RPS

UISCE ÉIREANN : IRISH WATER

National Wastewater Sludge Management Plan

Strategic Environmental Assessment Environmental Report

March 2016

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1 NON TECHNICAL SUMMARY

1.1 INTRODUCTION (CHAPTER 2)

Irish Water is currently preparing a National Wastewater Sludge Management Plan (referred to as the NWSMP) which will set out Irish Water's high level strategies for wastewater sludge management over a 25 year horizon. A national water sludge management plan will be developed in due course but is not the subject of this plan.

This document forms part of the official Strategic Environmental Assessment (SEA) of Irish Water's draft NWSMP. It sets out how the SEA has been undertaken and presents the findings of the assessment of the aims and strategies contained in the draft NWSMP as well as reasonable alternatives.

The purpose of this Environmental Report is to:

- Inform the development of the NWSMP;
- Identify describe and evaluate the likely significant effects of the NWSMP and its reasonable alternatives; and
- Provide an early opportunity for the statutory authorities and the public to offer views on any aspect of this Environmental Report, through consultation.

The Environmental Report complies with the requirements of the Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment (the SEA Directive) as implemented in Ireland through the European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations (S.I. 435 of 2004 as amended by S.I. 200 of 2011). The Strategic Environmental Assessment has been completed by RPS on behalf of Irish Water.

1.2 CONTENTS AND MAIN OBJECTIVES OF THE PLAN (CHAPTER 3)

The draft NWSMP under development contains the following information, outlined in **Table 1.1**.

Table 1.1 – SEA Stages

Chapter No.	Content
Chapter 1	Introduction sets out the purpose and objectives of the NWSMP in relation to wastewater sludge management.
Chapter 2	Overview of Sludge Composition, Loads and Outlets, including quantity, type and current level of treatment. The predicted future changes to sludge loads are assessed in terms of population projections. Recommendations for collection and assessment of future data to optimise future sludge management are included.
Chapter 3	Review of Standards and Plans including a review of current legislation and guidance documents in order to assess current requirements and recommendations.
Chapter 4	Consultation Process outlines the consultation with relevant stakeholders and consultees.
Chapter 5	Sludge Treatment Process outlines the current level of sludge treatment along with appropriate treatment processes for agricultural reused, energy recovery and alternative outlets to be

Chapter No.	Content
	considered.
Chapter 6	Sludge Transport Strategy deals with options for minimising sludge transport by capital works and optimising use of existing infrastructure.
Chapter 7	Sludge Infrastructure reviews the infrastructure required at sites for sludge satellite centres and sludge hub centres. It also deals with options for future sludge satellite and hub centres for sludge dewatering including assessment of potential for energy recovery.
Chapter 8	Sludge Outlet Options deals with potential sludge treatment and disposal options with respect to their ability to meet the criteria of providing a secure, sustainable, cost-effective solution over the life of the NWSMP taking into account current and anticipated legislative and operational constraints.
Chapter 9	Options Assessment and Alternatives deals with the selection of options and alternatives. This includes a review of environmental, social and economic aspects and risks associated with the preferred options.
Chapter 10	Quality Assurance, Monitoring and Reporting reviews current requirements for monitoring and reporting of sludge management activities.
Chapter 11	Review Research and Opportunities gives an overview of research identified in relation to sludge treatment and disposal, particularly where related to energy recovery and reduction of sludge volumes for disposal.
Chapter 12	Financial Evaluation includes a cost estimate for treatment and disposal of sludge over the life of the plan and assesses the potential impact changes in the availability of the agricultural outlet for sludge.
Chapter 13	Conclusions and Recommendations sets out the current status and the short, medium and long-term goals for management of wastewater sludge. Recommendations include the preferred options to achieve sustainable sludge management including regional plans for future infrastructure.

Irish Water's responsibilities for wastewater commences when effluent reaches the public wastewater network. Irish Water is responsible for its transfer to wastewater treatment plants (WWTPs), its treatment and the subsequent discharge of the treated effluent back into the water environment. The wastewater treatment process generates sludge which require further treatment prior to reuse or disposal. Irish Water is also responsible for the treatment and reuse / disposal of the wastewater sludge that is generated from its WWTPs.

The WSSP identified that there is a deficit of sludge management facilities nationally. The proper management of sludge presents a challenge to Irish Water in terms of identifying an appropriate management strategy and identifying options that can potentially generate revenue and reduce management costs. The NWSMP is required in order to set out the short, medium and long-term management strategy for the next 25 years for wastewater sludge produced at treatment plants under its control.

The NWSMP will take into account current legislation and guidance documents in relation to the treatment and utilisation of wastewater sludge in addition to potential environmental impacts and sustainability of proposals. The recommendations of the NWSMP will be used to inform future capital and operational activities in relation to sludge management. A separate report will be undertaken for sludge from water treatment plants.

The principle criterion which must be met by the sludge management strategies is that it must provide a secure, sustainable, cost-effective solution to management of wastewater sludge over the life of the NWSMP, taking into account current and anticipated legislative and operational constraints. This includes a review of existing and new technologies and risks associated with all options within the plan.

The following sludge management objectives are considered in the NWSMP:

- To avoid endangering human health or harming the environment;
- To maximise the benefits of wastewater sludge as a soil conditioner and source of nutrients;
- To ensure that all regulatory and legislative controls are met, and due regard is taken of non-statutory Codes of Practice and industry guidance;
- To establish long term, secure and sustainable disposal routes and outlets;
- To ensure cost-effective and efficient treatment and reuse/disposal techniques;
- To reduce potential for nuisance from sludge transport and sludge facilities;
- To extract energy and other resources where economically feasible; and
- To drive operational efficiencies, e.g. through use of sludge hub centres.

