Council Directive of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources (91/676/EEC)

Article 10 Report for Ireland for the Period 2012-2015

Prepared by the Environmental Protection Agency
June 2016

EXECUTIVE SUMMARY

Purpose

This report provides the information from Ireland to the European Commission, as required under Article 10 of the Nitrates Directive (91/676/EEC), with respect to the sixth reporting period (2012-2015). The report is submitted by the Environmental Protection Agency and has been produced with assistance from the Department of Agriculture, Food and the Marine, Department of Environment, Community and Local Government and Teagasc (the agriculture and food development authority in Ireland).

The information is presented according to the four sections in Annex V of the Nitrates Directive and comprises:

- A description, with maps, of the evolution of water quality in groundwater and surface waters;
- A statement on the adoption of a Whole Territory Approach with respect to the designation of nitrate vulnerable zones;
- A summary of agricultural activities and an account of the implementation of the agricultural Code of Good Practice;
- A summary of the principal measures and an evaluation of the National Action Programme for limiting nitrate inputs from agricultural sources.

Water Quality Monitoring in Ireland

During the previous (2008-2011) reporting period, Ireland continued to implement a monitoring programme to satisfy the requirements of the Water Framework Directive (WFD). This programme was established in 2006 and has been operational during the current 2012-2015 reporting period (EPA, 2006). This WFD programme incorporates monitoring of water quality in light of the European Commissions (Council Directive 2014/112/EU) approval for Ireland to operate a derogation from the limits of the Nitrates Directive.

Nitrate Concentrations in Groundwater and Surface Water

In the previous reporting period nitrate concentrations in Irish waters were found to be amongst the lowest in the EU (EU Commission, 2013). In the current reporting period, on the basis of 4-year average results, it appears that nitrate concentrations across all water categories for the stations assessed have remained stable. However, there is an increase in maximum nitrate concentrations for 47% of lakes (Table 2-13). Also five TRAC water bodies (four (25%) transitional and one (12%) coastal water body) have shown a decline in trophic state between the two assessment periods (Table 2-27).

Groundwater

- There has been no change in average nitrate concentrations in groundwater since the last reporting period on the basis of four year averages. The majority (87%) of groundwater monitoring stations had average nitrate concentrations <25 mg NO_3/L, with a further 12% <40 mg NO_3/L compared with 87% and 11% respectively in the last reporting period.
- Overall average nitrate concentration in groundwater has been relatively stable between the 2008-2011 and 2012-2015 reporting periods on the basis of four year averages. The maximum nitrate concentration has decreased at 64% of sites between the 2008-2011 and 2012-2015 reporting periods. In the same period the maximum nitrate concentration increased at 18% of sites.

Rivers

- The average nitrate concentrations were below 40 mg NO_3/L in all river monitoring stations for the period 2012-2015, with only one river station recording maximum nitrate concentration above 40 mg NO_3/L compared to two river stations in 2008-2011.
- 83% of river stations showed a stable trend in annual average nitrate concentrations with 12% showing weak improvement (decline in nitrate concentrations) and 5% showing weak increase in nitrate concentration. It is a similar story with regard to winter average concentrations with 81% of stations indicating a stable trend with roughly equal numbers showing weak increasing/decreasing trends.

- The assessment of trophic status in the assessed rivers revealed signs of eutrophication in 15% (26 sites from a total no. of 179 river sites) compared with 13% in the previous reporting period.

Lakes

- The average nitrate concentrations were below 40 mg NO_3/L in all lake monitoring stations for the period 2012-2015.
- The assessment of trophic status in the assessed lakes revealed signs of eutrophication in 12% (9 out of a total of 74 lakes) of lakes, the same as in the previous reporting period.
- All lakes showed a stable trend for average annual nitrate concentration (100%) and average winter concentrations (98%). There was an increase in maximum nitrate concentrations at 47% of lakes.

Transitional and Coastal Waters

- There have been stable trends in trophic status in 69% of transitional and 88% of coastal waters. Five water bodies, four (25%) transitional and one (12%) coastal water body, have shown a decline in trophic state between the two assessment periods.
- 91% of transitional stations recorded average nitrate concentrations <10 mg NO_3/L
- All the coastal monitoring stations recorded average nitrate concentrations <10 mg NO_3/L.

Nitrates Action Programmes

In 2010, following a public consultation phase, Ireland's first National Nitrates Action Programme was reviewed by an Expert Review Group. Following this review a second National Nitrates Action Programme was drafted and subsequently approved by the European Commission in tandem with a renewal of the approval for Ireland's nitrates derogation. Strengthened regulations were introduced in December 2010 giving legal effect to the operation of the second Nitrates Action Programme. After public consultation and review of the second Nitrates Action Programme, a third programme was introduced in 2014. This programme includes additional conditions relating to the application of fertilisers and land management and will run until the end of 2017.

Measures under the National Action Programmes have been in operation for 10 years since the introduction of the Good Agricultural Practice Regulations in 2006. An evaluation of these measures is one of the objectives of the Agricultural Catchments Programme, which was established in 2007 and completed its second four-year phase in 2015. Some of the findings from phase 2 are as follows:

Results from the Teagasc National Farm Survey (NFS) over the period 2006-2012 showed significant improvements in nutrient use efficiency, leading to reduced balances thus reducing nutrient available for loss. There was no evidence of nutrient transfers from slurry/manure applications in the four weeks following the end of the closed period for organic fertiliser application. This implies farmers are managing their application of organic fertilisers to avoid losses to water.

In Ireland an approach has been developed to identify Critical Source Areas. These are areas with a higher relative likelihood of nutrient loss to waters. Critical Source Areas need to be accurately identified in order to cost-effectively target management practices to reduce losses, conserve soil fertility and protect water quality. A third phase of the Agricultural Catchments Programme will run to 2019.

Forecast of Future Evolution of Water Body Quality

Overall, nitrate concentrations across all water categories for the stations assessed have remained stable. However, the downward trend in nitrate concentrations observed in the previous period has not being maintained into the current reporting period. There has been an increase in maximum nitrate concentrations for 47% of lakes and 5 of 24 transitional and coastal water bodies have shown an increase in eutrophication. The measures in third Nitrates Action Plan (NAP 3) do however appear to be providing a good level of protection for waters.

There are likely to be substantial changes in Irish agriculture in the coming decade. Food Wise 2025 is a strategic plan for the development of agri-food sector in Ireland over the next decade, which is based on the continued development of the sector where efficient and environmentally-friendly production delivers sustainable export growth on global markets. The following growth projections have been identified:

- Increasing the value of agri-food exports by 85% to €19 billion.
- Increasing value added in the agri-food, fisheries and wood products sector by 70% to in excess of €13 billion.
- Increasing the value of Primary Production by 65% to almost €10 billion
- The creation of an additional 23,000 direct jobs in the agri-food sector all along the supply chain from primary production to high valued added product development.

There are significant risks to the aquatic environment associated with the increase in animal numbers, the associated intensification and associated increases in food processing. This has been taken into account in the development of the strategy and a principle of Food Wise 2025 is that *“environmental protection and economic competitiveness are equal and complementary: One cannot be achieved at the expense of the other*”. The strategy further notes that “*achieving economic competitiveness and environmental sustainability are equal pillars in the delivery of the vision”*.

The strategy sets out more than 50 associated actions to achieve agricultural sustainability. This is welcome from an environmental perspective and the development of a clear mechanism for tracking implementation of these actions and assessing their effectiveness will be needed to ensure that impacts whether positive or negative on the environment are identified and managed. To assist with tracking implementation the Food Wise 2025 Implementation Plan provides for the establishment of a Sustainability Sub-Group to oversee the appropriate monitoring of, and respond to, any impacts on the environment which may result from implementation; and to monitor and drive the implementation of the FW2025 sustainability actions which are crucial to ensuring that environmental sustainability is maintained.

From a Water Framework Directive perspective, Draft River Basin Management Plan (RBMP) will be published by the end of 2016 with adoption of final plans due by the end of 2017. These plans will set out specific environmental objectives with target dates for Irish water bodies. The development of the plan is being done on the basis of a comprehensive re-characterisation of the Irish Water environment and the development of a substantial body of evidence to support this re-characterisation. This catchment re-characterisation is being used to identify the significant pressures at a variety of scales so that strategies, measures and resources can be prioritised and targeted to enable effective protection or restoration, as required, of our water resources. This evidence will provide part of the evidence base needed to ensure that the risks and potential impacts of any agricultural intensification are identified and acted upon and is essential to ensure the implementation of the Food Wise strategy is not damaging to the environment. (EPA, 2015).

The acceptance of the Integrated Catchment Management concept as an implementation strategy for the WFD provides for better engagement on the interface between agriculture and water quality management.

The ACP will continue to assess and evaluate the various measures being implemented under NAP 3 and the scientific findings from it will contribute to further enhancing the efficiency of nutrient management in agriculture.

These elements when coupled with farm inspections, infrastructural investment and improvements in advisory services and awareness provide the circumstances for reduced agricultural impacts on water quality.

Careful coordination and management of measures set out in NAP3 and the RBMP along with regular assessment and review have good potential to result in progressive improvement in water quality and in Ireland achieving the environmental objectives in the RBMPs and continuing to comply with the Nitrate Directive.

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ABBREVIATIONS

ACP	Agricultural Catchments Programme
AEOS	Agri-Environment Options Scheme
AIM	Animal Identification System
CSO	Central Statistics Office
DAFM	Department of Agriculture, Food and the Marine
DECLG	Department of Environment, Community and Local Government
EPA	Environmental Protection Agency
FWMS	Farm Waste Management Scheme
GAEC	Good Agricultural and Environmental Conditions
GAP	Good Agricultural Practice
GIS	Geographical Information System
GLAS	Green Low-Carbon Agri-Environment Scheme
ICM	Integrated Catchment Management
NAP	National Action Programme
OECD	Organisation for Economic Co-operation and Development
OFS	Organic Farming Scheme
PRTR	Pollutant Release and Transfer Register
RBD	River Basin District
RBMP	River Basin Management Plan
REPS	Rural Environment Protection Scheme
S.I.	Statutory Instrument
SMR	Statutory Management Requirements
SWMI	Significant Water Management Issues
WISE	Water Information System for Europe
WFD	Water Framework Directive

1 INTRODUCTION

1.1 Purpose

This Report provides the information from Ireland to the European Commission, as required under Article 10 of the Nitrates Directive (91/676/EEC), with respect to the sixth reporting period (2012-2015). The Report contains information, as outlined in Annex V of the Directive, regarding the monitoring of waters against pollution from agricultural sources and the details of, and results from, action programmes drawn up by the State to combat pollution in vulnerable areas.

1.2 Background to the Report

1.2.1 The Nitrates Directive

The objective of the Nitrates Directive, which was adopted in 1991, is the reduction of water pollution caused or induced by nitrates from agricultural sources and the prevention of further such pollution, with the primary emphasis being on the management of livestock manures and other fertilisers.

The Nitrates Directive requires Member States to:

- Monitor waters and identify those that are polluted or are liable to pollution by nitrates from agriculture;
- Establish a code of good agricultural practice to protect waters from such pollution;
- Promote the application by farmers of the code of good agricultural practice;
- Identify the area or areas to which an action programme should be applied to protect waters from pollution by nitrates from agricultural sources;
- Develop and implement action programmes to reduce and prevent such pollution in the identified area: action programmes are to be implemented and updated on a four-year cycle;
- Monitor the effectiveness of the action programmes; and
- Report to the EU Commission on progress.

The Nitrates Directive defines those waters 'polluted or liable to pollution' as:

- Surface freshwaters, in particular those used for the abstraction of drinking water, which contain, or could contain, if preventative action is not taken, nitrate concentrations >50 mg NO3/L.
- Groundwaters which contain, or could contain, if preventative action is not taken, nitrate concentrations >50 mg NO3/L, and
- Natural freshwater lakes, or other freshwater bodies, estuaries, coastal waters and marine waters which are found to be eutrophic or in the near future may become eutrophic if preventative action is not taken.

The Directive lays down that, at the end of each four-year programme (1995-99, 2000-03, 2004-07, 2008-11, 2012-15) and for each water monitoring report/evaluation of measures associated with this programme, a report describing the situation and its development shall be submitted to the Commission by each Member State.

1.2.2 Reporting Period 2012-2015

Since 2005 the responsibility for reporting under the Nitrates Directive has been assigned to the Environmental Protection Agency (EPA), under the National Regulations Implementing the Nitrates Directive (S.I. No. 788 of 2005).

The Article 10 Report for Ireland at the end of the fifth reporting period (2008-2011) was submitted in June 2012 by the Environmental Protection Agency (EPA, 2012) and comprised information on the Action Programmes in addition to information compiled by the Environmental Protection Agency on the evaluation of water quality.

1.3 Water Monitoring in Ireland

Although the EPA and other public authorities have monitored water quality at a number of stations nationwide for several decades; since 2003 attention has focussed on establishing a new monitoring programme and network under the Water Framework Directive (WFD). Under Article 10 of Ireland's National Regulations implementing the Water Framework Directive - European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003; amended in 2014 S.I. No. 350 of 2014) – the EPA was given authority for preparing the monitoring programme and for specifying the public authorities responsible for carrying out the monitoring.

Following an extensive research and development process in consultation with principal stakeholders and under the auspices of the National Technical Co-ordination Group for the WFD, an Irish Monitoring Network Programme has been established (EPA, 2006). The programme encompasses the three categories of Surveillance, Operational and Investigative Monitoring specified in the WFD. Data from the Surveillance Monitoring Programme for surface water and the Surveillance and Operational Monitoring Programme for groundwater, which are representative of water quality in Irish waters generally, are used for Article 10 Nitrates Directive and European State of the Environment reporting via the European Environment Agency (EEA) Waterbase system.

