flora and fauna. It is crucial to acknowledge which sites are within Natura 2000 sites in order to ensure appropriate procedures and management to the works.
		EU Biodiversity Action Plans- Heritage the loss of Biodiversity by 2010	The EU Biodiversity action plan aimed at reinforcing action to halt the loss of biodiversity in the EU by 2010. Accelerating the progress towards the recovery of habitats and natural systems in the EU. As well as, optimising the EU's contributions towards the rate of biodiversity loss worldwide by 2010.	
		The Habitats Directive (Council Directive 92/43/EEC)	The Habitats Directive ensure the conservation of a wide of a wide range of rare, threatened or endemic animal and plant species. Approximately 200 rare and important habitats are targeted for conservation.	
	National	Actions for Biodiversity 2011-2016. Ireland's 2nd National Biodiversity Plan <a href="http://www.npws.ie/legislationandconventions/nationalbiodiversityplan/">http://www.npws.ie/legislationandconventions/nationalbiodiversityplan/</a>	The National Biodiversity Plan outlines the measures that will be taken to conserve biodiversity in Ireland, presented as 102 actions under a series of 7 Strategic Objectives. This second plan builds on the achievements since 2002 and focuses on actions that were	Target 7 of the plan is to "optimise benefits for biodiversity in Flood Risk Management Planning". As part of this Ireland will ensure that the assessment of flood risk management measures in the preparation of the Flood Risk Management Plans consider the optimisation of benefits for biodiversity through restoration of floodplains, promotion of sustainable land uses and the improvement of water retention, including the controlled flooding



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			not fully completed in the lifetime of the first plan and addresses emerging issues. The overarching target of this plan is “that biodiversity loss and degradation of ecosystems are reduced by 2016 and progress is made towards substantial recovery by 2020”	of certain areas where appropriate. It is also an action to ensure that all significant drainage is assessed for its implications for biodiversity and particularly for wetlands. Other targets in the plan likely to be relevant to the Arterial Drainage Maintenance Programme include reducing pollutant pressures, controlling harmful invasive species, progressing towards “good ecological status”, maintaining/ restoring fish stock levels, safeguarding the Natura 2000 network and moving towards favourable conservation status.
		National Species Action Plans (SAPs) (various SAPs are likely to contain actions relevant to the Western RBD and flood risk management, including those for Otter and bats) <a href="http://www.npws.ie/publications/speciesactionplans/">http://www.npws.ie/publications/speciesactionplans/</a>	Under Action 26 of the National Biodiversity Action Plan, NPWS is committed to preparing SAPs for species of highest conservation concern. Threat response plans have also been produced for several species.	The purpose of a SAP is to outline the work to be done and strategies to be followed for the conservation of the species. Given the broad range of actions within them, they inform the policy of all Government agencies, including the OPW and a number of actions within them relate to works within watercourses.
		Draft National Peatland Strategy	The aim of the cross-governmental approach to managing peatlands including compliance with EU environmental law, climate change, forestry, flood control, energy, nature conservation, planning, and agriculture. The strategy also sets out proposals for the development of a new regulatory regime for turf contractors.	Peatland are very important habitats in Ireland, their conservation, is crucial from a biodiversity point of view and their deterioration results in extensive environmental problems. The reason this strategy is of relevance to the Arterial Drainage Program is because special precautions should be taken if the any work are carried out in close proximity to peatlands. Its gives suggestions on guidelines and targets for peatland conservation.
	Local	Biodiversity Action Plan for County Galway 2008 - 2013 <a href="http://www.galway.ie/en/Services/Heritage/BiodiversityProject/ActionPlan/TheFile,7481,en.pdf">http://www.galway.ie/en/Services/Heritage/BiodiversityProject/ActionPlan/TheFile,7481,en.pdf</a> Galway City Draft Biodiversity Action Plan 2013 - 2023	Each County/City within the Western RBD has developed Local Biodiversity Action Plans to promote, protect and enhance the biodiversity of each County/City Council area. These local area biodiversity action plans mirror the	The overarching aim of all the plans is to promote, protect and enhance biodiversity and key habitats and species within each County/City. Some of the actions within the local Biodiversity Action Plans relate to the freshwater environment and potential interact with the Arterial Drainage Scheme and Maintenance programme, for

Topic	Level	Plan / Programme / Policy	Description	Influence on / Relevance for Arterial Drainage Maintenance Scheme
		<a href="http://www.galwaycity.ie/GeneralNews/041212_01.pdf">http://www.galwaycity.ie/GeneralNews/041212_01.pdf</a> County Mayo Biodiversity Action Plan 2010 – 2015 <a href="http://www.mayococo.ie/en/media/Media,19219,en.pdf">http://www.mayococo.ie/en/media/Media,19219,en.pdf</a> County Sligo Draft Biodiversity Action Plan <a href="http://www.sligococo.ie/media/Draft%20Sligo%20Biodiversity%20Action%20Plan.pdf">http://www.sligococo.ie/media/Draft%20Sligo%20Biodiversity%20Action%20Plan.pdf</a> County Roscommon Heritage Plan 2012-2016: Incorporating County Roscommon Biodiversity Action Plan <a href="http://www.roscommoncoco.ie/en/Services/Heritage/County_Roscommon_Heritage_Plan_2012-2016/County_Roscommon_Heritage_Plan_2012-2016.pdf">http://www.roscommoncoco.ie/en/Services/Heritage/County_Roscommon_Heritage_Plan_2012-2016/County_Roscommon_Heritage_Plan_2012-2016.pdf</a> Clare Biodiversity Action Plan <a href="http://www.aughty.org/pdf/ClareBiodivActionPlan.pdf">http://www.aughty.org/pdf/ClareBiodivActionPlan.pdf</a>	objectives of the National Biodiversity Plan.	example, in seeking to protect and enhance the water and habitat quality of rivers and lakes.
		County Waterford Local Biodiversity Action Plan (2008-2013) <a href="http://www.askaboutireland.ie/enfo/irelands-environment/county-focus/waterford-city/local-events-information/waterford-city-biodiversi/biodiversityactionplan.pdf">http://www.askaboutireland.ie/enfo/irelands-environment/county-focus/waterford-city/local-events-information/waterford-city-biodiversi/biodiversityactionplan.pdf</a>		
		(Draft) County Meath Biodiversity Action Plan 2015-2020 <a href="http://www.meath.ie/CountyCouncil">http://www.meath.ie/CountyCouncil</a>		