1.3 SEA METHODOLOGY (CHAPTER 4)

1.3.1 The SEA Process

The SEA Directive requires that certain Plans and Programmes, which are likely to have a significant impact on the environment, be subject to the SEA process. The SEA process is broadly comprised of the following steps, as outlined in **Table 1.2**.

Table 1.2 – SEA Stages

SEA Step/Stage	Purpose	Status
Screening	The purpose of this stage of the process was to reach a decision, on whether or not an SEA of the NWSMP was required.	This stage was completed in Q2 2014 with a decision to undertake SEA of the NWSMP.
Scoping and statutory consultation	The purpose of this stage of the process was to clarify the scope and level of detail to be considered in the environmental assessment. This was done in consultation with the defined statutory bodies for SEA in Ireland and consultation was also undertaken with the authorities in Northern Ireland. **Appendix A** outlines the key issues raised in the Scoping Process.	This stage was completed in Q2 / Q3 2015.
Environmental assessment and consultation	The purpose of this stage of the process is to assess the likely significant impacts on the environment as a result of implementation of the NWSMP and consideration of reasonable alternatives. The output from this stage of the process is an SEA Environmental Report which records this assessment. Consultation on the draft NWSMP, Environmental Report and appropriate assessment are also part of this	This stage was completed in Q4 2015/ Q1 2016. Subject of this report.

SEA Step/Stage	Purpose	Status
	stage.	
SEA Statement	The purpose of this stage of the process is to identify how environmental considerations and consultations have been integrated into the final plan culminating in the production of an SEA Statement.	To be published with Final NWSMP in Summer 2016.

1.3.2 Environmental Assessment and Environmental Report

Based on the legislation and guidance, the Environmental Report must include the information outlined in **Table 1.3**.

Table 1.3 – Requirement of SEA Directive and Relevant Chapter in Environmental Report

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

Requirement of SEA Directive (Article 5(1) Annex I)	Chapter of Environmental Report
the plan or programme, or modification to a plan or programme	
A non-technical summary of the information provided under the above headings	Non-Technical Summary

1.4 REVIEW OF RELEVANT PLANS, POLICIES AND PROGRAMMES (CHAPTER 5)

This section of the report has taken consideration of the plan/ programme/ policy and legislative framework within which the NWSMP has been developed. The NWSMP is a Tier II Plan within the Irish Water planning framework and sits under the overarching Tier I Water Services Strategic Plan (WSSP). The NWSMP will in turn inform projects and activities required to implement the sludge management plan.

The NWSMP is a national plan and therefore the review has focused on relevant National, European and International frameworks. As part of the review process, a comprehensive list of plans and programmes, policy and legislation, relevant to the management of sludge produced at WWTPs under the control of Irish Water has been documented and is presented in **Appendix B** of this report. It is not intended to be an exhaustive list but rather is focused on those considered key to the NWSMP and takes on board comments made during the SEA scoping stage from both statutory consultees and the wider public.

In exploring the relationships between the NWSMP and plans, programmes, policy and legislation the following two questions have framed the review:

- Does the NWSMP contribute to the fulfilment of environmental protection objectives set in other Plans/ Programmes/ Policy/ Legislation; and
- To what degree are the environmental protection objectives set in these other Plans/ Programmes/ Policy/ Legislation impacted by the NWSMP?

A number of key plans, programmes and policies were considered from European, National, Regional and Local levels. Feedback from the SEA scoping consultation included a number of significant responses raising the issue of codes of practice and quality assurance schemes with direct relevant to land spreading on agricultural lands. In response to this, a list of the main codes and assurance scheme were compiled, which both impose controls on land spreading from an environmental protection perspective and also present significant limitations on where wastewater sludge may be acceptable for land spreading in the wider agricultural landscape.

1.5 RELEVANT ASPECTS OF THE CURRENT STATE OF THE ENVIRONMENT (BASELINE) (CHAPTER 6)

This section of the Environmental Report examines the relevant significant issues of the current state of the environment in relation to biodiversity, fauna, flora, population, human health, food production & safety, water, soil, geology, climatic factors, air, material assets, cultural heritage, landscape and the interrelationship between these factors. The baseline has been compiled using available datasets and indicators developed through scoping and review of relevant supporting

documentation. It is noted that the NWSMP is a national plan and as such the assessment is focussed at a national strategic level and this is mirrored in the level of detail presented for the baseline description in the main Environmental Report.

The baseline description is focussed in the first instance on the Republic of Ireland, however given that Ireland shares a land boundary with Northern Ireland, there is potential for environmental impact on water quality, biodiversity which are transboundary. As such (and in recognition of the scoping comments received by the NIEA) the baseline chapter includes reference, where relevant, to baseline conditions and pressures in Northern Ireland.

1.5.1 State of the Environment Overview – Republic of Ireland

In their 5th and most recent state of the environment review, the EPA identified four priority challenges for the environment, which, if addressed successfully, should benefit the present and future quality of Ireland's environment. These challenges are summarised in **Table 1.4**.