Although many historically monitored stations were included in the WFD National Monitoring Network Programme, the revisions to this Programme have resulted in a number of stations that are not common to both the current reporting period and previous periods. For these stations it has not been possible to undertake trend analysis in this report.

1.4 Report Structure and Content

1.4.1 Report Structure

This Report has been produced in accordance with the Development Guide for Member States' Reports, published in 2011. The Report is split into sections as specified in the guidelines, which contain the following information:

- A description, with associated maps, of evolution of quality of freshwaters (surface and groundwater), transitional and coastal waters since previous monitoring with respect to nitrates – Chapter 2.
- Description and justification of the designated vulnerable zones (including map), and of the extensions or additions carried out or envisaged – Chapter 3.
- An account of the development, promotion and implementation of the Good Agricultural Practice Regulations, including a summary of national agricultural statistics for the national territory – Chapter 4.
- An account of the principal measures contained in the Action Programme, and a description of the precise manner in which limits are being applied for the annual land application of organic nitrogen compounds – Chapter 5.
- The results of the evaluation of the action programmes – Chapter 6.
- A forecast of the future evolution of water body quality – Chapter 7.

The maps and summary tables included with this report were derived from data contained in a geo-database developed using ESRI® ArcMap GIS. On the maps in this report, only stations that are mentioned in the text are individually labelled. All stations are individually identified in the GIS layers and database tables with unique station codes. All maps have been uploaded to the Central Data Repository at http://cdr.eionet.europa.eu/.

The structure and formats of the spatial and non-spatial data tables comply with the specification provided in the EU Reportnet Data Dictionary.

1.4.2 Note on Reporting Period Trend Analysis

The reporting guidelines require an analysis comparing water quality results from the current period with those reported under the previous period. Data for the previous reporting period (2008-2011) have been included in this report to enable the trend analysis to be undertaken.

1.5 General Context

The general physical features of Ireland are shown on Maps 1-1 to 1-4. The management units for reporting under the Water Framework Directive are River Basin Districts (RBDs), largely based on an amalgamation of Hydrometric Areas that were previously reported on. During the reporting period Ireland was considered to be divided into eight RBDs, which are shown on Map 1-4 with the Hydrometric Areas that they contain. RBD boundaries are shown on the maps referred to in the main body of the report

2 EVALUATION OF WATER QUALITY

2.1 Groundwater

2.1.1 Groundwater Monitoring Network

The EPA provided information on groundwater quality from groundwater monitoring stations. A total of 205 groundwater stations are included in this report, spanning the 2012-2015 reporting period, which are a subset of the overall WFD Groundwater Monitoring Programme. Six stations that were included during the 2008-2011 reporting period were not included in the monitoring network for the current reporting period. These stations were removed from the monitoring network due to the closure of abstraction sites as part of national water supply rationalisation programmes.

Table 2-1 indicates the number of groundwater monitoring stations, and the type of groundwater sampled during each reporting period.

Table 2-1: Number of Groundwater Monitoring Stations with Samples in each Reporting Period

<table>
<tr><th>Water Bodies</th><th>Previous Reporting Period (2008-2011)</th><th>Current Reporting Period (2012-2015)</th><th>Common Points (2012-2015 with 2008-2011)</th></tr>
<tr><td>Phreatic groundwater (0-5 m)</td><td>26</td><td>25</td><td>25</td></tr>
<tr><td>Phreatic groundwater (5-15 m)</td><td rowspan="3">90</td><td rowspan="3">88</td><td rowspan="3">88</td></tr>
<tr><td>Phreatic groundwater deep (15-30 m)</td></tr>
<tr><td>Phreatic groundwater (>30 m)</td></tr>
<tr><td>Captive groundwater</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Karstic groundwater</td><td>95</td><td>92</td><td>92</td></tr>
<tr><td>Total</td><td>211</td><td>205</td><td>205</td></tr>
<tr><td colspan="4">Note: Section 2.1.2 provides an explanation of sampling depth.</td></tr>
</table>

2.1.2 Note on Sampling Depth

The following two paragraphs are quoted from the WFD Programme Report (EPA, 2006) to explain why sampling depth reported is an estimate:

Generally, sampling depth is not considered to be a critical factor when monitoring groundwater in the Republic of Ireland because most of the bedrock aquifers are unconfined and have fissure permeability only. The only aquifers in the Republic of Ireland with an intergranular permeability are the sand and gravels. Consequently, groundwater velocities in most Irish bedrock aquifers are relatively fast (a few metres/day) and mixing of groundwater in the top ~60 m readily occurs. The proposed monitoring network uses points with relatively large groundwater abstractions and these are considered to give representative samples because they are not usually affected by local point source pollution.

In the case of springs, the sampling depth is at the ground surface. In boreholes, pumps are usually located towards the bottom of the boreholes; therefore the sampling depths are determined by borehole depth. In some instances, screens are installed at the main water entry zones. In the remaining monitoring points, the boreholes are 'open hole', i.e. a liner or screen is not needed. Water can usually be drawn from all bedrock fractures in the borehole, i.e. from the total bedrock length. Therefore, the water sample is generally a composite of water from all fractures and/or conduits throughout the total length of bedrock in the borehole" (EPA, 2006).

2.2.1 Nitrate Concentrations in Groundwater

Average Nitrate Concentrations

The distribution of average nitrate concentrations for the period 2012-2015 are shown on Map 2-1 and the results are summarised in Table 2-2 and Table 2-3 below.

Table 2-2: Quality Classes for Average Nitrate Concentrations (mg NO_3/L) in Groundwater (Number of sampling points)

<table>
<tr><th>Water Bodies</th><th colspan="4">Number of points mg NO_3/L</th></tr>
<tr><th></th><th><25</th><th>25-39.99</th><th>40-50</th><th>>50</th></tr>
<tr><td>Phreatic groundwater (0-5 m)</td><td>21</td><td>4</td><td>0</td><td>0</td></tr>
<tr><td>Phreatic groundwater (5-15 m)</td><td rowspan="3">79</td><td rowspan="3">9</td><td rowspan="3">0</td><td rowspan="3">0</td></tr>
<tr><td>Phreatic groundwater deep (15-30 m)</td></tr>
<tr><td>Phreatic groundwater (>30 m)</td></tr>
<tr><td>Captive groundwater</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Karstic groundwater</td><td>78</td><td>12</td><td>2</td><td>0</td></tr>
<tr><td>Total</td><td>178</td><td>25</td><td>2</td><td>0</td></tr>
<tr><td>2008-2011 period</td><td>183</td><td>23</td><td>5</td><td>0</td></tr>
<tr><td>2004-2007 period</td><td>158</td><td>41</td><td>10</td><td>5</td></tr>
<tr><td>2000-2003 period</td><td>96</td><td>19</td><td>6</td><td>2</td></tr>
</table>

Table 2-3: Quality Classes for Average Nitrate Concentrations (mg NO_3/L) in Groundwater (Percentage of sampling points)

<table>
<tr><th>Water Bodies</th><th colspan="4">Percentage of points mg NO_3/L*</th></tr>
<tr><th></th><th><25</th><th>25-39.99</th><th>40-50</th><th>>50</th></tr>
<tr><td>Phreatic groundwater (0-5 m)</td><td>10.2%</td><td>2.0%</td><td>0.0%</td><td>0.0%</td></tr>
<tr><td>Phreatic groundwater (5-15 m)</td><td rowspan="3">38.5%</td><td rowspan="3">4.4%</td><td rowspan="3">0.0%</td><td rowspan="3">0.0%</td></tr>
<tr><td>Phreatic groundwater deep (15-30 m)</td></tr>
<tr><td>Phreatic groundwater (>30 m)</td></tr>
<tr><td>Captive groundwater</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Karstic groundwater</td><td>38.0%</td><td>5.9%</td><td>1.0%</td><td>0.0%</td></tr>
<tr><td>Total</td><td>86.8%</td><td>12.2%</td><td>1.0%</td><td>0.0%</td></tr>
<tr><td>2008-2011 period</td><td>87%</td><td>11%</td><td>2%</td><td>0%</td></tr>
<tr><td>2004-2007 period</td><td>74%</td><td>19%</td><td>5%</td><td>2%</td></tr>
<tr><td>2000-2003 period</td><td>78%</td><td>15%</td><td>5%</td><td>2%</td></tr>
</table>

*Rounding to 0.1%.

The results for 2012-2015 show that all 205 stations had average nitrate concentrations <50 mg NO_3/L and that 87% were <25 mg NO_3/L. There has been no change since the last reporting period (2008-2011) in the proportion of stations with concentrations <25 mg NO_3/L based on an average of 4 year's results.

Maximum Nitrate Concentrations

The distribution of maximum nitrate concentrations for the period 2012-2015 are shown in Map 2-2 and the results summarised in Table 2-4 and Table 2-5.

Table 2-4: Quality Classes for Maximum Nitrate Concentrations (mg NO_3/L) in Groundwater (Number of sampling points)

Water Bodies	Number of points mg NO_3/L			
	<25	**25-39.99**	**40-50**	**>50**
Phreatic groundwater (0-5 m)	14	8	2	1[1]
Phreatic groundwater (5-15 m)	68	16	3	1[2]
Phreatic groundwater deep (15-30 m)				
Phreatic groundwater (>30 m)				
Captive groundwater	-	-	-	-
Karstic groundwater	67	17	4	4[3]
Total	149	41	9	6
2008-2011 period	*134*	*46*	*15*	*16*
2004-2007 period	*143*	*47*	*13*	*11*
2000-2003 period	*83*	*28*	*7*	*5*

Notes:
1. Site code: IE_SH_G_0251_2500_0005
2. Site code: IE_SE_G_0061_3300_0005
3. Site codes: IE_SW_G_0082_0500_0017; IE_SH_G_0027_1300_0012; IE_SE_G_0156_1600_0005; IE_SE_G_0040_3700_0004

Table 2-5: Quality Classes for Maximum Nitrate Concentrations (mg NO_3/L) in Groundwater (Percentage of sampling points)

Water Bodies	Percentage of points mg NO_3/L*			
	<25	**25-39.99**	**40-50**	**>50**
Phreatic groundwater (0-5 m)	6.8%	3.9%	1.0%	0.5%
Phreatic groundwater (5-15 m)	33.2%	7.8%	1.5%	0.5%
Phreatic groundwater deep (15-30 m)				
Phreatic groundwater (>30 m)				
Captive groundwater	-	-	-	-
Karstic groundwater	32.7%	8.3%	2.0%	2.0%
Total	72.7%	20.0%	4.4%	2.9%
2008-2011 period	*63.5%*	*22%*	*7%*	*7.5%*
2004-2007 period	*67%*	*21%*	*7%*	*5%*
2000-2003 period	*67%*	*23%*	*6%*	*5%*

*Rounding to 0.1%.

The maximum nitrate values show that the majority (72.7%) of sites had maximum concentrations lower than 25 mg NO_3/L and a further 20% had maximum concentrations lower than 40 mg NO_3/L, with six sites having maximum concentrations >50 mg NO_3/L. Three of these six sites had only one sample exceeding 50 mg NO_3/L during the reporting period.

The trend since the last reporting period (2008-2011) is an increase in the proportion of sites with maximum concentrations <25 mg NO_3/L (from 63.5% to 72.7%) and a decrease in the proportion of sites with maximum concentrations >50 mg NO_3/L class (from 7.5% to 2.9%). Further analysis of the trend in concentration values is given in Section 2.1.4.

2.3.1 Trend Analysis in Groundwater

The trend analysis compares average and maximum nitrate concentrations for the current reporting period (2012-2015) against values at corresponding stations from the previous reporting period (2008-2011). Maps 2-3 and 2-4 show the respective average and maximum nitrate concentrations in 2012-2015 at the 205 monitoring sites that are common to both reporting periods.

The water quality evolution trend for average nitrate concentrations at the 205 stations between the reporting periods are shown on Map 2-5 and summarised in Table 2-6 and Table 2-7.

Table 2-6: Trends in Groundwater for Nitrate Concentrations based on Average Values (Number of sampling points)

Water Bodies	Number of points mg NO_3/L				
	<-5	-5 to -1	-1 to +1	+1 to +5	>+5
Phreatic groundwater (0-5 m)	1	4	15	4	1
Phreatic groundwater (5-15 m) Phreatic groundwater deep (15-30 m) Phreatic groundwater (>30 m)	6	14	46	21	1
Captive groundwater	-	-	-	-	-
Karstic groundwater	1	23	49	15	4
Total (n=205)	8	41	110	40	6

Notes:
Trend classes between current and previous reporting periods:
Strong increase: > +5 mg/L
Weak increase: +1 to +5 mg/L
Stable: -1 to +1 mg/L
Weak decrease: -1 to -5 mg/L
Strong decrease: < -5 mg/L

Table 2-7: Trends in Groundwater for Nitrate Concentrations based on Average Values (Percentage of sampling points)

Water Bodies	Percentage of points mg NO_3/L*				
	<-5	-5 to -1	-1 to +1	+1 to +5	>+5
Phreatic groundwater (0-5 m)	0.5%	2.0%	7.3%	2.0%	0.5%
Phreatic groundwater (5-15 m) Phreatic groundwater deep (15-30 m) Phreatic groundwater (>30 m)	2.9%	6.8%	22.4%	10.2%	0.5%
Captive groundwater	-	-	-	-	-
Karstic groundwater	0.5%	11.2%	23.9%	7.3%	2.0%
Total	3.9%	20.0%	53.7%	19.5%	2.9%

*Rounding to 0.1%.