Topic	Level	Plan / Programme / Policy	Description	Influence on / Relevance for Arterial Drainage Maintenance Scheme
		<a href="#">I/Heritage/NaturalHeritage/Biodiversity/CountyMeathBiodiversityActionPlan/</a>		
		County Cork Biodiversity Action Plan 2009-2014 <a href="http://www.corkcoco.ie/co/pdf/734358998.pdf">http://www.corkcoco.ie/co/pdf/734358998.pdf</a>		
		County Wicklow Biodiversity Action Plan 2010-2015 <a href="http://www.wicklow.ie/sites/default/files/County%20Wicklow%20Biodiversity%20Action%20Plan.pdf">http://www.wicklow.ie/sites/default/files/County%20Wicklow%20Biodiversity%20Action%20Plan.pdf</a>		
		Freshwater Pearl Mussel Sub-basin Management Plans (various) <a href="http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/">http://www.wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/</a>	The purpose of the Freshwater Pearl Mussel Sub-basin Management Plans is to address catchment-wide issues that are impacting upon mussel populations (physical modification, pollution, recreation, agricultural activities, forestry). The plans also contain Summary Action Programmes which contain the site specific measures needed to bring the populations back into favourable condition.	Several plans recognise that future flood alleviation schemes or physical modifications to the bank or channel (Arterial Drainage Maintenance work) in the vicinity of the freshwater pearl mussel are a significant risk. In the Action Programme all plans therefore suggest that necessary legislative change to control morphological alterations of surface waters are implemented.

Topic	Level	Plan / Programme / Policy	Description	Influence on / Relevance for Arterial Drainage Maintenance Scheme
<b>Fisheries</b>	National	National Report for Ireland on Eel Stock Recovery Plan (2008) <a href="http://www.dcenr.gov.ie/NR/rdonlyres/85E7B93C-9E85-4E81-8848-CAB42E1037BC/0/NationalManagementPlan191208v.pdf">http://www.dcenr.gov.ie/NR/rdonlyres/85E7B93C-9E85-4E81-8848-CAB42E1037BC/0/NationalManagementPlan191208v.pdf</a>	This plan assesses the status and threats to Eels in Ireland and contains a number of measures to allow the recovery of the stock of European eel. It also establishes the basis for the development of Eel Management Plans in river basin districts.	This plan contains a number of management actions to assist in the recovery of Eel stocks.
	Regional	Western River Basin District Eel Management Plan <a href="http://www.dcenr.gov.ie/NR/rdonlyres/1A1CFE18-5A7E-4441-A13F-DB98B1F5988F/0/WRBD191208.pdf">http://www.dcenr.gov.ie/NR/rdonlyres/1A1CFE18-5A7E-4441-A13F-DB98B1F5988F/0/WRBD191208.pdf</a>	This plan has been prepared in accordance with Council Regulation (EC) No. 1100/2007. It gives an overview of the Western RBD and Eel stocks within it, along with a description of current and future monitoring and management actions that will ensure that target levels of escapement are achieved.	In the Western RBD the main surface water pressures derive from water abstraction, water flow regulation, morphological alterations (drainage and river defence works), point sources (from industrial and urban wastewater mainly) and diffuse sources (urbanisation, agriculture, forestry and peat harvesting). The main morphological pressures arise from channelisation and dredging impacting bed slope, side slope and flow changes. The management actions from the National Stock Recovery Plan are translated directly into the Western RBD Eel Management Plan (see above).
	Local	Shellfish Water Action Programmes <a href="http://www.agriculture.gov.ie/fisheries/aquacultureforeshoremanagement/shellfishwatersdirective/">http://www.agriculture.gov.ie/fisheries/aquacultureforeshoremanagement/shellfishwatersdirective/</a>	Shellfish Waters Directive translated into Irish Law by European Communities (Quality of Shellfish Waters) Regulations 2006 (SI No 268) establishes measures to protect shellfish waters, against pollution and to safeguard certain shellfish populations from various harmful consequences, resulting from the discharge of pollutant substances into the sea. There are 14 Shellfish Waters in Ireland and Pollution Reduction Programmes and action plans have been devised for each that describe the shellfish area catchment, the pressures and risks in the area and sets	There are currently various Shellfish Waters with Shellfish Action Programmes in Ireland. The Arterial Drainage Programme will have to ensure that the water quality of the Shellfish areas is not impacted upon by the flood risk management options proposed.

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			out the actions proposed to alleviate risks.	
<b>Heritage</b>	National	National Heritage Plan (Department of Arts, Heritage, Gaeltacht and the Islands, 2002) <a href="http://www.corkcoco.ie/co/pdf/817002104.pdf">http://www.corkcoco.ie/co/pdf/817002104.pdf</a>	The national plan sets out a clear and coherent strategy and framework for the protection and enhancement of Ireland's heritage, including natural heritage, cultural landscapes, archaeology and architectural heritage.	Originally published in 2002 the National Heritage's Plan life was considered to be five years; however, it set the framework and requirement for production of Local Heritage plans at the County/City level (see below).
		Conserving Ireland's Maritime Heritage, 2006 <a href="http://www.heritagecouncil.ie/fileadmin/user_upload/Publications/Marine/Marine_Policy06_Eng.pdf">http://www.heritagecouncil.ie/fileadmin/user_upload/Publications/Marine/Marine_Policy06_Eng.pdf</a>	This report advocates greater recognition of Ireland's maritime heritage and the significant role heritage can play in the development of Ireland's marine and coastal resources. It identifies actions to improve the protection, conservation and management of these resources.	The report advocates the concept of heritage sustainability for use in assessing planning and development proposals in marine and coastal areas.  The report recommends a number of actions to protect maritime heritage, relating to a range of factors including water quality, biodiversity and fisheries along with maritime archaeology, built heritage and cultural heritage.