Table 1.4 – EPA Key Challenges and Relevance to the NWSMP

Challenge	Relationship to NWSMP
Challenge 1: Valuing and Protecting our Natural Environment	The NWSMP will first and foremost introduce a clear and transparent framework for the management of sludge generated through wastewater treatment in Ireland. The management of sludge has the potential for significant impact on the natural environment, particularly in relation to soils, water and air. The plan presents the opportunity to ensure that wastewater sludge management and related activities are carried out in compliance with all existing EU and national objectives, policies and legislation which also seek to protect the natural environment.
Challenge 2: Building a Resource-Efficient, Low Carbon Economy	The NWSMP sets out the approach for the sustainable management of wastewater sludge and includes objectives focussed at minimisation, treatment, transport and energy recovery, all of which would contribute to the effective and safe management of wastewater sludge. The NWSMP also considers the generation of greenhouse gas emissions from collection, transport and processing of sludge in addition to new sludge processing technologies utilising its potential for energy generation as an alternative to fossil fuels.
Challenge 3: Implementing Environmental Legislation	The NWSMP is undergoing both Strategic Environmental Assessment (SEA) and Appropriate Assessment (AA) in line with existing EU and national legislation. Projects arising from the NWSMP in many cases will require planning and further environmental assessment. The SEA will also have regard to inter-related EU legislation such as the Water Framework Directive, the Floods Directive, among others.
Challenge 4: Putting the Environment at the Centre of Our Decision Making	As noted above, the draft NWSMP is undergoing both SEA and AA in line with existing EU and national legislation. This is ensuring that the environmental consequences are taken into account as part of the plan's development. Both processes are helping to shape the evolution of the draft NWSMP.

A summary of the relevant aspects of the current state of the environment in Ireland has been summarised in **Table 1.5**.

Table 1.5 – Summary of Current State of the Environment in Ireland

Theme	Key Findings
Air Quality	While air quality is of a good standard, monitoring shows that levels of some pollutants (e.g. NO_2) are at concentrations that may impact on health. PM_{10}, $PM_{2.5}$, ozone, and PAH are above the WHO guideline values and an EEA report indicates that around 1,200 deaths in Ireland in 2012 were directly linked to air pollution. Continued effort is being made to reduce air pollution through bans on bituminous coal in large towns and cities and implementing the actions set out in the Smarter Travel Policy for Sustainable Transport. Incentives in recent years to change from petrol to diesel in the personal car fleet has had unforeseen and significant effects on air quality, increasing key pollutants in cities especially PM_{10}, $PM_{2.5}$.
Climate	Irish per capita GHG emissions remain among the highest in Europe, with agriculture the largest source accounting for 33.3% of total national emissions. Sectors such as energy are showing decreases in GHGs due to increased use of renewables and improving standards. In 2013, Ireland was halfway to its Renewable Energy Directive target and the newly published Climate Action and Low Carbon Development Bill will also help transition to a low carbon economy. Further reductions, particularly in the agriculture and transport sectors, will be required to meet the 2020 EU Effort Sharing targets of 20% below 2005 levels. Longer term horizons will pose a serious challenge for Ireland based on current trajectories.
Water	Most of Ireland's water bodies are of good ecological status however nutrient loading from wastewater and diffuse agricultural sources continue to be the main threat. Measures to improve water quality are being implemented in order to achieve the targets of the WFD such as the development of River Basin Management Plans and control and licensing of industrial discharges. The implementation and enforcement of the Nitrates Action Plan is the most important measure to address diffuse agricultural pollution of freshwaters. This includes a code of Good Agricultural Practice (GAP) which is mandatory for all farms. Nitrogen and phosphorus levels are decreasing although the rate of improvement has been slow and the improvements are relatively modest. This may be tempered by proposals to add orthophosphate to the drinking water supply in response to unacceptable levels of lead in drink water supplies. The second cycle of the RBMP's are also in preparation and are anticipated for 2017.
Land and Landscape	The rate of change in land use and land cover since the early 1990s is relatively high by European standards. The main changes have been an increase in the amount of forested lands and artificial areas, and a decrease in the total amount of agricultural land and peatland. The main drivers of land use change over the coming decade will be the agricultural policy of Food Wise 2025, and afforestation policies associated of the National Forestry Programme 2014-2020.
Nature and Biodiversity	The majority of Ireland's most important habitats are reported to be of poor or bad conservation status but the number of species considered declining in status is low. Aquatic species are most at risk. Factors such as agricultural intensification, population growth and climate change are likely to bring additional pressures on a number of species and habitats in Ireland. Based on the poor conservation status of many important habitats and some species, considerable efforts and resources will be required to improve their status, both within and outside protected areas. Conservation of marine fisheries is highlighted as a major priority that needs to be addressed urgently.
Sustainable Economy	The quality of Ireland's environment is generally good though it has been under increasing pressure over the last decade as a result of economic changes, population growth and urbanisation, and changing consumer patterns. In Ireland, the recent economic recession had lowered pressure on the environment in areas such as waste generation and GHG emissions, but as key sectors of the economy have now started to recover, the main challenge for Ireland is to try to grow the economy in a sustainable way. Many of the persistent environmental problems that we face, such as air pollution, biodiversity loss, and hazardous waste, are rooted in unsustainable production and consumption patterns.

Theme	Key Findings
Waste	Ireland is moving from a position of almost total reliance on landfill, to a high level of recovery. More value is being derived from waste through recycling and use as fuel and waste per capita is decreasing, however it is still considered to be at an unsustainably high level. Targets under the Landfill Directive to divert waste from landfill were met in 2013 target, but the recent economic recovery may put achievement of the 2016 target at risk. Ireland's first municipal waste incinerator became fully operational in 2012, which contributed to increased recovery rates, with 17 % of managed municipal waste used as a fuel. The priority is to ensure that recyclable materials from waste streams continue to be recycled where possible. New Regional Waste Management Plans were published in 2015.
Environment and Wellbeing	The overall quality of the Irish environment is generally good, but health impacts associated with air pollution in Ireland are still an issue that requires further measures. The availability of high-quality green spaces (parks, woods, countryside) and blue spaces (ponds, river banks, lakeshores and seashores) helps to foster activity on the road to better health. EU Drinking Water Regulations 2014 set quality standards for water at the tap and over the past 10 years the quality of Ireland's bathing waters has remained high, with the vast majority meeting required EU standards. Damage to health associated with environmental pollution in Ireland is much less than that caused by lifestyle factors such as poor diet, lack of exercise, and tobacco use. The ongoing protection of Ireland's high-quality environment is vital.