These results show that there has been a decrease in average nitrate concentration at 23.9% of sites, with 53.7% of sites showing a stable trend. Approximately 2.9% of sites (6 stations) showed a strong increase in average nitrate concentration with a further 19.5% of sites (40 stations) showing a weak increase in average nitrate concentration. The six stations showing a strong increase in average nitrate concentration are listed in Table 2-8. There were three stations showing a strong increasing trend in average concentrations for the previous reporting period (2008-2011). Of these three stations, two have shown a decrease and one is stable for the 2012-2015 period.

Table 2-8: Summary Results for Sites Showing a Strong Increase in Trend of Average Nitrate Concentrations in Groundwater

National Station Code	National Station Name	Avg. Nitrate 2008-2011 (mg NO_3/L)	Avg. Nitrate 2012-2015 (mg NO_3/L)	Max Nitrate 2008-2011 (mg NO_3/L)	Max Nitrate 2012-2015 (mg NO_3/L)	Trend Where Average Value (>+5 mg NO_3/L)*
IE_SH_G_0027_1300_0012	Gale Bridge	21.2	35.9	33.8	63.5	14.7
IE_SE_G_0163_1500_0003	Ballyragget PWS	18.5	25.1	33.2	38.5	6.7
IE_SE_G_0128_1500_0019	Thomastown WS (BH 9, GAA Grounds)	17.9	23.2	29.7	32.1	5.4
IE_SE_G_0156_1600_0005	Durrow PWS (Fermoyle WS)	26.8	43.5	61.3	70.9	16.7
IE_SE_G_0158_3700_0009	Thurles WS (Tobernaloo)	14.7	21.3	25.8	27.9	6.6
IE_SE_G_0119_3700_0006	Inchirourke	14.0	21.8	26.1	29.7	7.9

*Rounding to 0.1%.

The water quality evolution trend for maximum nitrate concentrations at the 205 stations that are common between the reporting periods are shown on Map 2-6 and the results are summarised in Table 2-9 and Table 2-10 below.

Table 2-9: Trends in Groundwater for Nitrate Concentrations based on Maximum Values (Number of sampling points)

Water Bodies	Number of points mg NO_3/L				
	<-5	-5 to -1	-1 to +1	+1 to +5	>+5
Phreatic groundwater (0-5 m)	7	8	5	3	2
Phreatic groundwater (5-15 m)					
Phreatic groundwater deep (15-30 m)	25	27	21	14	1
Phreatic groundwater (>30 m)					
Captive groundwater	-	-	-	-	-
Karstic groundwater	30	34	11	10	7
Total (n=205)	**62**	**69**	**37**	**27**	**10**

Table 2-10: Trends in Groundwater for Nitrate Concentrations based on Maximum Values (Percentage of sampling points)

Water Bodies	Percentage of points mg NO_3/L*				
	<-5	-5 to -1	-1 to +1	+1 to +5	>+5
Phreatic groundwater (0-5 m)	3.4%	3.9%	2.4%	1.5%	1.0%
Phreatic groundwater (5-15 m)					
Phreatic groundwater deep (15-30 m)	12.2%	13.2%	10.2%	6.8%	0.5%
Phreatic groundwater (>30 m)					
Captive groundwater	-	-	-	-	-
Karstic groundwater	14.6%	16.6%	5.4%	4.9%	3.4%
Total	**30.2%**	**33.7%**	**18.0%**	**13.2%**	**4.9%**

*Rounding to 0.1%.

These results show that the maximum nitrate concentration has increased at approximately 18.1% of sites, with a weak increase and strong increase in maximum nitrate concentration recorded at 27 and 10 sites, respectively. A stable trend is shown at 37 (approximately 18.0%) sites, with a decrease in the maximum nitrate concentration at the remaining 131 (approximately 63.9%) sites.

Overall average nitrate concentration in groundwater has been relatively stable between the 2008-2011 and 2012-2015 reporting periods. Approximately 2.9% of sites (6 stations) showed a strong increase in average nitrate concentration with a further 19.5% of sites (40 stations) showing a weak increase in average nitrate concentration. The maximum nitrate concentration has decreased at 63.9% of sites between the 2008-2011 and 2012-2015 reporting periods.

2.4 Surface Water Monitoring – Lakes and Rivers

2.4.1 Rivers

The WFD introduced a new monitoring programme in 2007 with some changes with respect to earlier monitoring networks. The Surveillance Monitoring Network serves as the core representative network for the WFD, Nitrates Directive and State of the Environment reporting via the EEA WISE network. The Surveillance Monitoring Network has remained relatively stable with a few minor amendments to stations based on safety grounds and to make it more representative of Irish rivers. Data are presented in this report for 180 Surveillance Monitoring river stations (and including one station substituted mid-program) from the WFD National Monitoring Programme. The previous report presented results for 178 river stations, of which 177 are included in this report – see Table 2-11.

2.4.2 Lakes

Data are presented for 74 of the Surveillance Monitoring lakes in the WFD National Monitoring Programme. The previous report also presented results for these 74 lakes – see Table 2-11.

Table 2-11: Summary of Surface Water Monitoring Network (Rivers and Lakes)

Water bodies	Reporting Period (2000-2003)	Reporting Period (2004-2007)	Reporting Period (2008-2011)	Reporting Period (2012-2015)	Common points between 2008-2011 and 2012-2015
Lakes	18[1]	69[2]	74[2]	74	74
Rivers	67	148	178[3]	180[3]	175

Notes:
[1] WISE/EUROWATERNET representative lakes
[2] WFD Surveillance Monitoring Lakes
[3] WFD Surveillance Rivers

2.4.3 Nitrate Concentrations in Lakes and Rivers

Annual average, winter average and maximum nitrate concentrations for the current and previous reporting periods for lakes and rivers are summarised in Table 2-12 below. Annual average, winter average and maximum nitrate concentrations for 2012-2015 are shown on Maps 2-7 to 2-12.

Table 2-12: Quality classes for Nitrate Concentrations in Surface Waters, 2012 to 2015 and 2008-2011 – Number of sampling points (and Percentage)

Water bodies	Quality classes (mg NO_3/L)					
	0-1.99	2-9.99	10-24.99	25-39.99	40-50	>50
Lakes annual average 2012-2015 2008-2011	71 (96%) 70 (95%)	3 (4%) 4 (5%)	0 0	0 0	0 0	0 0
Lakes winter average[1] 2012-2015 2008-2011	67 (91%) 69 (93%)	5 (7%) 7 (9%)	0	0 0	0 0	0 0
Lakes maximum 2012-2015 2008-2011	23 (31%) 34 (46%)	47 (64%) 39 (53%)	4 (5%) 1 (1%)	0 0	0 0	0 0
Rivers annual average 2012–2015 2008-2011	59 (32.6%) 52 (29.2%)	81 (44.8%) 84 (47.2%)	39 (21.6%) 40 (22.5%)	2 (1.1%) 2 (1.1%)	0 0	0 0
Rivers winter average[1] 2012-2015 2008-2011	51 (28.2%) 51 (28.7%)	85 (47.0%) 84 (47.2%)	43 (23.8%) 40 (22.5%)	2 (1.1%) 3 (1.7%)	0 0	0 0
Rivers maximum 2012-2015 2008-2011	19 (10.5%) 19 (10.7%)	79 (43.7%) 66 (37.1%)	75 (41.4%) 69 (38.8%)	8 (4.4%) 22 (12.3%)	1 (0.6%) 2 (1.1%)	0 0

Notes:
Winter period is between October and March. For lakes and rivers, where data were available, all winter months between January and December were included.

The majority of lakes fall within the 0-1.99 mg NO_3/L range for both the annual average (96%) and winter average (91%). None of the lakes were found to have annual average or winter average nitrate concentrations above 10 mg NO_3/L. Maximum nitrate only exceeded 10 mg NO_3/L in four lakes.

2.4.4 Trend Analysis in Lakes and Rivers

The nitrate concentrations for 2012-2015 are compared against samples from the previous reporting period (2008-2011) for lakes and rivers sites that are common to both reporting periods. Maps 2-13 to 2-18 show the annual average, maximum and winter average nitrate concentrations at these lake and river sampling stations for the 2012-2015 reporting period. The results of the trend analysis for lakes and rivers are presented in Table 2-13 and on Maps 2-19 to 2-24.

Practically all lakes displayed a stable trend for both annual average nitrate concentration (100%) and average winter concentration (99%). A statistical t-test of average nitrate concentration found evidence ($p=0.011$) for only a very small increase (<0.1 mg NO_3/L) since the 2008-2011 period using data from the 74 lakes sampled in both periods. In contrast, for maximum concentrations, while half of the lakes (53%) showed a stable or decreasing trend, a significant proportion were found to have had a weak (39%) or strong increase (8%). The previous report noted a trend of declining maximum NO_3 concentrations in Ireland but this may now be slowing or reversing. In this comparison (2008-2011 vs 2012-2015) only 11% of lakes had a decline in maximum concentration, whereas, the last report recorded a 25% decline (2004-2007 vs 2008-2011). However, comparisons are complicated by the fact that a lower number of lakes were sampled in earlier reports.

In the 2004-2007 reporting period rivers stations had shown an increasing trend in nitrate concentrations with 51% of sites having a weak increase in average nitrate concentrations compared to 2000-2003. This was offset somewhat in the 2008-2011 reporting period when 49% of sites displayed a decrease in nitrate concentrations compared to 2004-2007. For the 175 river stations common to 2008-2011 and 2012-2015 a generally stable trend in annual average concentrations is shown in 127 (83%) of stations. Twenty-one stations (11.9%) show a weak improvement. There was a weakly increasing trend at nine stations (5.1%) compared to three (2%) in the previous period. Although data are not flow-normalised and are reported as "as-measured" concentrations the data suggest a stabilisation of averaged river nitrate values.

It is a similar story with regard to average winter nitrate concentrations in rivers with 143 (81.3%) of stations indicating stable concentrations with roughly equal numbers showing weak increasing/decreasing concentrations. No strong changes were observed. With regard to winter maximum values there was a notable increase in the number of river stations exhibiting weak decreases.

Table 2-13: Quality classes for Nitrate concentrations in Rivers and Lakes 2012-2015 and 2008-2011 – Number of sampling points (and Percentage)

Water bodies	Number of points mg NO_3/L (% of points)				
	<-5	-5 to -1	-1 to +1	+1 to +5	>+5
Lakes annual average 2012-2015 2008-2011	0 0	0 4 (7%)	74(100%) 57 (93%)	0 0	0 0
Lakes winter average 2012-2015 2008-2011	0 0	0 7 (14%)	73 (99%) 42 (86%)	1 (1%) 0	0 0
Lakes maximum 2012-2015 2008-2011	0 6 (10%)	8 (11%) 9 (15%)	31 (42%) 35 (57%)	29 (39%) 11 (18%)	6 (8%) 0
Rivers annual average 2012-2015 2008-2011	0 9 (6.1%)	21 (11.9%) 64 (43.2%)	127 (83.0%) 72 (48.7%)	9 (5.1%) 3 (2.0%)	0 0
Rivers winter average 2012-2015 2008-2011	0 20 (13.5%)	15 (8.5%) 72 (48.6%)	143 (81.3%) 53 (35.8%)	18 (10.2%) 3 (2.0%)	0 0
Rivers maximum 2012-2015 2008-2011	22 (12.4%) 26 (17.6%)	68 (38.4%) 36 (24.3%)	46 (26.0%) 46 (31.1%)	28 (15.8%) 30 (20.3%)	13 (7.3%) 10 (6.8%)
Notes: Trend classes between current and previous reporting periods: Strong increase: >+5 mg/L Weak increase: +1 to +5 mg/L Stable: -1 to +1 mg/L Weak decrease: -1 to -5 mg/L Strong decrease: <-5 mg/L					

2.4.5 Eutrophication in Lakes and Rivers

Trophic Status in Lakes

Traditionally, lake water quality in Ireland was assessed using a modified version of the OECD scheme (Table 2-14) based on the annual maximum chlorophyll concentration. This was because data was limited and where available, chlorophyll was generally a common survey parameter sampled during a given period (summer and/or autumn) that was taken to be reflective of the annual maximum value. It was usually not possible to calculate average annual values for the application of the OECD scheme. In addition, because of the wide limits set for the eutrophic category in the original OECD scheme, a sub-division of this category was made. Therefore, the lakes were classified into six water quality categories (trophic status) by reference to the maximum levels of planktonic algae (including cyanobacteria) measured during the period.

The highest chlorophyll concentrations recorded are taken as estimates of the annual maximum values. These are based on average values per sampling occasion for lakes with more than one sampling site. These maximum values are used to assign a trophic status to the individual lakes. The average of the annual maxima for the period 2012-2015 has been used for the overall assessment of trophic status of each lake for this report in keeping with previous submissions.