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		The National Monuments Acts 1930-2004	Irish legislation for the protection of archaeological heritage is based on the National Monuments Acts 1930-2004, which is in accordance with the Valletta Convention. The Act secures the archaeological heritage in several key areas such as the protection monuments and areas, objects, control of archaeological excavation	The National Monuments Acts, the Architectural Heritage, and Historic Monuments Act, and Planning and Development Act, have set out to protect artefacts, buildings, and landmarks of cultural, historical, archaeological, or architectural significance. These Acts are relevant to the Arterial Drainage Maintenance because when works are carried out it is crucial to be aware of the potential for items to be uncovered and also that any works taking place in close proximity to areas of important cultural or historical significance follow specific guidelines.
		Architectural Heritage (National Heritage) and Historic Monuments (Miscellaneous Provisions) Act 1999	The national legislation advocates for the identification, recording, and evaluation of post-1200 architectural heritage of Ireland, as a way to build and protect. The National Inventory of Architectural Heritage (NIAH) is now a state initiative under the administration of the Department of Arts, Heritage and Gaeltacht.	
		The Planning and Development Acts (2000-2014)  Cultural Heritage And Landscape	In the Planning and Development Act 2000, there is a requirement that obliges planning authority to compile and maintain Record of Protected Structures (RPS).  It also contains provisions for the preservation and conservation of the landscape under the Act in Section 10, 202, and 204.  Section 10 of the Planning and Development Act, 2000, requires Local	



Topic	Level	Plan / Programme / Policy	Description	Influence on / Relevance for Arterial Drainage Maintenance Scheme
			<p>Authorities to include objectives for the following in their development plans:</p> <p><i>(2)(e) the preservation of the character of the landscape where, and to the extent that, in the opinion of the planning authority, the proper planning and sustainable development of the area requires it, including the preservation of views and prospects and the amenities of places and features of natural beauty or interest.</i></p> <p><i>Section 202, of the 2000 Act, gives Local Authorities the power to designate areas of special amenity:</i></p> <p><i>(1) Where, in the opinion of the planning authority, by reason of:</i></p> <p><i>(a) its outstanding natural beauty, or</i></p> <p><i>(b) its special recreational value,</i></p> <p><i>and having regard to any benefits for nature conservation, an area should be declared under this</i></p> <p><i>section to be an area of special amenity...</i></p> <p><i>The second type of special landscape is a Landscape Conservation Area. Section 204, of the Planning and Development</i></p>	
	Local	County Mayo Heritage Plan 2011 – 2016	Each County/City has developed Local	Arterial Drainage Programme works will have to ensure that the

Topic	Level	Plan / Programme / Policy	Description	Influence on / Relevance for Arterial Drainage Maintenance Scheme
		<a href="http://www.mayococo.ie/en/media/Media,17477,en.pdf">http://www.mayococo.ie/en/media/Media,17477,en.pdf</a> County Clare Heritage Plan, 2011-2017 <a href="http://www.clarecoco.ie/recreation-culture/publications/county-clare-heritage-plan-2011-2017-10318.pdf">http://www.clarecoco.ie/recreation-culture/publications/county-clare-heritage-plan-2011-2017-10318.pdf</a> County Roscommon Heritage Plan 2012-2016: Incorporating County Roscommon Biodiversity Action Plan <a href="http://www.roscommoncoco.ie/en/Services/Heritage/County_Roscommon_Heritage_Plan_2012-2016/County_Roscommon_Heritage_Plan_2012-2016.pdf">http://www.roscommoncoco.ie/en/Services/Heritage/County_Roscommon_Heritage_Plan_2012-2016/County_Roscommon_Heritage_Plan_2012-2016.pdf</a> Galway County Heritage Plan 2004-2008 (Heritage Plan Review 2009-2014 currently ongoing) <a href="http://www.galway.ie/en/Services/Heritage/HeritageArchives/HeritagePlan2004-2008/">http://www.galway.ie/en/Services/Heritage/HeritageArchives/HeritagePlan2004-2008/</a> County Sligo Heritage Plan 2007-2011 <a href="http://www.sligococo.ie/media/Media,6108,en.pdf">http://www.sligococo.ie/media/Media,6108,en.pdf</a> County Leitrim Heritage Plan 2003-2008 <a href="http://www.heritagecouncil.ie/fileadmin/user_upload/heritageplans/Leitrim_Heritage_Plan.pdf">http://www.heritagecouncil.ie/fileadmin/user_upload/heritageplans/Leitrim_Heritage_Plan.pdf</a>	<p>Heritage Plans, although the specified life of the plans in some cases has expired and they are in the process of being updated. These plans have been developed following issue of the National Heritage Plan.</p> <p>The aims of the plans are promoting best practice in heritage management; raising awareness and enjoyment of heritage; and the collection and dissemination of heritage information.</p>	<p>objectives of the County/City Heritage Plans are not compromised. This includes objectives such as promoting best practice standards for heritage management and conservation and maintaining and improving the water quality of surface waters (rivers &amp; lakes), groundwater and coastal waters.</p> <p>The Heritage Plans also often contain actions relating to the natural environment, such as protecting and enhancing habitat and species diversity and management of invasive species.#</p>

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		Galway City Walls Conservation, Management and Interpretation Plan: Public Consultation Draft January 2013 <a href="http://www.galwaycity.ie/AllServices/Heritage/Publications/150113_01.pdf">http://www.galwaycity.ie/AllServices/Heritage/Publications/150113_01.pdf</a>		
<b>Water</b>	International	EU Drinking Water Directives	The Drinking Water Directive concerns with the quality of water intended for human consumption. Its objective is to protect human from adverse effects of any contamination of water intended for human consumption by ensuring that it is wholesome and clean. The laid down the essential standards at EU level. Member states are required to transpose the law into national legislation and can include additional requirements.	Ensuring the maintenance or improvement of water quality is important to fulfilling the WFD targets and objectives. It is important that the works carried out for the Arterial Drainage Programme satisfy these aims and do not pose any threats to water quality.
		EU Bathing Water Directive (2007/7/EC)	The general purpose of the Directive was to create provisions to encourage monitoring and classification of bathing waters, management of bathing water quality, the provision of information to the public on bathing water quality.	
		EU Water Framework Directive (WFD)	The EU-Wide Law introduced in 2000 to bring a common approach to safeguarding all Community waterbodies and water-dependent ecosystems.	