1.5.2 State of the Environment Overview – Northern Ireland

The second State of the Environment Report for Northern Ireland (2013) is titled "From Evidence to Opportunity" and provides a five year update and commentary on forty-four indicators across eight themes to provide an evidence-based assessment of the state of the environment. Like Ireland, Northern Ireland has experienced the effects of recession in recent years which has in turn reduced some of the pressure on the environment but this has been replaced by new pressures and challenges associated with trying to stimulate an economy and reliance on natural resources. The seventh annual Northern Ireland Environmental Statistics Report (2015) provides an annual update to the figures and provides commentary around the trends outlined in the second State of the Environment Report for Northern Ireland (2013). The relevant aspects of the current state of the environment in Northern Ireland has been summarised in **Table 1.6**.

Table 1.6 – Summary of Current State of the Environment in Northern Ireland

Theme	Key Findings
Air Quality	There are 28 Air Quality Management Areas that are leading the activity to tackle air quality problems. There is continued improvement in air quality but problems do remain for nitrogen dioxide emissions due to transport. Agricultural emissions of ammonia still remain high and threaten ecosystems and habitats. Continued effort is required to reduce air pollution from key sources such as road transport and agriculture.
Climate	There is evidence that the climate in Northern Ireland is changing. There has been a reduction in greenhouse gas emissions but road transport emissions are still increasing. There are government targets towards reducing greenhouse gas emissions of at least 35% by 2025 based on 1990 levels but this will prove challenging. A key priority for climate change will be the implementation of the Northern Ireland Climate Change Adaptation Programme. The NI Environmental Statistics Report 2015 reported Greenhouse gas emissions in Northern Ireland have decreased since 1990, with a reduction of 16% by 2012. Most sectors have shown a decrease on the levels in the Base Year, with the exception of transport and land use change.
Water	The overall status of water bodies in Northern Ireland has not significantly changed from

Theme	Key Findings
	that recorded in 2009 but improvements have been identified in water utility discharges and drinking water quality. There has also been a reduction in water pollution incidents. The key challenges for the water bodies relate to diffuse nutrient pollution, chemical status of the water environment and measures to address physical modifications of beds, banks and shore of surface waters. Northern Ireland is broadly on track to implement the measures from the River Basin Management Plans developed under the Water Framework Directive. Water in particular provides a clear pathway for pollutants between the two jurisdictions.
Marine	There has been an improvement to the overall quality of the marine environment, including bathing water quality and beaches, around Northern Ireland's shores. This can be directly linked to improvements in wastewater treatment. One key remaining issue is marine litter. The next challenge will be the implementation of the Marine Strategy Framework Directive. The NI Environmental Statistics Report 2015 reported that almost 50% of marine water bodies around Northern Ireland's shores are classified as 'high' or 'good', with the remaining water body areas being classified as 'moderate' (33%), 'poor' (11%) or 'bad' (7%).
Land and Landscape	There is a marked change in the landscape with the development of upland wind farms and the significant decline in housing development has reduced pressure on land use. Investment is proposed in the agri-food sector but this will require innovative approaches to development within the countryside. Agri-environment schemes encourage farmers and landowners to manage their land to benefit the environment. The NI Environmental Statistics Report 2015 reported that at the end of 2014, 364,000 ha of land in Northern Ireland were under agri-environment scheme agreement.
Biodiversity	Despite continued action many key elements of biodiversity continue to decline. In particular since 2000 grassland habitats have shown the most decline, but in contrast woodland habitats have increased. The key pressures identified relate to land-use changes through agriculture and development with additional pressures such as pollution, invasive species and fisheries practices. The NI Environmental Statistics Report 2015 reported that at 31 March 2014, a total of 375 sites had been declared as Areas of Special Scientific Interest (ASSI), 57 sites as Special Areas of Conservation (SACs), 17 sites as Special Protection Areas (SPAs) and 21 sites as Ramsar sites (areas of wetland and waterfowl conservation)
Built Heritage	The key risks identified to archaeological resources come from agricultural land use and urban activities. It has been identified that protected sites have fared better. Through the Second Survey of Buildings of architectural or historic interest there has been an increase in the number of listed buildings. Built heritage has provided emerging opportunities in relation to regeneration, tourism and economic development. The NI Environmental Statistics Report 2015 reported that in 2013/14, there were a total of 1,950 scheduled historic monuments protected under Article 3 of the Historic Monuments and Archaeological Objects (NI) Order 1995. Listed buildings are those of special architectural or historic interest and there were a total of 8,621 buildings recorded by NIEA in 2013/14 with 480 listed buildings and structures classified as 'at risk' on the online Built Heritage at Risk in Northern Ireland (BHARNI) database.
Waste and Resources	Recycling has seen a significant increase with a fourfold rise since 2002. With the publication of the Northern Ireland Waste Management Strategy there is a focus towards greater waste prevention and a reduction in consumption. The single use carrier bag levy has given rise to a reduced consumption rate of more than 80% in its first year of operation.

The existing environmental pressures in Ireland are also considered in detail in **Chapter 6** of the Environmental Report, as summarised in **Table 1.7**.