Table 2-14: Modified version of the OECD scheme based on values of annual maximum chlorophyll concentration. Indicators related to water quality and the probability of pollution are also described

Classification Scheme			Category Description			
Lake Trophic Category		**Annual Max. Chlorophyll mg/m^3**	**Algal Growth**	**Deoxygenation in Hypolimnion**	**Level of Pollution**	**Impairment of use of Lake**
Oligotrophic (O)		<8	Low	Low	Very low	Probably none
Mesotrophic (M)		8≤ x <25	Moderate	Moderate	Low	Very little
Eutrophic (E)	Moderately (m-E)	25≤ x <35	Substantial	May be high	Significant	May be appreciable
	Strongly (s-E)	35≤ x <55	High	High	Strong	Appreciable
	Highly (h-E)	55≤ x <75	High	Probably total	High	High
Hypertrophic (H)		>75	Very High	Probably total	Very high	Very high

Trophic status data were obtained for 63 of the monitored lakes for the period 2001-2003, 58 lakes in the 2004-2006 period, 74 lakes in the 2008-2011 period and 74 lakes in the current period. The aggregated results for each period were calculated from the average of the annual maxima chlorophyll values. The results for the 2012-2015 and 2008-2011 periods are presented on Maps 2-25 and 2-26 respectively and are summarised in Table 2-15.

Table 2-15: Trophic Status of Lakes

	Trophic Status - No. of sampling points (and %)					
Sampling Period	**Oligotrophic**	**Mesotrophic**	**Moderately Eutrophic**	**Strongly Eutrophic**	**Highly Eutrophic**	**Hyper-trophic**
2001-2003	33 (52%)	23 (36%)	1 (2%)	4 (6%)	1[1] (2%)	1[2] (2%)
2004-2006	34 (59%)	20 (34%)	2 (3%)	0	1[3] (2%)	1[1] (2%)
2008-2011	33 (45%)	32 (43%)	3 (4%)	2 (3%)	3[4] (4%)	1[2] (1%)
2012-2015	39 (53%)	26 (35%)	3 (4%)	3 (4%)	1[5] (1%)	2[6] (3%)

Notes:
1. Lake site code and name: NW_36_647 Lake White
2. Lake site code and name: NW_36_671 Lake Egish
3. Lake site code and name: NB_06_56 Lake Muckno or Blayney
4. Lake site code and name: NB_06_56 Lake Muckno or Blayney, SH_24_99 Lake Gur, SW_19_4 Lake Allua
5. Lake site code and name: SW_19_4 Lake Allua
6. Lake site code and name: NW_36_671 Lake Egish, SH_25_189 Alewnaghta

In the 2012-2015 period 88% of lakes were classified as either Oligotrophic or Mesotrophic. This was similar to values reported in previous periods: 88% of lakes in 2008-2011, 93% of lakes in 2004-2006 and 88% of lakes in 2001-2003. The highest chlorophyll maxima were recorded in lakes Allua, Egish, and Alewnaghta. The trend in trophic status between the two periods 2012-2015 and 2008-2011 for the lakes common to both reporting periods are summarised in Table 2-16 and Map 2-27.

Table 2-16: Trend in Trophic Status for Lakes

	Change in Trophic Status[1] – No. of points (and %)				
	Strong decrease	**Weak decrease**	**Stable**	**Weak increase**	**Strong increase**
Lakes (n=57)	1 (1%)	15 (20%)	49 (66%)	8 (11%)	1 (1%)[2]

Notes:

1. Explanation of trend classes:
Strong increase = > 1 deterioration in class e.g. Oligotrophic to Moderately Eutrophic
Weak increase = 1 deterioration in class, e.g. Oligotrophic to Mesotrophic
Stable = No change in class
Weak decrease = 1 improvement in class, e.g. Mesotrophic to Oligotrophic
Strong decrease = > 1 improvement in class, e.g. Moderately Eutrophic to Oligotrophic
2. Lake site code and name: SH_25_189 Alewnaghta

A stable trend was recorded in 66% of the lakes, with 12% of lakes showing an increase in eutrophication and 21% of lakes showing a decline in eutrophication. Most of the increase in

eutrophication is a result of five lakes previously classed as Oligotrophic becoming Mesotrophic. The strongest increase in eutrophication was recorded in Lake Alewnaghta which changed from Moderately Eutrophic to Hypertrophic. This result was caused by a phytoplankton bloom event in the summer of 2012 where a maximum value of 268 □g/L chlorophy
to any of the other three years where maximum concentrations were within the mesotrophic range. Overall a large majority of 87% of the lakes were either stable or had declining trophic status as identified by maximum chlorophyll concentrations.

Trophic Status in Rivers

Trophic status in Irish rivers is assessed on the basis of biological assessments using a biotic index scheme primarily based on aquatic macroinvertebrate communities – the EPA Quality Rating System (Q-Value) enables an assessment of the biological response to eutrophication and organic pollution in a predictable manner. The method has been inter-calibrated for the pressure ‘organic enrichment’ at an EU level under the WFD. As it is not strictly a trophic status system it must be used with some caveats, as not all pollution of Irish rivers is due to eutrophication. It is used in this report because it enables trend analysis for a longer set of data as it has been used in Ireland for a considerable period. The scheme is WFD-compliant and incorporates the WFD’s normative definitions for ecological status. The biotic index contains five levels of ecological status, as defined by specific assemblages of macro invertebrates. Table 2-17 relates the Q-Values to WFD ecological status, trophic status and water quality (or level of pollution) as defined historically in Irish river pollution assessments.

Table 2-17: Biotic Index for Indication of Water Quality

WFD Ecological Status	Trophic Status	Water Quality	Q-Values
High	Ultra-oligotrophic	Unpolluted	5, 4-5
Good	Oligotrophic	Unpolluted	4
Moderate	Mesotrophic	Slightly Polluted	3-4
Poor	Eutrophic	Moderately Polluted	3, 2-3
Bad	Hypertrophic	Seriously Polluted	2, 1-2, 1

Biological sampling is undertaken on a three-yearly rotational basis as per requirements of the WFD so every site is not sampled every year. The data dictionary for the 2012-2015 Article 10 Report requires five trophic categories: Ultra-Oligotrophic, Oligotrophic, Mesotrophic, Eutrophic and Hypertrophic. The total number and proportion of stations in each trophic status class are presented in Table 2-18 for the 2000-2003, 2004-2007, 2008-2011 and 2012-2015 periods, corresponding to the four-year Nitrates Directive reporting cycle. The most recent trophic assessment in any four-year reporting period is used to define trophic status where a site has been monitored more than once in the reporting period. The results from the 2012-2015 and 2008-2011 sampling periods are shown on Map 2-28 and 2-29 respectively.

Table 2-18: Trophic Status of Rivers

		Trophic Status – Percentage & Number of Sampling Stations				
Sampling Period	**Stations Sampled**	**Ultra-Oligotrophic**	**Oligotrophic**	**Mesotrophic**	**Eutrophic**	**Hypertrophic**
2000-2003	167	29%	32%	19%	19%	1.2%
2004-2007	168	18%	40%	26%	14%	1.8%
2008-2011	176	22%	44%	22%	12%	0.6%
2012-2015	179	26%	41%	19%	14%	0.6%

Table 2.18 indicates that 67% of all sites were recorded as unpolluted in 2012-2015, representing a slight improvement from 66% in 2008-2011, 58% in 2004-2007 and 61% in 2000-2003. Overall this represents an improvement in water quality, with a decreased proportion of locations exhibiting signs of eutrophication.

There are 175 river monitoring stations that are common to the 2008-2011 and 2012-2015 reporting periods. The trend in trophic status is shown in Table 2-19 and Map 2-30.

Table 2-19: Trend in Trophic Status for Rivers, 2008-2011 to 2012-2015 - Number of sampling points (and Percentage)

	Change in Trophic Status – No. of sites (and %)[1]				
	Strong decrease[2]	Weak decrease	Stable	Weak increase	Strong increase
Rivers (n=175)	3 (2%)	30 (17%)	111 (63%)	31 (18%)	0 (0%)

1. Not all surveillance monitoring sites were monitored in both periods – 175 were common to 2008-2011 and 2012-2015
2. Explanation of change classes:
Strong increase: > 1 deterioration in class e.g. Oligotrophic to Eutrophic
Weak increase: 1 deterioration in class, e.g. Ultra-oligotrophic to Oligotrophic
Stable: No change in class
Weak decrease: 1 improvement in class, e.g. Mesotrophic to Oligotrophic
Strong decrease: > 1 improvement in class, e.g. Eutrophic to Oligotrophic

The majority (63%) of the 175 river monitoring stations had a stable trend, i.e. no change in status, with 19% of stations showing an improvement and 18% showing a decline in trophic status. Of the 30 sites that showed a weak decrease, 15 of these stations improved from Oligotrophic to Ultra-Oligotrophic, 11 improved from Mesotrophic to Oligotrophic and four stations improved from Eutrophic to Mesotrophic. There was no improvement seen at the single Hypertrophic station. Table 2-20 gives the evolution of trends between the 2008-2011 and 2012-2015 periods.

Table 2-20: Number and Percentage of River Stations changing trophic class from 2008-2011 and 2012-2015 (n=175)

	2008-2011 Status				
2012-2015 Trend	**Ultra-oligotrophic**	**Oligotrophic**	**Mesotrophic**	**Eutrophic**	**Hypertrophic**
Strong Decrease	0	0	1	2	0
Weak Decrease	0	15	11	4	0
Stable	29	50	16	15	1
Weak Increase	8	13	10	0	0
Strong Increase	0	0	0	0	0
Total	37	78	38	21	1

2.5 Surface Water Monitoring – Transitional, Coastal and Marine Waters

2.5.1 Monitoring Network for Transitional, Coastal and Marine Waters

Monitoring data for the current reporting period were obtained for 140 Surveillance Monitoring stations for transitional and coastal (TCM) stations from the WFD National Monitoring Programme. The data have been summarised for the current period (2012-2015) and compared to the previous reporting period (2008-2011). A breakdown of the numbers and types of monitoring stations is given in Table 2-21.

Table 2-21: Number of monitoring stations for Nitrate concentrations

Stations	Previous Reporting Period (2008-2011)	Current Reporting Period (2012-2015)
Transitional	99	108
Coastal	24	32
Total no. stations	123	140

2.5.2 Nitrate Concentrations in Transitional, Coastal and Marine Waters

The average annual, winter average and maximum nitrate concentrations for the TCM stations are shown on Maps 2-31 to 2-33 and summarised in Table 2-22 and Table 2-23. Nitrate is measured as dissolved inorganic nitrogen, which has been converted to Nitrate assuming that all measured nitrogen is present as nitrate. Direct nitrate measurements are not taken in TCM stations.

Table 2-22: Quality classes for Nitrate Concentrations in Transitional, Coastal and Marine Waters, 2012-2015 – Number of sampling points

Stations	Quality classes (mg NO_3/L)					
	0-1.99	2-9.99	10-24.99	25-39.99	40-50	>50
Transitional annual average (n=89)	54	27	8	0	0	0
Transitional winter average (n=88)	36	41	11	0	0	0
Transitional maximum (n=89)	31	42	16	0	0	0
Coastal annual average (n=28)	27	1	0	0	0	0
Coastal winter average (n=30)[1]	25	5	0	0	0	0
Coastal maximum (n=28)	20	8	0	0	0	0

Notes:
1. Winter period is between October and March.

Table 2-23: Quality classes for Nitrate Concentrations in Transitional, Coastal and Marine Waters, 2012-2015 – Percentage of sampling points

Stations	Quality classes (mg NO_3/L)					
	0-1.99	2-9.99	10-24.99	25-39.99	40-50	>50
Transitional annual average	61%	30%	9%	0%	0%	0%
Transitional winter average	41%	47%	13%	0%	0%	0%
Transitional maximum	35%	47%	18%	0%	0%	0%
Coastal annual average	96%	4%	0%	0%	0%	0%
Coastal winter average	83%	17%	0%	0%	0%	0%
Coastal maximum	71%	29%	0%	0%	0%	0%

All stations recorded winter and annual averages below 25 mg NO_3/L with all coastal stations below 10 mg NO_3/L. In the previous reporting period (2008–2011), there were eight stations with nitrate values between 25 and 40 mg NO_3/L and one station with nitrate >50 mg NO_3/L.

It must be noted that these concentrations are face-value and not related to the salinity of the sample. Similar assessments for trophic status and Water Framework Directive EQSs are calculated on a water body basis with salinity-corrected assessment criteria.

2.5.3 Trend Analysis in Transitional, Coastal and Marine Waters

Average and maximum nitrate concentrations at 106 TCM stations were compared between the 2012-2015 and 2008-2011 periods. The trend analysis results are shown on Maps 2-36 and 2-37 and summarised in Table 2-24 and Table 2-25. Changes in nitrate concentration were assessed across five quality classes.

All coastal stations showed a stable or weak decrease in winter average and maximum nitrate concentrations. For coastal waters, 96% of stations showed a stable trend in annual average concentration. One coastal station showed a weak increase in annual average nitrate concentration.

In transitional waters, 95% of stations showed a stable trend or had a weak decrease in annual average concentration. For winter average concentrations, 11% showed a weak increase, with one station showing a strong increase. An increase in maximum concentration is observed at 7% of sites, with one site showing a strong increase.

This simple trend analysis does not take into account the salinity of the samples, the diluting capacity of seawater or the variable dynamics of the marine environment. Overall the trends in transitional and coastal water show that the annual and winter nitrate concentrations have remained stable between the two assessment periods.