Topic	Level	Plan / Programme / Policy	Description	Influence on / Relevance for Arterial Drainage Maintenance Scheme
	National	Arterial Drainage Act 1945	The Office of Public Works (OPW) is the body through which Central Government exercises statutory responsibilities in respect to river drainage and flood relief. It derives its statutory authority from the Arterial Drainage Acts, 1945 and 1995 and the European Communities (Assessment and Management of Flood Risk) Regulations 2010.	Where the OPW have completed drainage works under the act, there is a statutory requirement to maintain the drainage works forming part of the Scheme. These drainage works include watercourses, embankments, and other structures. Since the new watercourses or embankments could be subject to siltation, settlement, or erosion, ongoing maintenance activities are necessary.
		Water Services Act 2007	The Water Service Act 2007 (No.30 of 2007) places a duty of care on the owner of a waste water treatment system (Section 70) to ensure that 'it is kept so as not to cause or be likely to cause a risk to human health or the environment. It also gives powers to a person authorised by the WSA to direct the owner to take such measures as are considered necessary to deal with the risk. Inspections other than the risk-based inspections may be undertaken by authorised persons under the Water Pollution Act.	The standards that domestic waste water treatment systems shall meet are set out in the Water Services Acts 2007 and 2012 (Domestic Waste Water Treatment Systems) Regulations 2012 (S.I. No. 223 of 2012). These regulations were published in June 2012 following a public consultation process by the DoECLG. The regulations prescribe the actions to be taken by owners of domestic waste water treatment systems to ensure compliance with their obligations under Section 70(C)(1) of the Water Services (Amendment) Act 2012 It is important that the Arterial Drainage Program helps fulfil these regulations by maintenance and monitoring of the scheme.
		The Water Services (Amendment) Act, 2012 (No. 2 of 2012) And Waste Water Discharge (Authorisation) Regulation, 2007 (S.I.No.684 of 2007	The Water Services (Amendment) Act, 2012 (No. 2 of 2012) provides for the registration of domestic waste water treatment systems, the preparation of a National Inspection Plan and the	

Topic	Level	Plan / Programme / Policy	Description	Influence on / Relevance for Arterial Drainage Maintenance Scheme
			inspections and remediation of treatment systems that are impacting on health or the environment.	
		Groundwater Protection Schemes <a href="http://www.gsi.ie/NR/rdonlyres/64575B4B-A06E-484C-86DC-66288B347C0C/0/groundwater.pdf">http://www.gsi.ie/NR/rdonlyres/64575B4B-A06E-484C-86DC-66288B347C0C/0/groundwater.pdf</a>	Groundwater Protection Schemes aim to maintain the quantity and quality of groundwater, and in some cases improve it, by applying a risk assessment-based approach to groundwater protection and sustainable development. A scheme provides guidelines for the planning and licensing authorities in carrying out their functions, and a framework to assist in decision-making on the location, nature and control of developments and activities in order to protect groundwater.	Groundwater Protection Schemes have two main components: (a) land surface zoning; and (b) groundwater protection responses for potentially polluting activities. Land surface zoning is presented on a Groundwater Protection Map which delineates land areas in terms of groundwater vulnerability to pollution and groundwater potential. Groundwater protection responses for the different zones indicate the acceptability of a particular activity with respect to the potential hazard, aquifer category or source protection area, and groundwater vulnerability. A scheme also provides for the delineation of Source Protection Areas around significant groundwater supply sources.
		OPW Arterial Drainage Maintenance & High Risk Channel Designation: Draft Programme 2011 – 2015 <a href="http://www.opw.ie/en/media/Arterial%20Drainage%20Maintenance%20&amp;%20High%20Risk%20Channel%20Designation%20Draft%20Programme%202011-2015.pdf">http://www.opw.ie/en/media/Arterial%20Drainage%20Maintenance%20&amp;%20High%20Risk%20Channel%20Designation%20Draft%20Programme%202011-2015.pdf</a>	Where the Commissioners of Public Works have completed a drainage scheme under the Arterial Drainage Acts, 1945 and 1995, there is a statutory requirement to maintain the drainage works forming part of the Scheme. These drainage works include watercourses, embankments and other structures which can suffer from siltation, settlement and erosion. Ongoing maintenance activities are of a cyclical nature and are to maintain the channel at a certain outfall datum and conveyance capacity.	All arterial drainage work undertaken must be considered to ensure that all factors influencing flooding and flood risk are considered. A series of Ecological Impact Assessments, along with a SEA an assessment under the Habitats Directive has also been undertaken alongside this programme to ensure significant adverse environmental impacts do not arise.

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			An annual programme of maintenance is compiled to maintain the drainage works, which are prioritised based on the rate of deterioration and the risk arising. In any one year, approximately one-fifth of watercourses are maintained.	
		OPW Minor Flood Mitigation Works Programme <a href="http://www.opw.ie/en/floodriskmanagement/floodriskmanagementoperations/minorfloodworkscoastalprotection/scheme/">http://www.opw.ie/en/floodriskmanagement/floodriskmanagementoperations/minorfloodworkscoastalprotection/scheme/</a>	<p>The Minor Flood Mitigation Works &amp; Coastal Protection Scheme was introduced by the Office of Public Works in 2009. The purpose of the scheme is to provide funding to Local Authorities to undertake minor flood mitigation works or studies to address localised flooding and coastal protection problems within their administrative areas.</p> <p>Under the scheme, applications are considered for projects that are estimated to cost not more than €500,000 in each instance. Funding of up to 90% of the cost is available for approved projects.</p>	All minor works completed and proposed must be considered as part of the Arterial Drainage works and production of the FRMPs to ensure that all factors influencing flooding and flood risk are considered.