Table 1.7 – Existing Environmental Pressures

Issue Area	Existing Environmental Pressures
Biodiversity, Flora and Fauna	The main drivers and pressures on biodiversity flora and fauna noted by the EPA in their most recent State of the Environment Report (SOE), 2012 which are relevant to the NWSMP include direct habitat loss and damage as a result of infrastructural developments and land reclamation; water pollution particularly from nutrients and silt; unsustainable exploitation of natural resources (including land) and invasive alien species. Relevant indirect pressures include population growth; and climate change. A general lack of environmental awareness, especially the ecosystem services it provides were also cited as pressures to our biodiversity. The quantity of wastewater sludge being produced in Ireland has increased in line with the increase in secondary wastewater treatment since the implementation of the Council Directive 91/271/EEC concerning urban waste water treatment. In 2014 over 93% of waste water produced in Ireland received secondary or more stringent treatment. This has increased from 25% in 1998. There has consequently been a significant increase in sludge production. Proposed works to provide secondary or more stringent treatment for existing agglomerations and works to reduce stormwater overflows will further increase wastewater sludge production in the coming years Over 98% wastewater sludge produced at Irish Water WWTPs is currently disposed to agriculture including sludge which is composted and subsequently disposed of to agriculture. Over 95% of this was fully treated, in accordance with the treatment processes recommended in the Code of Good Practice for Use of Biosolids in Agriculture (COGP), in 2014 with further improvements to treatment levels introduced during 2015. The key pressures and threats in relation to the NWSMP include: ▪ Habitat loss and fragmentation from sludge infrastructure; ▪ Deterioration in habitat quality as a result of land spreading and subsequent changes to chemical compositions of surface water run-off; ▪ Deterioration / disturbance of species as a result of changes soil / air / water quality; and ▪ Leaching of heavy metals, nutrients and pathogens to soil and water following landspreading.
Population and Human Health	The CSO states in their report *Population and Labour Force Projections 2016-2046* (CSO, 2013), that the total population is predicted to grow to between 4.7 and 5.3 million over the period 2016-2026. As such the quantity of sludge produced at WWTPs will increase in line with increased populations and this rising population and growing economy will need to be accommodated through the delivery of sludge outlets without placing undue pressure on the environment. Irish Water has no statutory obligations in relation to Domestic WWTSs (septic tanks and individual WWTPs). However, following the system of registration put into place over the last number of years, and ongoing inspections, it is expected that emptying of septic tanks will become more frequent and the demand for acceptance of septic tank sludge at WWTPs will increase. An EPA Strive Report Series No. 23 on the *Management Options for the Collection, Treatment and Disposal of Sludge Derived from Domestic Wastewater Treatment Systems* identifies that upgrades are needed at existing WWTPs to provide for acceptance of sludge from individual septic tanks. Recent revelations regarding Lead in Drinking Water have resulted in proposals to dose drinking water with orthophosphate. This will have implications for sludge quantity and composition for WWTPs if the proposal goes forward.
Food Production & Safety	The agri-food sector is one of Ireland's most important indigenous industries. It is a significant part of the economy and throughout the recent economic unrest remained very resilient with significant development within the sector. The key to this success has been Ireland's reputation to produce high quality food products and access to international

Issue Area	Existing Environmental Pressures
	markets. Quality assurance plays a fundamental role in promoting food, providing consumers with a quality assured product. Bord Bia operates Quality Assurance Schemes for the key primary production enterprises at processor and at farm level. The schemes are voluntary and a critical criterion set out in Bord Bia's quality assurance standards is that the use of raw or treated wastewater sludge are prohibited from being used on Bord Bia certified farms. In addition, it is acknowledged that there is a strongly negative sentiment among processors and their customers in relation to the use of municipal sludge on agricultural land, with some processors simply not accepting products from lands on which wastewater sludge has been landspread. The Food Wise 2025 Strategy is anticipated to result in an increase in food production, due to the ambitious targets for increasing agricultural outputs over the next 10 years. This increase will require both available agricultural landbank and also soil fertility through organic or chemical fertiliser application. Given that the main outlet for wastewater sludge in Ireland is currently agriculture, the landbank that is available and suitable for landspreading of wastewater sludge is expected to come under increasing pressure due to the growing negative sentiment among processors and customers, the number of farms certified under Quality Assurance Schemes where wastewater sludge is prohibited in addition to increasing agricultural outputs to meet the Food Wise 2025 Strategy which is expected to increase the number of farms committing to quality assurance schemes.
Soils and Geology	Despite the wide range of functions that soils perform from an ecosystem services perspective, there is little legislation relating directly to soils and soil protection and as such a targeted response to the pressure on soils in Ireland cannot be formulated to any great extent. The EPA in 2002 identified the main pressures on the soil resource in Ireland as: intensive agriculture; forestry; industry; peat extraction; and urbanisation and infrastructure development. Little has changed in the intervening years and the 2012 SoE Report included pressures such as land use, population growth and soil contamination. Inter-related policies on land use, forestry, agriculture and energy all have potential impacts on the soil resource. While the pressures on the soil resource from the building sector have decreased in recent years, other intensifications are taking its place. Of particular note is Food Wise 2025 which seeks to significantly increase the agricultural outputs from Ireland. Whilst it is acknowledged that environmental compliance is considered as part of this increased output [through separate SEA and AA of those plans], this intensification is nonetheless likely to put additional pressures on soils, due to increased stock yields and increased use of organic and inorganic fertilisers. The main outlet for wastewater sludge in Ireland is agriculture with over 98% of wastewater sludge being currently recovered to agriculture. The topsoil and subsoil, depending on their type, permeability and thickness, play a critical role in preventing groundwater contamination and mitigating the impact of many potential pollutants. Groundwater is most at risk where the subsoils are absent or thin and, in areas of karstic limestone, where surface streams sink underground at swallow holes. The main technical limitations in relation to the use of wastewater sludge in agriculture are in relation to heavy metals and nutrients. As such, there are large areas in the west, midlands and north east of Ireland which are unsuitable for the landspreading of wastewater sludge due to groundwater vulnerability, and soil types. The key environmental issues relating to soil which will be relevant to Irish Water's activities will be the need to help maintain the hydrogeological and ecological function of the soil resource.
Water	The most recent audit of the significant water management issues in Ireland was launched by the DECLG in 2015. This document highlighted the following key issues in relation to the environment: ▪ Urban waste water treatment plants; ▪ Agriculture;