Table 2-24: Trend in Nitrate Concentrations in Transitional, Coastal and Marine Waters, 2008-2011 to 2012-2015 – Number of sampling points

Stations	Quality classes (mg NO_3/L)				
	<-5	-5 to -1	-1 to +1	+1 to < 5	>+5
Transitional annual average (n=83)	0	12	67	4	0
Transitional winter average (n=76)	1	28	38	8	1
Transitional maximum (n=63)	13	16	29	4	1
Coastal annual average (n=23)	0	0	22	1	0
Coastal winter average (n=21)	0	2	19	0	0
Coastal maximum (n=18)	0	10	8	0	0

Notes:
Trend classes between current and previous reporting periods:
Strong increase: >+5 mg/L
Weak increase: +1 to +5 mg/L
Stable: -1 to +1 mg/L
Weak decrease: -1 to -5 mg/L
Strong decrease: <-5 mg/L

Table 2-25: Trend in Nitrate Concentrations in Transitional, Coastal and Marine Waters, 2008-2011 to 2012-2015 – Percentage of sampling points

Stations	Quality classes (mg NO_3/L)				
	<-5	-5 to -1	-1 to +1	+1 to < 5	>+5
Transitional annual average (n=83)	0%	14%	81%	5%	0%
Transitional winter average (n=76)	1%	37%	50%	11%	1%
Transitional maximum (n=63)	21%	25%	46%	6%	1%
Coastal annual average (n=23)	0%	0%	96%	4%	0%
Coastal winter average (n=21)	0%	10%	90%	0%	0%
Coastal maximum (n=18)	0%	56%	44%	0%	0%

2.5.4 Eutrophication in Transitional, Coastal and Marine Waters

Methodology

Since 2001, the Trophic Status Assessment Scheme (TSAS) has been adopted to measure sensitivity to eutrophication in transitional, coastal and marine sites. The system is based on evaluating water quality parameters against a set of criteria which are grouped into the following three categories related to the median salinity of the sample:

- criteria for nutrient enrichment from nitrogen and phosphorus;
- criteria for accelerated growth of phytoplankton and macroalgae, and
- criteria for "undesirable disturbance" measured using oxygen conditions (EPA, 2010).

A detailed description of the system is given in the EPA Water Quality in Ireland Report 2007-2009 (EPA, 2010).

Using these criteria, water bodies are classified into one of four categories to describe their trophic status and tendency to eutrophication:

- Eutrophic;
- Potentially Eutrophic;
- Intermediate;
- Unpolluted.

Trophic Status Results

Trophic Status is assessed at the water body level and cannot be measured on a station-by-station basis. The TSAS assessment covers 25 water bodies from the WFD programme. Trophic status is assigned on a whole-water body basis using a combined three-year assessment.

For the 2008-2011 reporting period data was only available for 28 water bodies so the trend analyses can only be made for these common water bodies. Map 2-38 shows the trophic status classes at these sites and the results are summarised in Table 2-26.

Table 2-26: Quality Classes on the Trophic State of Transitional, Coastal and Marine Waters, 2012-2015 - Number of Waterbodies (and Percentage)

Waterbodies	Number of sampling points (and %)			
	Unpolluted	Intermediate	Potentially Eutrophic	Eutrophic
Transitional (n=17)	10 (59%)	4 (23%)	2 (12%)	1 (6%)
Coastal (n=8)	7 (88%)	1 (12%)	0 (0%)	0 (0%)

Table 2-27: Trends in Quality Classes on the Trophic State of Transitional, Coastal and Marine Waters, 2012-2015 - Number of Waterbodies (and Percentage)

Water bodies	% of points				
	Strong increase	Weak increase	Stable	Weak decrease	Strong decrease
Transitional (n=16)	0	1 (6%)	11 (69%)	4 (25%)	0
Coastal (n=8)	0	0	7 (88%)	1 (12%)	0

Table 2-27 shows stable trends in the trophic status between the 2008-2011 and 2012-2015 assessments. There have been no changes for 69% of transitional and 88% of coastal waters. Five water bodies have shown a decline in trophic state between the two assessment periods; the Boyne Estuary, Upper Barrow Estuary, Barrow-Nore Estuary Upper and the Fergus Estuary transitional water bodies and the Cork Harbour coastal water body.

The overall picture for surface water indicates that the average nitrate concentrations were below 40 mg NO_3/L in all lake and river monitoring stations for the period 2012-2015, with only one river station recording maximum nitrate concentrations above 40 mg NO_3/L. Of the assessed lake and river stations, 100% of lakes and 95% of rivers showed a stable trend or a decrease in average nitrate concentrations. However 23% and 47% of the respective river and lake stations show upward trends in maximum nitrate concentrations. All transitional stations recorded average nitrate concentrations below 25 mg NO_3/L with all coastal stations below 10 mg NO_3/L. Ninety-six percent of coastal stations and 95% of transitional stations showed a stable or weak decrease in average nitrate concentrations. There has been an increase in maximum nitrate concentration at only 7% of transitional stations compared with 28% and 25% for transitional and coastal stations, respectfully, in the previous reporting period. However, this simple trend analysis does not take into account the salinity of the samples, the diluting capacity of seawater or the variable dynamics of the marine environment.

The assessment of trophic status in the assessed lakes and rivers revealed a relatively stable picture with signs of eutrophication in 15% of rivers and 12% of lakes. There has been a reduction in trends showing signs of eutrophication in lakes with 12% of lakes in 2012-2015 showing weak or strong increase in trophic status compared to 31% of lakes in 2008-2011. For rivers, 18% of rivers showed weak or strong increase in trophic status compared to 12% of rivers in 2008-2011. There have been stable trends in the trophic status in 69% of transitional and 88% of coastal waters. Fiver water bodies (four transitional and one coastal) have shown a decline in trophic state between the two assessment periods.

3 NITRATE VULNERABLE ZONES

Ireland has adopted a whole territory approach in implementing the Nitrates Directive. This decision was given legal effect in 2003 by the European Communities (Protection of Waters against Pollution from Agricultural Sources) Regulations, 2003 (S.I. No. 213 of 2003). There has been no revision to this decision and the Action Programme is being applied across the whole national territory.

The Nitrates Directive is one of 11 key directives which form the basic measures that Member States are required to fully implement under the Water Framework Directive. Furthermore, the Nitrates Directive is one of the main agricultural measures of the Water Framework Directive. Therefore, the adoption of a whole territory approach to implementation of the Nitrates Directive and the establishment of legally binding limits for the application of nitrogen and phosphorus to agricultural land in Ireland ensures that all Irish farmers are contributing to the achievement of the objectives of the Water Framework Directive.

4 DEVELOPMENT, PROMOTION AND IMPLEMENTATION OF CODE OF GOOD PRACTICE

4.1 Data Concerning the National Territory of Ireland

A summary of agricultural activity in Ireland during the period 2011-2015 is presented in Table 4-1 together with figures for the previous reporting period, where available.

Table 4-1: Agricultural Statistics for Ireland

	Reporting Period	Reporting Period
	Previous Period 2008-2011	**Current Period 2012-2015**
Total land area (km^2)[1]	68,900	68,900
Agricultural land (km^2)[1]	2008 41,999 2009 41,899 2010 45,689 2011 45,555	2012 45,327 2013 44,778 2014 44,658 2015 44,295
Agricultural land available for application of manure (km^2)[1,2]	2008 37,541 2009 37,487 2010 41,317 2011 41,082	2012 40,515 2013 40,043 2014 39,715 2015 39,260
Grassland area (km^2)[1]	2008 37,810 2009 37,878 2010 42,150 2011 41,901	2012 41,507 2013 40,996 2014 40,981 2015 40,698
Perennial crops (km^2)[1]	Fruit crops 2008 4 2009 4 2010 12 2011 8	Fruit crops 2012 9 2013 9 2014 9 2015 9
Annual use of organic N from livestock manure (thousand tonnes)[3]	2008 458.2 2009 454.7 2010 443.9 2011 439.1	2012 453.0 2013 461.8 2014 461.4 2015 NA
Annual use of organic N other than livestock manure (thousand tonnes)	NA	NA
Annual use of mineral N (thousand tonnes N)[4]	2008 309.0 2009 306.8 2010 362.4 2011 295.8	2012 296.5 2013 353.0 2014 331.8 2015 331.0
Number of farms[1]	2008 NA 2009 NA 2010 139,860 2011 NA	2012 NA 2013 139,600 2014 NA 2015 NA
Number of farms with livestock[1]	Total number of farms (000s) with: 2010 Cattle: 111.0 Sheep:32.2 Pigs:1.2 Poultry: 8.5 Horses/Ponies: NA	Total number of farms (000s) with: 2013 Cattle: 111.3 Sheep: 36.6 Pigs: 1.3 Poultry: 8.1 Horses/Ponies: NA
Cattle (million heads, in June)[1]	2008 6.7199 2009 6.7161 2010 6.6066 2011 6.4930	2012 6.7541 2013 6.9026 2014 6.9261 2015 6.9635
Sheep (million heads, in June)[1]	2008 5.0614 2009 4.7780 2010 4.6416	2012 5.1700 2013 5.0070 2014 5.0968

	Reporting Period		Reporting Period	
	Previous Period 2008-2011		Current Period 2012-2015	
	2011	4.8025	2015	5.1387
Pigs (million heads, in June)[1]	2008	1.4620	2012	1.5709
	2009	1.3852	2013	1.5525
	2010	1.5183	2014	1.5553
	2011	1.5551	2015	1.5369
Poultry (million heads, in June)[1]	2008	NA	2012	NA
	2009	NA	2013	NA
	2010	11.0254	2014	NA
	2011	NA	2015	NA
Other (million heads, in June)[1]	2008	0.1231	2012	0.1333
Horses, ponies, mules, jennets, asses, goats, farmed deer	2009	0.1262	2013	0.1200
	2010	0.1292	2014	0.1176
	2011	0.1289	2015	0.1187

1. Central Statistics Office (CSO), Ireland.
2. Estimated from the area allocated to grassland and crop production, but excludes rough grazing.
3. Department of Agriculture, Food and the Marine estimate (using CSO June livestock numbers). Includes N deposited on land by grazing livestock.
4. Department of Agriculture, Food and the Marine.
5. Includes those employed in agriculture, forestry and fishing.
NA = not available

4.2 Nitrogen Discharges to the Environment

Figures for the annual discharge of agricultural and mineral sources of nitrogen to the environment are summarised in Table4-2.

Industrial data reported in Table 4-2 are based on annual returns to the EPA from licenced facilities under the e-PRTR reporting mechanism. Formal licencing of municipal wastewater treatment facilities was introduced in 2008 under the Wastewater Discharge Authorisation Regulations 2007 (S.I. No. 684 of 2007). The mass loadings reported and the numbers of Wastewater Treatment Plants (WWTPs) for which data was available are indicated in the yearly totals. No contribution has been determined for WWTP plants of population equivalents <500 PE as these are not required to be reported under PRTR at present.

Table 4-2: Total Nitrogen Discharges to the Environment

	Reporting Period			
	Previous period 2008-2011		Current period 2012-2015	
Total (thousand tonnes)	NA		NA	
Agricultural N (Organic N + Mineral N)[1]	2008	767.2	2012	749.5
(thousand tonnes)	2009	761.5	2013	814.9
	2010	806.3	2014	793.2
	2011	734.9	2015	NA
Industrial N (not connected with urban)[2]	2008	0.076	2012	0.077
(thousand tonnes)	2009	0.084	2013	NA
	2010	0.053	2014	0.061
	2011	0.075	2015	0.051
Urban wastewater[2]	2008	3.889	2012	4.057
(thousand tonnes)	2009	4.194	2013	4.002
	2010	4.595	2014	4.548
	2011	4.454	2015	5.298[3]

1. Total application of organic and mineral N to agricultural land (these figures are not losses to the environment) – estimate from Central Statistics Office (CSO), Ireland and Department of Agriculture, Food and the Marine figures.
2. Total nitrogen discharge from industrial and urban WWTP. Source – e-PRTR submissions to EPA. The figures only include industrial facilities with emissions above the reporting threshold of 0.05 (thousand tonnes) and urban waste water treatment plans with population equivalents of >100,000. In 2014 the urban water figure accounted for 81% of national waste water load. 3. 2015 figures not validated yet.
NA = total not available as values for agriculture are not losses

4.3 Code of Good Practice

Date of first publication: 01-07-1996

The agricultural Code of Good Practice has not been revised and has been superseded by the Nitrates Action Programme which applies to the whole territory. The Good Agricultural Practice (GAP) Regulations give legal effect to Ireland's Nitrates Action Programme. These Regulations were signed by the Minister for the Environment, Heritage and Local Government on 11 December 2005 and came into effect on 1 February 2006 (DEHLG/DAF, 2005). Following a period of further consultation, the Minister made revised Regulations on 18 July 2006 (S.I. No. 378 of 2006). The Regulations were amended subsequently on 31 March 2009 (S.I. No. 101 of 2009) and again in 2010 (S.I. No. 610 of 2010). The GAP regulations were further revised in 2014 (S.I. No. 31 of 2014) and the current regulations came into effect on 28 January 2014. The purpose of these regulations is to give effect to Ireland's Nitrates Action Programme for the protection of waters against pollution caused by agricultural sources. The set of measures in these regulations provide a basic level of protection against adverse impacts to waters arising from the proposed agricultural expansion under Food Harvest 2020. Food Harvest 2020 has since been superseded by Food Wise 2025 (see Chapter 7 of this report).

5 PRINCIPAL MEASURES UNDER NATIONAL ACTION PROGRAMME

5.1 Agricultural Activities, Development and Nitrogen Assessment

Statistics summarising agricultural activity in Ireland during the current and previous reporting periods are presented in Table 5-1.