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		Second Nitrates Action Programme 2010-2013 <a href="http://www.environ.ie/en/Environment/Water/WaterQuality/NitratesDirective/#Ireland's+Nitrates+Action+Programme">http://www.environ.ie/en/Environment/Water/WaterQuality/NitratesDirective/#Ireland's Nitrates Action Programme</a>	This Programme has been devised in line with the Nitrates Directive (91/676/EEC) which is concerned the protection of waters against pollution by nitrates from agricultural sources. In accordance with the Directive each Member State is obliged to put in place a Nitrates Action Programme and to review and if necessary revise their action programme at least every four years. Ireland's first Nitrates Action Programme was reviewed in 2010 and the second programme has now been enacted through the European Communities (Good Agricultural Practice for the Protection of Waters) Regulations 2010 – SI No. 610 of 2010. It is due to be reviewed again in 2013.	<p>The regulations introduced as part of the Nitrates Action Programme strengthened statutory protection of waters against pollution from agricultural sources (e.g. by phosphorus or nitrogen). They require avoidance of farming practices which create a risk of pollution to water courses and provide for inspections and enforcement by local authorities. Specific provisions are included in relation to fertilisers and manures. The review of the programme in 2010 did not make substantial revisions, but strengthened protection measures, for example by increasing buffer zones for fertiliser application adjacent to watercourses and amending maximum nitrogen and phosphorous fertilisation rates.</p> <p>Flooding of agricultural land and farm properties potentially provides a pathway for nutrients and other agricultural chemicals to enter into watercourses. The Arterial Drainage Programme must recognise and ensure, where possible that waters are protected from pollution from agricultural sources.</p>
	Regional	Final River Basin Management Plan for the Western River Basin District in Ireland (2009-2015) <a href="http://www.wfdireland.ie/docs/1_River%20Basin%20Management%20Plans%202009%20-%202015/WRBD%20RBMP%202010/WRBD%20RBMP%202010.pdf">http://www.wfdireland.ie/docs/1_River%20Basin%20Management%20Plans%202009%20-%202015/WRBD%20RBMP%202010/WRBD%20RBMP%202010.pdf</a>	The Western River Basin Management Plan (RBMP) has been produced in accordance with the requirements of the Water Framework Directive (WFD). The WFD requires governments to take a new approach to managing their waters (i.e. rivers, lakes, groundwater, estuaries (transitional) and coastal waters). Waterbodies must achieve at least good status (or for artificial or heavily modified waterbodies; potential) by 2015 and ensure that status doesn't deteriorate. The RBMP outlines the measures necessary to achieve these aims in the	<p>The Western RBMP outlines the aims and objectives for achieving the requirements of the WFD in the Western RBD. The plan aims to achieve good status for 74% of rivers by 2015, with the step to 100% compliance to be achieved over the following two planning cycles to 2027. It is considered that the key factors contributing to poor water quality are discharges (e.g. nutrients from agricultural activities and municipal wastewater treatment works). Industrial discharges, wastewater from unsewered properties and discharges from other activities have also been identified as issues, along with water abstraction and physical modification.</p> <p>The RBMP identifies a Programme of Measures to protect and restore water status by addressing the main pressures in the RBD. The Arterial Drainage Scheme and maintenance</p>

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			Western RBMP.	programme must give full regard to the objectives of the RBMP and the Programme of RBMPs.
		Environmental River Enhancement Programme <a href="http://www.fisheriesireland.ie/Projects/erep.html">http://www.fisheriesireland.ie/Projects/erep.html</a>	The Environmental River Enhancement Programme (EREP) is an OPW funded project that is being co-ordinated and managed by Inland Fisheries Ireland. The programme focuses on the enhancement of drained salmonid rivers in Ireland.	The programme involves two different approaches to enhancement, these being capital enhancement and enhanced maintenance respectively. The EREP and the FRMPs developed as part of the arterial drainage scheme and maintenance programme potentially could work together to deliver further environmental benefits.
	International	EU Common Agricultural Policy	The Common Agricultural Policy allows European farmers to meet the need of 500 million Europeans. Its objectives are to ensure a decent standard of living for farmers and to provide a stable and safe food supply at affordable prices for consumers	The Arterial Drainage Program is important for Ireland because it creates waterways or embankments in order to drain land and prevent field from being flooded on a yearly basis. It indirectly assists in the efforts to maintain and increase sustainable productivity.
		The Clean Air for Europe ( CAFÉ ) Directive (2008/50/EC)	CAFÉ was published in 2008 and it replaced first, second, and third Daughter Directives. The Clean Air for Europe objectives are to develop, collect, and validate scientific information on the effect of air pollution, to support correct legislation and review the effectiveness of existing legislation and to develop new proposals as and when, necessary. To ensure that the requisite measures are taken at the relevant level, and to	<p>The Arterial Drainage Program should be aware the importance of CAFÉ and its objectives and similarly should be influenced by these during the works, ensuring appropriate machinery and equipment are used.</p> <p>The Irish Legislation introduced to fulfil the EU Directive are just as important and pertinent, yet its recommendations and objectives are more relevant to Irish laws and practices.</p>

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			develop structural links with the relevant policy areas.	
		The Fourth Daughter Directive (2004/107/EC)	The Fourth Daughter Directive (2004/107/EC) will be included in CAFÉ at a later stage.	
		Air Quality Standards Regulations 2011 (S.I.No.180 of 2011)	The CAFÉ directive were transposed into Irish Legislation Air Quality Standards Regulations. It also replaces the Air Quality Standards Regulations 2002 (S.I.No.271 of 2002), the Ozone in Ambient Air Regulations 2004 (S.I No. 53 of 2004) and S.I. No. 33 of 1999.	
		Mercury, Nickle, and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 (S.I No.58 of 2009).	The fourth Daughter Directive (2004/107/EC) was transposed into Irish legislation by the Arsenic, Cadmium, Mercury, Nickle, and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulation 2009 (S.I. No 58 of 2009).	
		National Emissions Ceiling (NEC) Directive	The substantive objective of the directive is to reach the national ceilings by 2010 and in later years (Article 4). In addition the directive requires the Member States to draft and report National Programmes and to report emissions and projections to the Commission and the European Environment Agency. These additional obligations serve as important measures to be taken by Member States to ensure that the ceilings are met by 2010.	