Issue Area	Existing Environmental Pressures
	▪ Forestry; ▪ Homes and gardens (including domestic waste water treatment systems); ▪ Industrial Discharges; and ▪ Activities which spread invasive alien species. The most significant surface water quality issue in Ireland continues to be excessive nutrient enrichment which leads to eutrophication; agriculture and municipal sources are the most important suspected causes of pollution to rivers. Twelve large urban areas did not meet the EU Urban Waste Water Treatment Directive requirement for the provision of secondary treatment, and untreated sewage was discharged from 45 areas. For groundwaters, nitrogen and phosphorus levels in general have remained stable or have been decreasing since 2007. Coliforms in groundwater however remain a risk for drinking waters in areas where treatment is inadequate. Waste water discharges also contributed to poor water quality at 7 out of 136 bathing waters. Improving the operation and standards of waste water infrastructure across industries will be critical to mitigate against future pressures arising from population growth and planned expansion of the agricultural and industrial sectors under Food Wise 2025. Other significant pressures include forestry; forest cover in Ireland is approximately 10.7% (EU average: 38%) and the main pressures to water from forestry activities relate to sediment and nutrients entering watercourses. On-site domestic waste water systems are another source of nutrients and organic pollution and the number of such systems are estimated by the CSO to be approximately 500,000 (or about one third of all households). Industrial pollution accounts for approximately 5% of slight and moderate pollution cases, with discharges from the food and beverage sectors tending to carry large nutrient loads. Invasive alien animal and plant species (e.g. zebra mussel, Japanese knotweed etc.) compete with and can displace native species and can contribute to river bank destabilisation. Movement of boats and fishing gear between locations in the aquatic environment can spread such species, as well as moving soil.
Air and Climate	In general ambient air quality in Ireland is good due largely to the prevailing clean westerly air-flow from the Atlantic and the relative absence of large cities and heavy industry. Increasing population and the demand for electricity, space heating fuels, construction materials and vehicle ownership are some of the national drivers for air emissions in Ireland. Ireland also has a large agricultural and food export industry, a key driver for ammonia emissions. Expected growth in the agricultural sector as outlined in the Food Wise 2025 strategy (DAFM, 2015), along with the removal of milk production quotas within the European Union (CEU, 2009) will increase pressure on future emissions to air from this sector (EPA, 2012). The EU Commission's proposal requires Ireland to deliver a 20% reduction in emissions of greenhouse gases relative to the 1990 levels by 2020. Despite the current economic downturn leading to a marked reduction in Ireland's GHG emissions this 20% reduction on 1990 levels will be difficult to achieve. An integrated approach across a range of sectors, including waste, is required to meet Ireland's EU and International obligations to reduce GHG emissions and to improve air quality. The latest data from the EPA indicate that emissions of GHGs in Ireland in 2013 were 58.21Mt CO_2 equivalent which represents a decrease of 0.7% on emissions in 2012. The waste sector is the smallest contributor to the overall emissions and presently contributes 2.7% of GHGs and has seen a 10.4% increase in emissions from 2013. Under the CAFE Directive, Ireland is required to reduce levels of $PM_{2.5}$ by 10% between 2012 and 2020. $PM_{2.5}$ is fine particulate matter and can be emitted directly into the atmosphere or can be formed secondarily. This reduction will be challenging as it will require an integrated approach across a number of sectors including industrial, transport and residential emissions. The test in meeting Ireland's obligations under the National Emissions Ceiling Directive is

Issue Area	Existing Environmental Pressures
	greater, in particular for oxides of nitrogen and volatile organic compounds which are currently out of compliance. Transport emissions are the greatest source of oxides of nitrogen and the measures proposed in the National Programme on Transboundary Pollutants will seek to reduce these emissions to below the ceiling limit by 2010 and each year thereafter.
Material Assets	The CSO predicts that the average annual population growth rate during the period 2016-2026 will be between 0.4 and 1%. As such the quantity of sludge produced at WWTPs will increase in line with increased populations which presents a challenge to ensure wastewater networks and treatment plants have adequate capacity and are sustainable for wastewater sludge management. Transportation is a significant part of sludge management and currently there is no transportation strategy which is currently resulting in sludge being transported over long distances, which has an associated impact on air quality and climate. A more coordinated approach is required to reduce transportation distances and associated transportation costs, which will have positive impacts on reducing carbon footprint, air quality and climate, traffic, odour and noise emissions. The current outlet for wastewater sludge is almost exclusively agriculture, however this is coming under increasing pressure and the existing landbank available to Irish Water for landspreading of sludge is likely to reduce. While alternatives do exist for reuse and recovery of sludge, the majority are not advanced in Ireland to the point where they can offer credible or complete solutions to land spreading.
Cultural Heritage	Wastewater and sludge management infrastructure resulting from economic growth and increasing population has the potential to place pressure on sites or features of architectural, archaeological or cultural heritage interest. The infrastructure can put direct pressure on this resource, where it is in proximity, or where it increases the potential to interact with known or previously unknown sites and features. Together with the existing pressures on landscape and visual resources, this can result in an impact on the overall cultural heritage resource.
Landscape	Existing pressures on landscape and visual resources are primarily related to impacts to sensitive views and landscapes resulting from the secondary impacts from the siting of development. Issues of spatial planning, land use and soil quality are intertwined and interdependent, and this should be reflected in integrated policies and plans at national, regional and local levels. The main drivers of land use change over the coming decade will be the agricultural policies of afforestation and Food Wise 2025. The sustainable management of both land use and soils requires an integrated approach from the key statutory bodies. The recently published "National Landscape Strategy for Ireland 2015-2025" will be the means by which the State will provide a framework for the protection of the many cultural, social, economic and environmental values embedded in the landscape with a key action to develop a National Landscape Character Assessment. The main issue for Landscape associated with the implementation of the NWSMP is the resulting potential for both direct and indirect impacts on landscape character, areas of outstanding natural beauty, protected views and similar designations. The key issues associated with sludge management and landscape relates to: ▪ Impacts on designed landscape; ▪ Impacts on landscape character as a result of siting new wastewater and sludge management infrastructure ▪ Impacts on cultural heritage resources; and ▪ Impacts on natural heritage resources and tourism assets which are dependent on the adjoining landscape setting. The main drivers of land use change over the coming decade will be the agricultural policies of afforestation and Food Wise 2025. The sustainable management of both land