Table 5-1: Summary of Agricultural Activities

	Reporting Period	
	Previous period 2008-2011	**Current period 2012-2015**
Total land area (km^2)[1]	68,900	68,900
Agricultural area (km^2)[1]	2008 41,999 2009 41,899 2010 45,689 2011 45,555	2012 45,327 2013 44,778 2014 44,658 2015 44,295
Agricultural area available for application of manure (km^2)[1,2]	2008 37,541 2009 37,487 2010 41,317 2011 41,082	2012 40,515 2013 40,043 2014 39,715 2015 39,260
Evolution in farming practices		
Grassland area (km^2)[1]	2008 37,810 2009 37,878 2010 42,150 2011 41,901	2012 41,507 2013 40,996 2014 40,981 2015 40,698
Perennial crops (km^2)[1]	Fruit crops 2008 4 2009 4 2010 12 2011 8	Fruit crops 2012 9 2013 9 2014 9 2015 9
Manure N excretion per animal category[3] (000 tonnes/year)		
Cattle	2008 399.4 2009 397.6 2010 386.7 2011 381.1	2012 392.6 2013 402.7 2014 402.8 2015 NA
Sheep and goats	2008 33.0 2009 30.9 2010 30.3 2011 30.9	2012 32.5 2013 32.3 2014 31.8 2015 NA
Pigs	2008 12.7 2009 12.4 2010 12.9 2011 13.0	2012 12.9 2013 12.6 2014 12.8 2015 NA
Poultry	2008 7.4 2009 7.7 2010 7.6 2011 7.7	2012 8.4 2013 8.2 2014 8.2 2015 NA
Other Horses, ponies, mules, jennets, asses, farmed deer	2008 5.8 2009 6.1 2010 6.3 2011 6.3	2012 6.6 2013 6.1 2014 5.8 2015 NA

Notes
1. Central Statistics Office, Ireland
2. Estimated from the area allocated to grassland and crop production, but excludes rough grazing
3. Department of Agriculture, Food and the Marine estimate (using CSO June livestock numbers). Includes N deposited on land by grazing livestock
NA not available

5.1.1 Principal Evolution Observed in Crops

Changes Favourable to Limit Nitrogen Losses

- Grass continues to be the dominant crop in Ireland: an average of 4,104,800 ha was devoted to grass production in the current period compared to 4,218,400 ha in the 2008-2011 period[1].
- Mild winters and cool summers with rainfall relatively evenly distributed throughout the year and moist soils ensure grass growth almost right throughout the year in Ireland thereby reducing the potential for nitrogen leaching.
- The decline in potato area has continued with an average of 9,425 ha in the 2012-2015 period compared with an average of 11,500 ha during the 2008-2011 period[2].
- The area devoted to maize for silage decreased to an average of 13,750 ha in the current period (2012-2015) compared to an average of 22,750 ha in the previous period (2008-2011)[2]. Maize is a late harvested crop thereby reducing the likelihood of green cover being established for the winter period.

Changes Unfavourable to Limit Nitrogen Losses

- The proportion of the total area farmed devoted to grass production has decreased slightly from 92.0% in the 2008-2011 period to 91.7% in the current period but still remains high. The average total area farmed also decreased from the previous period[2].
- The total area devoted to tillage crops, fruit and horticulture has increased slightly from an average of 368,425 ha in the period 2008-2011 to an average of 371,675 ha in the period 2012-2015[2].
- The total area devoted to cereal crops has increased from an average of 298,275 ha in the period 2008-2011 to 305,575 ha in the period 2012-2015[2].
- Late harvesting of crops reduces the quality and effectiveness of green cover being established (by sowing a winter crop or via natural regeneration) before the onset of winter (however the action programme requires green cover be put in place where a total herbicide is used or arable land is ploughed after 1st July each year).

Notes

1. Includes pasture, Hay, Grass silage and rough grazing in use, Central Statistics Office, Ireland

2. Central Statistics Office, Ireland

5.2 Action Programme

Ireland’s National Nitrates Action Programme was designed to prevent pollution of surface waters and groundwater from agricultural sources and to protect and improve water quality, giving effect to the EU Nitrates Directive. The dates of publication and revisions to the National Action Programme are listed in Table 5-2. The background to the third National Action Programme (NAP3) is outlined below (DECLG 2014).

Article 28 of the Good Agricultural Practice Regulations, in line with the Nitrates Directive, requires the Minister for the Environment, Community and Local Government, in consultation with the Minister for Agriculture, Food and the Marine, to review the Nitrates Action Programme every four years. Following its second review, Ireland’s third NAP will run until the end of 2017.

Ireland has applied its National Nitrates Action Programme on a country-wide basis, thus ensuring 100% territorial coverage compared to an EU average of 45% territorial coverage. In addition, the Programme also provides for the control of phosphorus used in agriculture. The scope of the two previous National Action Programmes (NAP 1 & NAP 2) has therefore been comprehensive, both in terms of addressing the major sources of agricultural nutrients and in covering a national farming population of over 139,860 farm holdings (CSO, 2012).

Table 5-2: Revisions National Nitrates Action Programme

Date of Publication	28/07/2005
Dates of Revision	01/02/2006
	01/08/2006
	19/07/2007
	31/03/2009
	28/12/2010
	28/01/2014
	12/03/2014
	13/10/2014
Deadline fixed for the limit of 170 kg N/ha from livestock manure	Dec 2009
	Dec 2013
	Dec 2017

The principal elements of the NAP regime to-date include:

- limits on farm stocking rates,
- limiting the application of fertilisers,
- the introduction of ‘closed periods’ preventing the application of organic and chemical fertilisers during environmentally vulnerable parts of the season,
- minimum storage requirements for livestock manures,
- requirements regarding maintenance of green cover in tillage lands and set back distance from waters.

Elements of action programmes are set out in the Article 10 Report for Ireland for the period 2008-2011 (EPA, 2012).

In common with other EU Member States in which intensive agricultural activity is practised, Ireland availed of a derogation from the 170 kg organic nitrogen limit of the Nitrates Directive, which was granted by the EU Commission in 2007. During the NAP1, derogations were granted to just over 5,000 farm holdings, amounting to circa 4% of total net land area. The number of farm holdings granted derogations under the NAP 2 was 5,093 (5.2% of the total net agricultural land area nationally) and 5,273 in 2014 under NAP 3. All derogation farm holdings were subject to strict controls, including a requirement on farmers to apply annually to the Department of Agriculture, Food and the Marine (DAFM) for a derogation as well as complying with additional conditions related to the application of manure and other fertilisers and conditions related to land management. An inspection programme was also established to ensure compliance with the derogation conditions. This regime will continue under NAP 3.

5.2.1 Introduced or Modified Elements of Action Programme

Periods of Prohibition of Application

The country is divided into three zones for the purposes of the Regulations. These zones are related to the length of the growing season, weather, soil types etc. in each zone (see Figure 5-).

- Chemical fertiliser may not be applied between the 15th September and 12th/15th/31st January (the end of the prohibited period varies depending on Zone) – see Table 5-3.
- Organic fertilisers (other than farmyard manure) may not be applied between the 15th October and the 12th/15th/31st January.
- Farmyard manure may not be applied between 1st November and the 12th/15th/31st January.
- Soiled water or chemical fertilisers to meet the crop requirements of autumn-planted cabbage or of crops grown under permanent cover may be applied throughout the year, subject to weather and ground conditions being suitable.

Figure 5-1: Zones Governing the Application of Regulations

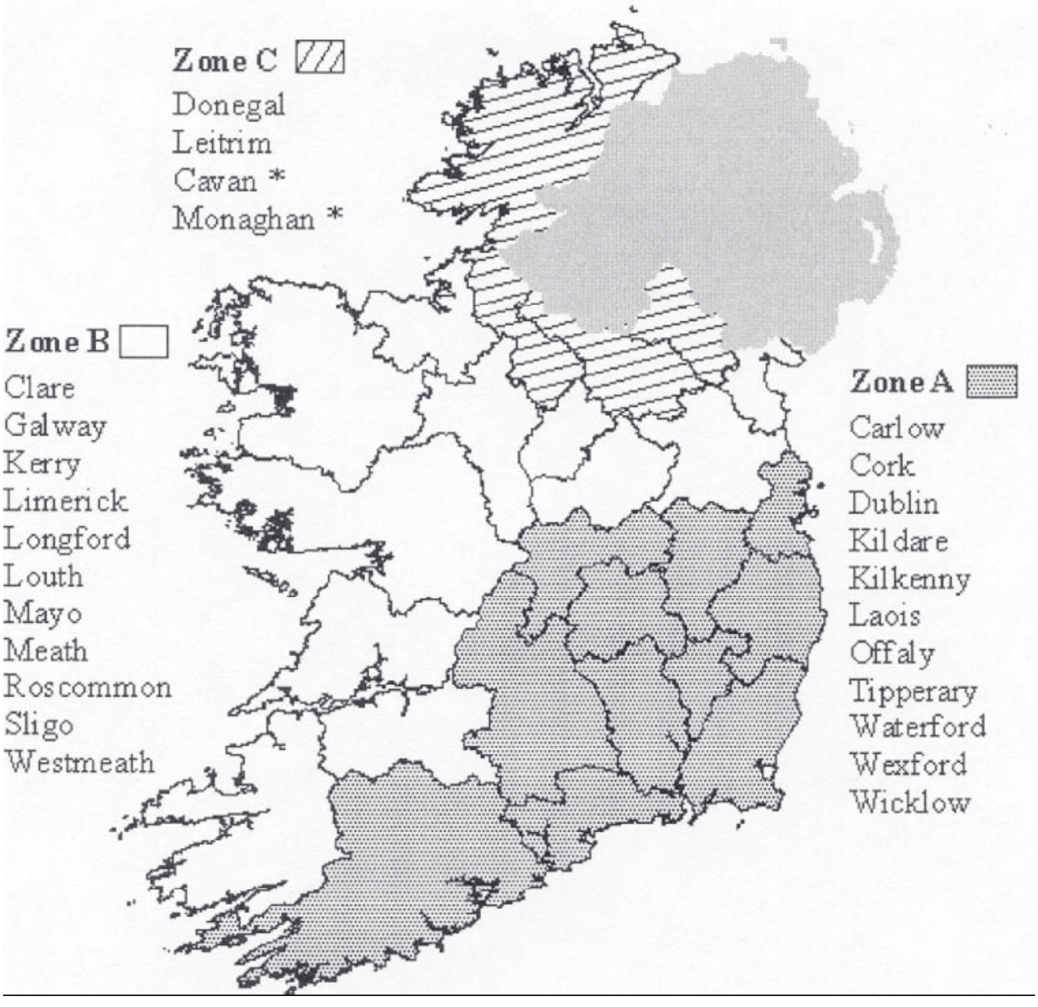

Table 5-3: Prohibited Application Periods in National Zones

Zones	Storage Capacity Required	Prohibited Application Periods		
		Chemical Fertilisers	Organic Fertilisers	Farmyard Manure
A	16 weeks	15 Sept–12 Jan	15 Oct–12 Jan	1 Nov–12 Jan
B	18 weeks	15 Sept–15 Jan	15 Oct–15 Jan	1 Nov–15 Jan
C (Donegal & Leitrim)	20 weeks	15 Sept–31 Jan	15 Oct–31 Jan	1 Nov–31 Jan
C (Cavan & Monaghan)	22 weeks	15 Sept–31 Jan	15 Oct–31 Jan	1 Nov–31 Jan

Capacity of manure storage, and requirement regarding construction and tightness

- Storage facilities for livestock manure and other organic fertilisers, soiled water and effluents from dungsteads, farmyard manure pits or silage pits must be maintained free of structural defect and be maintained and managed in such manner as is necessary to prevent run-off or seepage, directly or indirectly, into groundwater or surface water, of such substances.
- Storage facilities built after the introduction of the Regulations must be designed, sited, constructed, maintained and managed so as to prevent run-off or seepage, directly or indirectly, into groundwater or surface water and must comply with such construction specifications for those facilities as may be approved from time to time by the Minister for Agriculture, Food and the Marine.
- In the case of holdings with pigs the required storage capacity is adequate capacity to store all such manure for a period of at least 26 weeks (at least16/18/20/22 weeks is adequate in the case of holdings with less than 100 pigs).
- In the case of holdings with poultry the required storage capacity is adequate capacity to store all such manure for a period of at least 26 weeks (at least16/18/20/22 weeks is adequate in the case of holdings with less than 2,000 poultry places).
- In the case of holdings with sheep, deer and goats the required storage capacity is adequate capacity to store all such manure for a period of at least six weeks.
- In the case of holdings with cattle the required storage capacity is adequate capacity to store all such manure for a period of at least 16/18/20/22 weeks (depending on the zone that the holding is located in).
- Reduced storage capacity is acceptable in certain circumstances (e.g. where grazing livestock are being out-wintered in accordance with the conditions set out in the Regulations).
- The storage capacity for soiled water must equal or exceed the capacity required to store all soiled water likely to arise on the holding during a period of 10 days.

Rational fertilisation

- An occupier of a holding must take all such reasonable steps as are necessary for the purposes of preventing or minimising the application to land of fertilisers in excess of crop requirement.
- The amounts of available nitrogen or available phosphorus applied may not exceed the maximum fertilisation rates set out in the Regulations.
- In the absence of a soil test for phosphorus index 3 must be assumed (maximum rates of P that can be used in such circumstances are maintenance levels of P).
- The availability of nitrogen and phosphorus in chemical and organic fertilisers is specified in the Regulations (e.g. nitrogen and phosphorus in chemical fertilisers and phosphorus in organic fertilisers is deemed to be 100% available).

Provisions on application of fertilisers on water-saturated, flooded, frozen and snow-covered ground

Chemical or organic fertilisers cannot be applied when:

- The land is waterlogged.
- The land is flooded or likely to flood.
- The land is snow-covered or frozen.

- Heavy rain is forecast within 48 hours.