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Other	National	Ireland Rural Development Programme 2007-2013 <a href="http://www.rdsu.ie/the-national-rural-network/rural-development-programme/">http://www.rdsu.ie/the-national-rural-network/rural-development-programme/</a>	The Rural Development Programme for Ireland 2007-2013 (RDP) was approved by the European Commission in July 2007 and is based on the EU funding framework for Agriculture and Rural Development. The EU framework requires each country to submit a rural development strategy which they subsequently translate into a practical programme with measures, funding allocations, targets and mechanisms for delivery.	The RDP is structured around three key axes: - Improving the competitiveness of agriculture; - Improving the environment and land management; and - Improving rural quality of life, With a fourth axis focusing on the implementation of the LEADER approach.
		Rural Environmental Protection Scheme (REPS) <a href="https://www.agriculture.gov.ie/farmerschemespayments/ruralenvironmentprotectionschemereps/overviewofreps/">https://www.agriculture.gov.ie/farmerschemespayments/ruralenvironmentprotectionschemereps/overviewofreps/</a>	The REPS offers payment rewards to farmers who undertake farming methods in an environmentally friendly way. The objectives of the scheme are: Establish farming practices and production methods which reflect the increasing concern for conservation, landscape protection and wider environmental problems; Protect wildlife habitats and endangered species of flora and fauna; Produce quality food in an extensive and environmentally friendly manner.	Participants in REPS, AEOS, and GLAS must comply with eleven basic measures, including to protect and maintain all watercourses and wells and cease using herbicides, pesticides and fertilisers in and around hedgerows, lakes, ponds, rivers and streams (except with consent).  REPS, AEOS, and GLAS recognise the importance of the riparian zone in rural areas and the arterial drainage scheme and maintenance programme should make recommendations that are compatible with those in the current environmental protection schemes, which at the moment is GLAS.
		Agri-Environmental Options Scheme (AEOS)	A scheme launched in 2010 aiming to build on the Rural Environment Protection Scheme (REPS) in order to promote biodiversity, improve water quality and combat climate change.	

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		Green-Low Carbon Agri-Environmental Scheme (GLAS)	GLASS is the new agri-environmental scheme under the Rural Development Plan 2014-2020, which rewards farmers for carrying out environmentally sound practices that meet the criteria set out by the scheme.	
		Food Harvest 2020: A vision for Irish agri-food and fisheries <a href="http://www.agriculture.gov.ie/agri-foodindustry/foodharvest2020/">http://www.agriculture.gov.ie/agri-foodindustry/foodharvest2020/</a>	This plan is a strategy for the medium-term development of the agri-food (including drinks) fisheries and forestry sector for the period to 2020. It outlines the key actions needed to ensure that the sector contributes to the maximum possible extent to our export-led economic recovery and the full development of the smart economy.	This plan recognises that agriculture can have significant impacts on the environment, including the provision of environmental services, such as biodiversity, flood and drought control, and as a carbon sink. The role agricultural land can play in flood control and mitigation will need to be considered as part of the Arterial Drainage Scheme and Maintenance study, as will the importance of protecting key agricultural areas within the RBD.
		Ireland National Climate Change Strategy 2007 - 2012 <a href="http://www.environ.ie/en/Environment/Atmosphere/ClimateChange/NationalClimateChangeStrategy/">http://www.environ.ie/en/Environment/Atmosphere/ClimateChange/NationalClimateChangeStrategy/</a>	This strategy sets out a range of measures, building on those already in place under the first National Climate Change Strategy (2000) to ensure Ireland reaches its target under the Kyoto Protocol. It provides a framework for action to reduce Ireland's greenhouse gas emissions in the most efficient and equitable manner while continuing to support economic growth and preparing Ireland for the more ambitious commitments that will be required after 2012.	Climate change is identified as one of the important elements that needs to be addressed when assessing future flood relief measures in Ireland.  In relation to adaptive measures, the strategy recognises that the OPW has been appointed as the lead agency to implement flooding policy in Ireland and that they are currently developing a strategy to manage flood risk in conjunction with other relevant state agencies; the arterial drainage programme is a key aspect of this.  Also, the Planning and Development Act 2000 also empowers local planning authorities to provide, in their development plans policies so that development in areas at risk of flooding may be regulated, restricted or controlled. Therefore, if development is proposed in a flood-risk area, the risk of flooding can be carefully evaluated and planning permission refused, if necessary.
		Code of Best Forest Practice	The Code of Best Practice is designed to	The Code recognises the impacts forestry can have on water