Issue Area	Existing Environmental Pressures
	use and soils requires an integrated approach from the key statutory bodies. The recently published "National Landscape Strategy for Ireland 2015-2025" will be the means by which the State will provide a framework for the protection of the many cultural, social, economic and environmental values embedded in the landscape with a key action to develop a National Landscape Character Assessment.

1.5.3 Interrelationships

In accordance with the SEA Directive, the interrelationship between the SEA environmental topics must be taken into account (**Table 1.8**). The key interrelationships identified in this SEA are set out below. A key interrelationship is between water and population/human health. The landspreading of wastewater sludge on agricultural land has the potential to generate runoff which can enter receiving waters, impacting on the ecological status of water bodies, invertebrates, plant life and all stages of fish cycles. This has the potential to impact on human health where commercial fisheries may become contaminated.

Table 1.8 – Inter-relationship between the SEA Topics

	Biodiversity Flora, Fauna	Population & Human Health	Food Production & Safety	Soil/ Geology	Water	Air & Climate	Material Assets	Cultural Heritage
Biodiversity, Flora, Fauna								
Population/ Human Health	√							
Food Production & Safety	√	√						
Soil/Geology	√	√	√					
Water	√	√	√	√				
Air & Climate	√	√	X	X	√			
Material Assets	√	√	√	√	√	√		
Cultural Heritage	X	√	X	√	√	√	√	
Landscape	√	√	X	√	√	√	√	√

1.5.4 Evolution of the baseline in the absence of the NWSMP

The NWSMP is a Tier II Implementation Plan which sits below the Irish Water WSSP and as such, where appropriate, the links between these plans will be recognised throughout the Strategic Environmental Assessment (SEA) and Appropriate Assessment (AA) of the NWSMP. The NWSMP will set out the short, medium and long-term strategy for management of sludge produced at WWTPs under the control of Irish Water and will set out a strategy for future capital works, operating procedures, quality control and risk management systems to ensure a sustainable strategy for wastewater sludge management. In the absence of the NWSMP, the pressures identified would continue to impact on existing wastewater infrastructure and investment to drive operational

efficiencies and establish long term, secure and sustainable recovery routes and outlets would not occur which in turn could lead to deterioration of existing assets.

1.6 ENVIRONMENTAL PROTECTION OBJECTIVES AND SEA FRAMEWORK (CHAPTER 7)

There are essentially three types of objectives considered as part of this SEA. The first relates to the objectives of the plan. The second relates to wider Environmental Objectives, i.e. environmental protection objectives at a national, European and international level, and finally there are the Strategic Environmental Objectives (SEOs), which were devised to test the effects of the NWSMP on the wider environment.

The assessment is an objectives-led assessment which involves comparing the proposed alternatives against defined SEA Environmental Objectives for each of the identified issue areas. For the purposes of consistency, the draft objectives, targets and indicators proposed for the NWSMP have been based on the objectives, targets and indicators already used for the WSSP. As a Tier II Plan, the NWSMP sits below the WSSP and would have similar context. Only those relevant to wastewater sludge management have been included. **Section 1.9**, Mitigation and Monitoring outlines the targets and indicators associated with the objectives outlined in **Table 1.9**.

The selected SEOs for this SEA are set out in **Table 1.9**. These environmental objectives are based on the current understanding of the key environmental issues having regard to the environmental protection objectives outlined in **Chapter 7**, of the main Environmental Report (and **Appendix B**). A draft set of objectives was included in the SEA Scoping Report prepared for the NWSMP which underwent public consultation in Q2 of 2015. The objectives have been updated prior to the assessment based on feedback from statutory consultees and the public on the draft objectives.

Table 1.9 – Strategic Environmental Objectives

Environmental Component	Strategic Environmental Objective
Biodiversity and flora and fauna (BFF)	Prevent damage to terrestrial, aquatic and soil biodiversity, particularly EU designated sites and protected species resulting from Irish Water's activities.
Population and Human Health (PHH)	Protect and reduce risk to human health in undertaking water services.
Food Production and Safety (FPS)	To contribute to protection of food safety by ensuring the quality of the sludge product for land spreading on agricultural land.
Soil and Geology (SG)	Avoid conflicts with, and contribute towards, the appropriate management of soil quality and quantity.
Water (W)	Prevent deterioration of the status of water bodies with regard to quality and quantity due to Irish Water activities and contribute towards the improvement of water body status for rivers, lakes, transitional and coastal waters and groundwaters to at least good status, as appropriate to the Water Framework Directive.
Air and Climatic Factors (AQ)	Minimise contributions to climate change and emissions to air (including greenhouse gas emissions) as a result of Irish Water activities and ensure the resilience of water supply and treatment infrastructure to the effects of climate change.
Material Assets (MA)	Provide new, and upgrade existing, wastewater management

Environmental Component	Strategic Environmental Objective
	infrastructure to protect human health and ecological status of water bodies.
Cultural Heritage (CH)	Avoid damage to cultural heritage resources resulting from Irish Water's activities.
Landscape (L)	Avoid damage to designated landscapes resulting from Irish Water's activities.