Limitation of total fertilisation, by types of crops,

Maximum fertilisation rates of available nitrogen and phosphorus for grassland, tillage, vegetable and fruit crops are set out in the Regulations.

Provisions on fertilisation on slopes

Chemical or organic fertilisers cannot be applied when the ground slopes steeply and, taking into account factors such as proximity to waters, soil condition, ground cover and rainfall, there is significant risk of causing water pollution.

Provisions on application of fertilizers near watercourses

- Chemical fertiliser must not be applied to land within 2 metres of a surface watercourse.
- In the case of organic fertiliser or soiled water; site-specific and risk-based approach to be used by Local Authorities in setting setback distances around drinking water abstraction points, following assessment of conditions.
- Organic fertiliser or soiled water cannot be applied to land within 200/100/25 metres of any water supply for human consumption (varies depending on amount of water being supplied or the number of people being served).
- Organic fertiliser or soiled water cannot be applied to land within 20 metres of a lake shoreline.
- Organic fertiliser or soiled water cannot be applied to land within 15 metres of exposed cavernous or karstified limestone features.
- Organic fertiliser or soiled water cannot be applied to land within 5 metres of any other surface watercourse (there are exceptions).

Provisions on procedure for land application of fertilizers, both chemical and livestock manure

- An occupier of a holding must have regard to weather forecasts issued by Met Éireann when applying fertilisers.
- Organic fertilisers must be applied in as accurate and uniform a manner as is practically possible.
- Organic fertilisers may not be applied with an upward facing splash plate or by use of a sludge irrigator.
- Organic fertilisers cannot be applied from a road or passageway adjacent to the land.
- Soiled water may not be applied at rates that exceed 50,000 litres/ha in any 42 day period or by irrigation at a rate exceeding 5 mm/hour (except in extreme vulnerability areas where the maximum rates allowed are much lower).

Winter coverage of soils

- Arable land ploughed between 1st July and 30th November must have a green cover from a sown crop within 6 weeks of ploughing.
- Grassland ploughed between 1st July and 15th October must have a green cover from a sown crop by 1 November.
- Grassland may not be ploughed between 16th October and 30th November.
- Where a non-selective herbicide is used on arable land or grassland between 1st July and 30th November, there must be green cover from a sown crop or from natural regeneration within six weeks of application of the herbicide.
- Where green cover is provided to comply with the rules concerning ploughing or use of a non-selective herbicide, it must not be removed by ploughing or by use of a non-selective herbicide before 1st December, unless a crop is sown within two weeks of removing it.

Other preventive measures

- Certain records must be maintained.
- Farmyard manure may not be stored in a field during the prohibited application period for farmyard manure (1st November to 12th/15th/31st January, depending on zone – see Figure 5-1).
- Farmyard manure may not be stored in a field, during the permitted application period, within certain specified distances from water sources.

- Silage bales may not be stored outside of farmyards within 20 metres of a watercourse or drinking water abstraction point in the absence of adequate facilities for the collection and storage of any effluent arising.

The soil sampling area permitted (in exceptional circumstances where soil types and cropping of lands were similar during the previous five years) for the taking of a soil sample for the analysis of phosphorus or organic matter content is 8 hectares (in the previous Action Programme a maximum sample area of 12 ha was allowed).

Third National Action Programme

The period of public consultation on the third proposed NAP lasted between 01 May and 12 June 2013. The changes are based on recommendations of an Expert Review Group composed of representatives of the Department of Environment, Community and Local Government, the Department of Agriculture, Food and the Marine, the Environmental Protection Agency and Teagasc. The Group's recommendations were a result of an extensive review of more up-to-date research, information which was not available at the time of NAP 2 and consideration of written submissions arising out of the public consultation process. The changes also take into account the EPA's report in accordance with Article 29(2) of NAP 2 on Progress on Implementation of the EC (Good Agricultural Practices for the Protection of Waters) Regulations, 2010 and practical experience gained during the implementation of the first two programmes.

The amendments include:

(1) Adjustments to the maximum allowable phosphorus application rates for grassland, maize and cereals on high pH soils
(2) Reduction in the period for which soil P test results remain valid from 6 years to 5 years on non-derogation farms.
(3) Clarification that the application of relevant buffer zones applies to "waters" instead of the more ambiguous term "watercourse".
(4) Introduction of a 2-m wide uncultivated and unsown zone adjacent to a stream/drain as mapped on current OSI 6" maps (1:10560) to be maintained where tillage crops are grown (not including grass establishment).
(5) New setback distance for supplementary feeding points (20 m) and an increased setback distance for the storage of farmyard manure (from 10 m to 20 m) from waters.
(6) Increase setback distances from surface waters for the spreading of organic fertiliser only during the two weeks preceding and two weeks following the prohibition periods set out in Art. 17(2) of the existing regulations. Note: it is not proposed to alter the existing prohibition periods for spreading organic fertilisers.
(7) Amendment to the definition of "soiled water" to provide greater clarity.
(8) Removal of the requirement to establish green cover in certain cereal crops following non-selective herbicide use after 15 October in order to enable the effective control of certain grass weeds.
(9) Increase in the maximum allowed nitrogen application rates on winter barley and spring wheat by 20 kg per hectare per year across all indices in order to allow high yielding crop varieties realise their crop yield potential.
(10) A number of other minor technical amendments.

6 EVALUATION OF ACTION PROGRAMMES

6.1 Agricultural Inspections

Table 6-1: Summary of Nitrates Action Programme Inspections

Year	Local Authority Inspections	DAFM Inspections (on behalf of LAs)	Total Inspections
2012	4,011	1,650	**5,661**
2013	3,916	1,669	**5,858**
2014	3,457	1,650	**5,107**
2015	3,500	1,652	**5,152**

Data source: Local Authorities Water and Communities Office

Table 6-1 summarises the number of farm inspections carried out by local authorities and DAFM (on behalf of LAs) in the period 2012–2015. The average number of inspections for this period is 5,445. These inspections are carried out to determine the effectiveness of the measures set out in the National Action Programme (NAP). There has been a notable reduction in local authority inspections in 2014 and 2015.

6.2 Objectives of the Action Programme

The objective of the Nitrates Action Programme is the protection of waters against pollution caused by agricultural sources. The set of measures in Good Agricultural Practice Regulations (S.I. No. 31 of 2014) provide a basic level of protection against possible adverse impacts to waters arising from the proposed agricultural expansion under Food Wise 2025.

Under Article 27 (1) of the Good Agricultural Practice Regulations (S.I. No. 31 of 2014), the Minister for Agriculture, Food and the Marine, is required to carry out, or cause to be carried out, such monitoring and evaluation programmes in relation to farm practices as may be necessary to determine the effectiveness of the measures set out in the NAP.

6.3 Agricultural Catchments Programme

The Department of Agriculture, Food and the Marine (DAFM) established the Agricultural Catchments Programme (ACP) in part fulfilment of Ireland's obligation to monitor the effectiveness of the measures contained in the National Nitrates Action Programme in 2007. The ACP is operated by Teagasc and the second 4-year phase of the programme concluded in 2015. A third phase was approved for funding by DAFM in late 2015 and will run for a further four years from 2016 to 2019. Further information on the ACP and its findings from Phase 1 and Phase 2 are available on the Teagasc website at http://www.teagasc.ie/agcatchments.

6.3.1 ACP Objectives

The main objective of the ACP is to evaluate the efficacy of the Good Agricultural Practice (GAP) package of measures introduced under the Irish National Nitrates Action Programme and to disseminate the findings of the programme widely to magnify their impact on policy and practice in agri-environmental management. The programme integrates the bio-physical and the socio-economic to better understand the wider impact of the GAP measures at farm and catchment scale across the six catchments that constitute the study area. These catchments include derogation holdings, as required by the European Commission under Ireland's approval to operate under a nitrates derogation. Measurements, modelling and socio-economic studies are being used to evaluate the efficacy, cost effectiveness and economic impact of the measures. Modifications to national measures will be identified where evidence indicates that water quality targets may not be achieved. The ACP also explores farmer attitudes to implementation of nitrates regulations, adoption of nutrient management practices, provision of ecosystem services and the economic impacts of efficient nutrient management.

In addition to the core research programme, PhD projects funded by the Teagasc Walsh Fellowship programme enhance and strengthen the ACP. The research themes covered in these projects in Phase 2 included:

- The identification of Critical Source Areas through sediment fingerprinting.
- Investigating the relationship between P loading and lake ecological response.
- Technology transfer – adoption of nutrient management and grassland management practices.
- Developing nitrogen tests for grassland soils.
- Determining the sources of pathogenic bacteria in water.
- Investigations into the biotic and abiotic attenuation of N and P in drainage ditch networks.
- Using numerical modelling and soil hydraulic parameters to estimate the inherent delay, or 'time lag', from the soil surface to the saturated zone.
- Understanding N dynamics in groundwater moving along hill slopes to streams.
- Investigating the feasibility of precision nutrient management on intensive dairy farms to account for variability in soil type in the managing on-farm nutrient sources.

6.3.2 ACP Phase 2 Findings

Some of the findings that are more relevant to policy and practice implementation which emerged during Phase 2 of the ACP are summarised below:

Improved efficiency in use of nitrogen and phosphorus – results of a Teagasc National Farm Survey (NFS) study of 150 dairy farms in the period 2006-2012 showed significant improvements in nutrient use efficiency leading to reduced balances thus reducing nutrient available for loss. P balance declined by 50% from 11.9 to 6.0 kg ha^{-1} and N balance declined by 25.1 kg ha^{-1} from 180.4 to 155.3 kg ha^{-1} over the study period. These declines were attributable to reduced chemical N and P fertiliser imports. Phosphorus use efficiency improved by 18% over the study period from 60 to 78%, while N use efficiency improved by 2.1% over the period from 20.8 to 22.9%.

- **Evaluating the 'closed' period for organic fertiliser application** – disproportionately high nutrient losses were found during the closed period; mostly derived from soil stores, but some of the early closed period losses were also associated with slurry/manure application. However there was no evidence of nutrient transfers from slurry/manure applications in the four weeks following the end of the closed period; even though modelling indicated a continued nutrient transfer risk during this time. This implies farmers are managing their application of organic fertilisers to avoid losses to water. Supporting farmers in making decisions to spread organic fertilisers at the best times and places will help to strengthen existing regulatory frameworks to avoid storm driven incidental nutrient transfers.
- **Assessing P loss risk in karst** – studies found that farming in a karst catchment could pose less risk to groundwater than expected. A specific P vulnerability map was developed for the ACP catchment that used the soil and hydro-geological P buffering potential as key assumptions in moderating P export to springs. The proposed vulnerability map classified 14% of the site as highly vulnerable for P loss to groundwater while a 'Critical Source Area' map that took soil P levels into account identified only 2% of the area as at high risk. This approach could be used to mitigate risk in karst areas while facilitating farmers to intensify on the safer areas.
- **Nitrate attenuation potential in a free-draining catchment -** catchments with little landscape attenuation of N, and/or a dense under-field drainage system, may deliver more nitrate-N to surrounding waters as agriculture intensifies. However, an intensively managed grassland catchment, with high risk for N leaching to groundwater that was studied had relatively low nitrate-N loss likely due to an N buffering zone near the stream. Mean nitrate-N concentration in groundwater across the catchment was below current regulatory standards and was similar to the average in the stream outlet.
- **Effect of soil type and hydrology on P loss –** a poorly drained grassland catchment had three times higher annual P loss than an arable, mostly groundwater fed catchment despite the latter having higher soil P sources. The grassland catchment was P transfer risky rather than P source risky and the size of the P losses from the two catchments was defined by basic rainfall to runoff partitioning influences that determine proportions of quickflow and slowflow. Schemes designed to attenuate diffuse P after mobilisation from soil surfaces could be targeted more effectively if they took into account soil type and hydrology before, or in addition to, any of the other factors known to influence P losses from catchments (such as soil P and land use).
- **Groundwater phosphorus vulnerability** – in two groundwater-fed catchments in winter the groundwater contribution to total reactive phosphorus in stream water was 50% and 59%. It

was found that iron-rich soils favour P mobilisation into soluble form and its transfer to groundwater. It was concluded that susceptibility of P via groundwater should be considered for mitigation in some settings.

- **Lag times in the unsaturated zone –** using free-licence hydrological software, meteorological and soil data and bedrock or groundwater information the time lags in water quality response in the unsaturated zone were determined. Results indicated that this time lag would preclude full effects of the GAP measures within the first WFD reporting period, although trends in water quality response should begin to be observed.
- **Suspended sediment -** average levels of suspended sediments in the ACP catchments were low compared to similar catchments elsewhere in Europe and were higher in poorly drained catchments than in well drained ones. Typical Irish landscape features (hedgerows, drainage ditches and irregular field sizes) may provide resilience to hill slope soil erosion and/or sediment transport despite the dominance of intensive agriculture.
- **Storm-triggered, increased supply of sediment-derived phosphorus in a small freshwater lake** - internal loading from sediment-derived phosphorus was found to be a significant contributor to the eutrophication problem in a lake in one of the studied catchments. These types of lakes may display a lag time before measures to improve water quality prove successful. Internal P loading should be accounted for when designing remediation strategies.
- **How differing farming motivations affect practice adoption -** farmers more motivated by classifications of 'farm stewardship', 'ecocentric' and 'productivist' considerations were more likely to adopt a greater number of good nutrient management practices. 'Anthropocentric' considerations were important to some farmers and this had a negative effect on adoption rates. Demographic and structural variables such as age, off-farm employment, farm-yard manure systems (all negative) and contact with extension services (positive) were found to significantly influence adoption of nutrient management practices examined.
- **Understanding Soil Testing on Dairy Farms -** Farmers who test their soil regularly are younger, have larger farm and herd sizes and have higher per hectare farm gross margin and gross output compared to those farmers who don't regularly test their soil**.** Dairy farmers who soil test voluntarily are associated with higher levels of formal agricultural education and larger farm sizes.
- **Using drainage ditch to mitigate P loss –** drainage ditches with low slopes are likely to primarily retain sediment while ditches with high slopes are likely to mobilise sediment during storms. Tailoring management according to channel classes may reduce P transfers downstream.
- **A sub-field scale Critical Source Area index for phosphorus management** – areas at highest risk of P losses from agricultural land to watercourses are called Critical Source Areas (CSAs). These need to be accurately identified in order to cost-effectively target management practices to reduce losses, conserve soil fertility and protect water quality. Using maps of runoff-generating areas to target buffer strips at points where runoff is delivered to the watercourse could reduce costs of implementation in the GLAS agri-environment scheme on average by 66% and 91% over 1 and 5 years, respectively. Runoff-generating areas were the dominant CSA factor in the studied catchments, overriding source pressures. Targeting measures at these areas is therefore potentially a longer-term, more sustainable and cost-effective strategy for mitigating diffuse pollution.