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		<a href="http://www.agriculture.gov.ie/forestservice/publications/codeofbestforestpractice/">http://www.agriculture.gov.ie/forestservice/publications/codeofbestforestpractice/</a>	ensure that forest operations in Ireland are carried out in a way which meets high environmental, social and economic standards. It provides direction for forest managers by describing how forestry operations should be undertaken, specifically focusing on impacts on landscape, water quality, heritage and biodiversity.	quality, ecology and stability. Harvesting and access for forestry operations in particular can impact on the hydrology, chemistry and level of sedimentation in aquatic zones, through compaction by heavy machinery, soil displacement, increased run-off through drainage, and contamination with fertilisers, chemicals and fuel.  The importance of riparian woodlands, in relation to water quality, bank stabilisation and biodiversity, is also recognised. There are also related guidance documents on issues including Archaeology, Fisheries, Landscape and Biodiversity, among others
		Tourism Product Development Strategy, 2007 – 2013 <a href="http://www.failteireland.ie/getdoc/cbfcd692-3336-4d27-8dab-8cdb67bf40ea/Tourism-Product-Development-Strategy--2007---2013.aspx">http://www.failteireland.ie/getdoc/cbfcd692-3336-4d27-8dab-8cdb67bf40ea/Tourism-Product-Development-Strategy--2007---2013.aspx</a>	The strategy proposes a framework and policy guidance for the long-term development of the tourism product in Ireland.	The strategy recognises the importance of Ireland's inland waters to the national tourism product, however, although currently of a relatively high standard, their decline threatens tourism. The strategy recognises that pollution of rivers and streams is a key threat, particularly to salmon and trout stocks which are an important tourist resource. The strategy also recognises the importance of the coastline and off-shore islands to tourism.
		GRID25: A Strategy for the Development of Ireland's Electricity Grid for a Sustainable and Competitive Future <a href="http://www.eirgrid.com/media/Grid%2025.pdf">http://www.eirgrid.com/media/Grid%2025.pdf</a>	Over the next 15 to 20 years, major changes will take place in Ireland's electricity needs, in its sources of fuel and in its fleet of power stations. GRID25 provides an outline of how the development of the Grid should be undertaken to support a long-term sustainable and reliable electricity supply. It also supports the Government's priority actions of increasing the penetration of	GRID25 will bring new levels of wind generation, both on and off-shore and an introduction of commercial ocean technology-based generation to Ireland. The north-west is recognised as being particularly rich in wind and ocean renewable energy resources  It will be important that the arterial drainage scheme and protects these critical infrastructure assets, and recognises that future development proposed in this strategy may require protection from flooding.



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			renewable energy technologies and of improving energy efficiency and energy savings.	
		National Renewable Energy Action Plan to 2020 <a href="http://www.dcenr.gov.ie/NR/rdonlyres/C71495BB-DB3C-4FE9-A725-0C094FE19BCA/0/2010NREAP.pdf">http://www.dcenr.gov.ie/NR/rdonlyres/C71495BB-DB3C-4FE9-A725-0C094FE19BCA/0/2010NREAP.pdf</a>	The 2009 Renewable Energy Directive (2009/28/EC) requires each Member State to adopt a national renewable energy action plan and submit these to the European Commission. Ireland's National Renewable Energy Action Plan is the Framework within which Ireland has set out the detailed schemes, policies and measures to deliver the trajectory of growth from renewable sources.	The development of renewable energy is central to overall energy policy in Ireland. The significant growth in electricity from renewable sources in recent years is largely attributable to onshore wind. Moving towards, and beyond 2020, the Irish Government is looking for significant opportunities to develop Ireland's abundant offshore renewable energy resources, including offshore wind, wave and tidal energy. A key challenge in Ireland, which has been highlighted in national guidelines on wind energy development, is that many of the best wind energy sites are also the most sensitive environmentally and hydrologically (e.g. peat lands and other wetlands, uplands, mountains and coastal areas). The Arterial Drainage Scheme study provides opportunity to help protect critical infrastructure assets and could influence their development in hydrologically sensitive areas. The installation of hydroelectric power generation facilities will require specific consideration in relation to flood risk.
		Strategy for Renewable Energy: 2012 – 2020 <a href="http://www.dcenr.gov.ie/NR/rdonlyres/9472D68A-40F4-41B8-B8FD-F5F788D4207A/0/RenewableEnergyStrategy2012_2020.pdf">http://www.dcenr.gov.ie/NR/rdonlyres/9472D68A-40F4-41B8-B8FD-F5F788D4207A/0/RenewableEnergyStrategy2012_2020.pdf</a>	This high level Strategy is underpinned by the detailed National Renewable Energy Action Plan and sets out the Government's Strategic Goals for Renewable Energy, including the key Actions underway and those planned in the short and medium term for each of the renewable energy sectors. A number of counties in the Western RBD also have, or are planning to develop, county-	The Government's overriding energy policy objective is to ensure competitive, secure and sustainable energy for the economy and for society. Renewable energy, allied with energy efficiency, is crucial to achieving secure sustainable and competitive energy supplies and reducing dependency on expensive fossil imports and underpinning the move towards a low carbon economy. The arterial drainage programme provides opportunity to help protect critical infrastructure assets, although their impact on flooding and flood risk management will need to be considered.

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			level Renewable Energy Strategies.	
		Replacement Waste Management Plan for the Connacht Region 2006-2011 (and review) <a href="http://www.connachtwaste.ie/Downloads/">http://www.connachtwaste.ie/Downloads/</a>	This plan adopts a regional approach to integrated waste management based on the waste hierarchy established in the EU Framework Directive on Waste. It sets the targets for municipal waste of 48% recycling, 33% energy recovery and 19% residual waste disposal. The European Communities (Waste Directive) Regulations 2011 transpose the Waste Framework Directive (2008/98/EC) into Irish law; these regulations require a review of existing waste management plans to bring them into line with the requirements of this Directive.	This plan covers Galway City and County, Leitrim, Mayo, Roscommon, Sligo. It contains a specific policy of "waste treated or disposed of at landfill in the Region will be done in accordance with the highest environmental standards without causing environmental pollution". Flooding has the potential to create new pathways for contaminative substances, which may arise from landfill sites of other waste facilities, to reach rivers and result in pollution incidents.
		Delivering a Sustainable Energy Future for Ireland - The Energy Policy Framework 2007-2020	The action plan aimed determining actions to ensure security of energy supply, promotion of sustainable/green energy supply and use, and enhance the competitiveness of energy supply.	These strategies have been introduced in order to meet national and international climate change targets. Through public consultation, communication between various departments and Ministries, guidance documents, plans and strategies have been developed to introduce more sustainable practices in Ireland. These are continuously changing and being updated. It is crucial for the Arterial Drainage Programme to be aware of the existence of these plans and to acknowledge their targets.
		The National Bioenergy Action Plan	This plan aims at promoting Ireland's potential to provide bio-energy resources to generate electricity. The sustainable development of bioenergy as a resource will contribute to policy objectives in energy, environmental, climate change mitigation, rural and regional development policies. Targets were set in various departments: - Electricity sector - Transport fuel sector	