6.4 Measures that support the National Action Programme

6.4.1 Investment Schemes for Farm Waste Management

In addition to the Nitrates Regulations, Ireland's National Action Programme under the Nitrates Directive included a commitment to investment in farm facilities to assist farmers in complying with the Regulations. A Farm Waste Management Scheme (FWMS) was established and operated by the DAFM following a survey of farm facilities carried out by Teagasc. The FWMS was open to applications from farmers between March 2006 and July 2007 and offered up to 60% grant-aid for approved farm building works. Total expenditure on farm building works under the FWMS was in excess of €2 billion of which grant-aid expenditure comprised approximately €1.2 billion. Approximately 43,000 farmers received approval for grant-aided farm building works under the Scheme and over six million cubic metres of storage capacity was provided under this scheme.

6.4.2 Agri-Environmental Measures

The Green Low Carbon Agri-environment Scheme (GLAS) is a targeted agri-environment scheme with a budget of €1.3 billion over the course of the RDP 2014-2020, making it the largest scheme within the RDP. The DAFM expects that there will be between 45,000 and 50,000 participants within GLAS, once it is fully subscribed. Maximum annual payments to farmers will generally be €5,000; however there is potential for some farmers to increase their annual payment to a maximum of €7,000 by making an exceptional environmental commitment. GLAS is built on the previous and successful REPS and AEOS schemes, which operated until recently, and ties in with the green vision for Irish agriculture as contained in Food Wise 2025.

GLAS identifies key Priority Environmental Assets, including high status water areas and other vulnerable water areas as well as farmland habitat, commonage land, farmland birds and rare breeds. Farmers in these areas receive priority access into GLAS, and must address these Priority Environmental Assets by putting in place appropriate measures under the scheme. Measures to protect and enhance water quality comprise 45% of all GLAS actions and include providing arable grass margins, riparian margins and protecting watercourses from bovines through fencing, as well as putting low-input permanent pasture and traditional hay meadows in place, and observing minimum tillage operations

6.4.3 Advisory Programme

Article 12 of Regulation (EU) No. 1306/2013 of the European Parliament and of the Council requires each Member State to establish an approved Farm Advisory System (FAS) to advise farmers on land management and farm management. This requirement also existed under previous EU regulations. The Minister for Agriculture, Food and Marine established the Farm Advisory Service in Ireland in January 2007. The regulation provides that beneficiaries and farmers not receiving support under the CAP may use FAS on a voluntary basis.

The scope of the advice to be provided by FAS was expanded under the reform of CAP, effective from 2015, and must cover at least the following:

- the obligations at farm level resulting from the Statutory Management Requirements, (including requirements under the Nitrates Regulations), and the standards for Good Agricultural Environmental Condition of land as laid down in Chapter 1 of Title VI of Regulation No. 1306/2013;
- the agricultural practices beneficial for the climate and the environment and the maintenance of the agricultural area;
- measures at farm level provided for in certain areas of rural development programmes;
- requirements relating to specific aspects of the Water Framework Directive;
- requirements relating to specific aspects of the Sustainable Use of Pesticides Directive.

DAFM has some 700 advisors (Teagasc and private) approved under FAS, a list of these advisors is available on the DAFM website (http://www.agriculture.gov.ie/farmerschemespayments/farmadvisorysystem/).
All approved advisors are required to attend training provided by DAFM on the various elements covered by FAS. During the period 2014 to 2016, 9 training sessions were provided by DAFM to both existing and new FAS advisors. Details of training presentations are available on the DAFM website using the above link.

DAFM is shortly issuing an 'Explanatory Handbook for Cross Compliance Requirements' to all farmers. This booklet will also be available on the DAFM website (http://www.agriculture.gov.ie/farmerschemespayments/crosscompliance/).

6.5 Other developments that may impact positively on water quality

6.5.1 Fertiliser Use

In 2000, mineral N sales amounted to 407,598 tonnes, this figure dropped to 321,588 tonnes in 2007. Mineral N fertiliser sales continued to drop to 308,960 and 306,806 tonnes for 2008 and 2009, respectively. In 2010, there was an increase in N fertiliser sales to 362,396 tonnes but 2011 and 2012 saw sales drop once again to 295,795 and 296,536 tonnes, respectively. While 2013 saw an increase again to 353,044, thereafter in 2014 and 2015 mineral N fertiliser sales fell to 331,782 and 330, 959 tonnes, respectively. The average annual sales figure for mineral N fertiliser for the current period (2012-2015) is 328,080 tonnes compared to 318,489 tonnes for the previous period (2008-2011) and 345,358 tonnes for the period from 2004-2007.

Chemical P sales declined from 49,267 tonnes in 2000 to 32,415 tonnes in 2007. The average annual sales figure for the 2004-2007 period was 37,733 tonnes compared to 26,174 tonnes in the 2008-2011 period. 2009 recorded the lowest annual chemical P fertiliser sales at 20,232 tonnes, across all reporting periods under the Nitrates Directive. Chemical P fertiliser sales have increased since and were 36,551 tonnes in 2015 with the average for the 2012-2015 reporting period was 34,135 tonnes. The increase is likely due to the reported loss of soil P fertility during the last reporting period.

6.5.2 Enforcement

In addition to the inspections outlined in Table 6-1, approximately 6,500 DAFM inspections (including GLAS, derogation farm applicants, eligibility etc.) also take place annually and any nitrates breaches noted on these farms in the course of these inspections are cross reported for penalty purposes.

DAFM also carry out administrative checks on all herd owners to establish if they are adhering to the 170 or 250 kg Nitrogen per hectare limits as appropriate. This is done by checking the total Nitrogen figures from the Animal Identification System (AIM) against the areas declared under the Basic Payment Scheme. Herd owners exceeding these limits are subject to penalties.

6.5.3 WFD Implementation

In 2014 the European Union (Water Policy) Regulations were introduced to set out a new governance structure to achieve better implementation of the Water Framework Directive in Ireland. These regulations provide for a more integrated governance structure where clear responsibilities were assigned to the EPA, the local authorities and the Minister for the Environment. These regulations also established the Water Policy Advisory Committee, which brings together the key policy-setting national organisations that impact on Ireland's delivery of the WFD to advise the Minister.

As a component of the new arrangements, significant new responsibilities have been assigned to the EPA, together with additional resources. The EPA now has a leadership role in technical implementation and reporting. The EPA will be i) undertaking catchment characterisation, ii) reviewing the impact of human activities, iii) drafting environmental objectives and iv) compiling common programmes of measures for a Programme of Measures Steering Group and finalisation and approval by the Minister. Catchment characterisation provides an understanding of how catchments work. This includes the physical, hydrochemical, and ecological characteristics, impacts, pressures and quantification of pollutant loads and abstraction pressures in the catchment. Characterisation is being used by the EPA to identify he significant pressures so that strategies, measures and resources can be prioritised and targeted to enable effective protection or restoration, as required, of our water resources. Final decisions on the environmental objectives and associated measures will be in the River Basin Management Plan (RBMP) that will be published in December 2017.The local authorities will lead implementation and most enforcement of measures on the ground and have key responsibility for ensuring compliance with the Directive on public participation. These new governance arrangements will enable more effective WFD implementation.

Integrated Catchment Management (ICM) has become an accepted approach for achieving successful management of water resources and implementation of the WFD. This is set out in the Significant Water Management Issues (SWMI) consultation document for this cycle of the river basin management planning. This strategic new direction represents a shift away from traditional generalised approach to one based on building partnerships; engagement with and involving local communities; taking a catchment-based approach; undertaking catchment characterisation to a level that enables critical source areas of nutrients to be identified and pathways for water and pollutants to be understood; and select both country-wide and local targeted measures to achieve objectives.

As part of the characterisation process, the EPA has developed models to i) locate critical source areas for phosphate and nitrate arising from diffuse agricultural sources (i.e. areas with a greater potential to release nutrient to waters) and ii) estimate and predict the sources of nutrient loads (phosphorus and nitrogen) arising from a range of sources including agriculture, urban wastewater works, industrial discharges, septic tank systems and forestry. The critical source area approach will help focus activities to areas they are most likely to have a positive impact on water quality.

Engagement and communications is the key to successful Integrated Catchment Management. A Catchment Management Network has been established to provide a platform for the EPA, government departments and agencies, local authorities, other public bodies and environmental non-government organisations to work together to avoid duplication of effort while working towards RBMP delivery and achieving integrated catchment management. The Network is providing a mechanism for knowledge exchange. It is enabling catchment managers to come together to exchange ideas and assist one another in delivering the 2nd cycle RBMP and taking Ireland further along the path towards achieving integrated catchment management.

A quarterly Catchments Newsletter is providing an informal means of facilitating communication and networking on catchment issues. A new website – www.catchments.ie – was launched in June 2016 as a means of making information on water quality and WFD implementation more widely available.

7 FORECAST OF FUTURE EVOLUTION OF WATER BODY QUALITY

Overall, nitrate concentrations across all water categories for the stations assessed have remained stable. However, the downward trend in nitrate concentrations observed in the previous period has not being maintained into the current reporting period. There has been an increase in maximum nitrate concentrations for 47% of lakes and 5 of 24 transitional and coastal water bodies have shown an increase in eutrophication. The measures in third Nitrates Action Plan (NAP 3) do however appear to be providing a good level of protection for waters.

There are likely to be substantial changes in Irish agriculture in the coming decade. Food Wise 2025 is a strategic plan for the development of agri-food sector in Ireland over the next decade, which is based on the continued development of the sector where efficient and environmentally-friendly production delivers sustainable export growth on global markets. The following growth projections have been identified:

- Increasing the value of agri-food exports by 85% to €19 billion.
- Increasing value added in the agri-food, fisheries and wood products sector by 70% to in excess of €13 billion.
- Increasing the value of Primary Production by 65% to almost €10 billion
- The creation of an additional 23,000 direct jobs in the agri-food sector all along the supply chain from primary production to high valued added product development.

There are significant risks to the aquatic environment associated with the increase in animal numbers, the associated intensification and associated increases in food processing. This has been taken into account in the development of the strategy and a principle of Food Wise 2025 is that *"environmental protection and economic competitiveness are equal and complementary: One cannot be achieved at the expense of the other*". The strategy further notes that "*achieving economic competitiveness and environmental sustainability are equal pillars in the delivery of the vision"*.

The strategy sets out more than 50 associated actions to achieve agricultural sustainability. This is welcome from an environmental perspective and the development of a clear mechanism for tracking implementation of these actions and assessing their effectiveness will be needed to ensure that impacts whether positive or negative on the environment are identified and managed. To assist with tracking implementation the Food Wise 2025 Implementation Plan provides for the establishment of a Sustainability Sub-Group to oversee the appropriate monitoring of, and respond to, any impacts on the environment which may result from implementation; and to monitor and drive the implementation of the FW2025 sustainability actions which are crucial to ensuring that environmental sustainability is maintained.

From a Water Framework Directive perspective, Draft River Basin Management Plans (RBMPs) will be published by the end of 2016 with adoption of final plans due by the end of 2017. These plans will set out specific environmental objectives with target dates for Irish water bodies. The development of the plan is being done on the basis of a comprehensive re-characterisation of the Irish Water environment and the development of a substantial body of evidence to support this re-characterisation. This catchment re-characterisation is being used to identify the significant pressures at a variety of scales so that strategies, measures and resources can be prioritised and targeted to enable effective protection or restoration, as required, of our water resources. This evidence will provide part of the evidence base needed to ensure that the risks and potential impacts of any agricultural intensification are identified and acted upon and is essential to ensure the implementation of the Food Wise strategy is not damaging to the environment. (EPA, 2015).

The acceptance of the Integrated Catchment Management concept as an implementation strategy for the WFD provides for better engagement on the interface between agriculture and water quality management.

The ACP will continue to assess and evaluate the various measures being implemented under NAP 3 and the scientific findings from it will contribute to further enhancing the efficiency of nutrient management in agriculture.

These elements when coupled with farm inspections, infrastructural investment and improvements in advisory services and awareness provide the circumstances for reduced agricultural impacts on water quality.

Careful coordination and management of measures set out in NAP3 and the RBMPs along with regular assessment and review have good potential to result in progressive improvement in water quality and in Ireland achieving the environmental objectives in the RBMPs and continuing to comply with the Nitrate Directive.

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