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			<ul style="list-style-type: none"> <li>- Heat Sector</li> <li>-Department of Finance</li> <li>-Department of Communications, Marine, and Natural Resources</li> <li>-Department of Agriculture and Food</li> <li>-Development of Environment, Heritage, and Local Government</li> </ul>	
		The National Energy Efficiency Action Plan	Ireland's third National Energy Efficiency Action Plan (NEEAP 3) reaffirmed Ireland's commitment to delivering a 20% reduction in energy demand across a whole of the economy by 2020, along with 33% reduction in public sector energy use. The plans outline energy efficiency measures that will be implemented to reach the national energy saving targets.	
		Smarter Travel- A Sustainable Transport Future- A New Transport Policy for Ireland 2009-2020	The policy document focuses on coming up with a strategy that will help achieve a sustainable travel and transport system by 2020.	
	Regional	Mayo Wind Energy Strategy (2008) <a href="http://www.mayococo.ie/en/Planning/DevelopmentPlansandLocalAreaPlans/MayoCountyDevelopmentPlan2008-2014/PDFFile,7798,en.pdf">http://www.mayococo.ie/en/Planning/DevelopmentPlansandLocalAreaPlans/MayoCountyDevelopmentPlan2008-2014/PDFFile,7798,en.pdf</a> County Galway Wind Energy Strategy 2011-2016 <a href="http://www.galway.ie/en/Services/">http://www.galway.ie/en/Services/</a>	The objective of these Strategies is to review and identify geographic areas of each county that would be deemed suitable for the siting of wind energy developments in a manner that safeguards both environmental issues and landscape and visual amenity.	These strategies recognise the significant potential for the growth of wind energy in the Western RBD, but that they can be constrained by landscape, natural heritage and amenity resource issues. In particular, peatlands are vulnerable to eco-hydrological damage through wind farm construction by impacting on the hydrological regime, causing the growth of the bog to stagnate. The infrastructure (i.e. service roads and power lines) associated with wind farm developments can also cause

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		<a href="#">Planning/DevelopmentPlans/Coun tyGalwayWindEnergyStrategy2011-2016/Copy%20of%201%20Final%20WES%20TEXT%201%20as%20adopted%2026092011.docx.pdf</a>		the peat to dry out and compact, eventually destroying the habitat. The potential damage to peatlands through wind farms can also upset the accumulation of carbon and causes an efflux of CO2 to the atmosphere as a bi-product of aerobic decomposition, negating the benefits of the development itself. Wind turbines can also impact on sensitive landscapes, amenity resources and historic environment assets. The Arterial Drainage Programme should have regard to these issues.
		Clare County Development Plan 2011–2017: Wind Energy Strategy <a href="http://www.clarecoco.ie/planning/publications/clare-county-development-plan-2011-2017-volume-5-clare-wind-energy-strategy-9109.pdf">http://www.clarecoco.ie/planning/publications/clare-county-development-plan-2011-2017-volume-5-clare-wind-energy-strategy-9109.pdf</a>		
	Local	Sub-regional study for Galway Transportation and Planning (2002) <a href="http://www.galwaycity.ie/AllServices/RoadsandTraffic/Publications/FileEnglish,2457,en.PDF">http://www.galwaycity.ie/AllServices/RoadsandTraffic/Publications/FileEnglish,2457,en.PDF</a>	This study is aimed at establishing a development framework in land use and transportation terms for Galway City and County. This framework was aimed at supporting and facilitating dynamic sustainable and quality based economic, social and physical development.	The Arterial Drainage Programme should have regard for these proposed, and some cases new, infrastructure developments.
		Coillte District Strategic Plans: East Galway/ Roscommon W2, 2011-2015 <a href="http://www.coillte.ie/fileadmin/temp/ates/pdfs/dsp/W2-2011-2015-DSP-new2.pdf">http://www.coillte.ie/fileadmin/temp/ates/pdfs/dsp/W2-2011-2015-DSP-new2.pdf</a> Clare South Galway W1, 2011-2015 <a href="http://www.coillte.ie/fileadmin/temp/ates/pdfs/dsp/W1-2011-2015-DSP-new2.pdf">http://www.coillte.ie/fileadmin/temp/ates/pdfs/dsp/W1-2011-2015-DSP-new2.pdf</a> Connemara/Mayo W3, 2011-2015 <a href="http://www.coillte.ie/fileadmin/temp/ates/pdfs/dsp/W3-2011-2015-DSP-new2.pdf">http://www.coillte.ie/fileadmin/temp/ates/pdfs/dsp/W3-2011-2015-DSP-new2.pdf</a>	Coillte's estate is divided into 317 forests, which are combined into 13 forest management districts. Coillte has developed plans for each of these districts, known as District Strategic Plans (DSPs), which describe Coillte's forests in the area and set out the long-term vision for the management of these forests as well as short-term objectives for the district.	DSPs address a wide range of economic, social and environmental objectives and include details of how the forest will be expanded and restructured, how the mix of tree species in the forests will change over time, how nature will be conserved and recreational facilities provided, among other issues. They specifically recognise the impact forestry can have on water quality, and propose measures such as the introduction of riparian buffer zones to protect watercourses.

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		Sligo/Leitrim N2, 2011-2015 <a href="http://www.coillte.ie/fileadmin/templates/pdfs/dsp/N2-2011-2015-DSP-new2.pdf">http://www.coillte.ie/fileadmin/templates/pdfs/dsp/N2-2011-2015-DSP-new2.pdf</a>		

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Registered Office

**24 Grove Island  
Corbally  
Limerick  
Ireland**

t: +353 (0) 61 345463  
e: info@jbaconsulting.ie

**JBA Consulting Engineers  
and Scientists Limited**

**Registration number 444752**



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