1.7 ALTERNATIVES (CHAPTER 8)

The consideration of alternatives is a requirement of the SEA Directive (2001/42/EC). The term 'reasonable' is not defined in the legislation. Good practice points to the analysis of 'alternatives' as being a constructive and informative exercise for the policy makers, and that only 'possible' options for policy are examined.

Alternatives are required to take into account the objectives of the draft NWSMP. The alternatives study therefore must operate within the strategic objectives, set out for the draft NWSMP, and provide an examination of alternative means of implementing the NWSMP. Section 3.14 of the DEHLG Guidelines[1] notes that the higher the level of the plan, the more strategic the options which are likely to be available.

Early discussion of possible alternatives was undertaken as part of the scoping for the NWSMP, which was the subject of public consultation. Both the NWSMP Team and the SEA Team have been conscious of the need for iteration in this regard and consideration of alternatives therefore started early in the process by considering strategic needs initially before considering policy alternatives. The draft NWSMP is not prescriptive about location of future outlets or specific technologies to be used in sludge management therefore these types of alternatives have not been addressed. **Table 1.10** outlines the alternatives for realising the objectives of the NWSMP.

Table 1.10 – Alternatives Considered

Scenarios	Alternatives considered
Do-nothing Scenarios	No Plan vs National Wastewater Sludge Management Plan
Transport Scenarios	Transport of Liquid Wastewater Sludge
	Transport of Thickened / Dewatered Wastewater Sludge
Infrastructure Scenarios	Maintain Status Quo
	Improve Regional Access to Treatment Infrastructure
Reuse and Disposal Scenarios	Reuse on Agricultural Land
	Reuse on Energy Crops
	Reuse in Forestry
	Utilise for Land Reclamation
	Disposal through Thermal Recovery

[1] Implementation of SEA Directive (2001/42/EC): Assessment of the Effects of Certain Plans and Programmes on the Environment, DEHLG 2004

The alternatives scenarios for the draft NWSMP undertook an objectives-led assessment. Each alternative being assessed against the strategic environmental assessment objectives outlined in **Table 1.10**. A number of mitigation measures arose following the assessment, which were brought through to **Chapter 10, 'Mitigation & Monitoring'** of the Environmental Report, they included:

- Land spreading needs to address inconsistencies between the COGP and the Regulations.
- The current barriers on the regulatory practices for reuse of sludge on energy crops need to be reconsidered although it is recognised that this is outside the remit of Irish Water. However, regardless of changes to the current procedures it is strongly recommended that screening for Appropriate Assessment of all potential sites remains part of the procedure [as it current is under the *Certificate of Registrations* procedures].
- It is recommend that if land spreading is to continue, screening for Appropriate Assessment should become a compliance point in relation to all lands proposed for land spreading.
- Further research into alternative reuse outlets should be undertaken include consideration of wider environmental impacts including biodiversity, water, soils, human health and food safety as a minimum with a view to developing specific standard operating procedures for land spreading on feasible lands.
- It is recommended that Irish water formally liaise with the Regional Waste Authorities and suppliers in relation to delivery of thermal recovery capacity.

1.8 ASSESSMENT OF PREFERRED STRATEGY (CHAPTER 9)

This section evaluates as far as possible the likely significant effects on the environment and to set out measures envisaged to prevent, reduce and as far as possible offset any significant adverse effects on the environment of implementing the NWSMP.

In compiling the draft NWSMP, Irish Water has had regard to the key opportunities and challenges and has developed specific actions to address many of the short comings noted. *Policy* actions have been designed to ensure that regulatory and legislative controls are met and there is transparency and clarity in the minimum requirements and standards that will be acceptable. *Administrative* actions have been included to establish a 'fit for purpose' register of all wastewater sludge management infrastructure. *Research* actions are included to address gaps in knowledge with regard to alternative technologies such as the use of reed beds in management of the wastewater sludge. *Infrastructure Planning* actions have been included to address shortfalls in capacity of certain treatment processes and furthermore to address geographic imbalance and access to a national network of treatment, storage and recovery / disposal in order to drive operational efficiencies. Finally actions centred on *Protection* of human health and the environment have been included to ensure that management of wastewater sludge nationally is carried out in a safe and secure manner. **Table 1.11** presents the actions as established within the draft NWSMP.

Table 1.11 –Proposed Actions within the draft NWSMP

Action Ref.	PROPOSED ACTIONS	BFF	PHH	FPS	SG	W	AQ/ CF	MA	CH	L
	POLICY Actions									
Policy Action_1	An independently audited quality control / assurance system will be put in place for wastewater sludge management activities to ensure compliance with Irish Water policies and to address stakeholder concerns, particularly in relation to agricultural produce. [Section 10.1 of draft NWSMP].	+	+	+	+	+	+	+	0	0
Policy Action_2	An annual audit of wastewater sludge management activities will be undertaken on behalf of Irish Water, pending full development of a quality control / assurance scheme [Section 10.1 and 10.4 of draft NWSMP].	+	+	+	+	+	+	+	0	0
	ADMINISTRATION Actions									
Admin Action_1	An audit of WWTP's will be compiled into an asset register [Section 10.5 of draft NWSMP]. This data will then be kept on an asset register and used to inform future developments.	+	+	+	+	+	+	+	+	+
Admin Action_2	GIS systems will be used to record the destination of all wastewater sludge reused or disposed of to ensure that there is consistency and traceability in reporting of wastewater sludge movements [Section 10.9 of draft NWSMP].	+	+	+	+	+	+	+	+	+
Admin Action_3	Irish Water is currently developing systems to allow online reporting of all wastewater sludge data by contractors [Section 10.7 of draft NWSMP].	+	+	+	+	+	+	+	0	0
	RESEARCH AND REVIEW									
Research and Review Action_1	A review of existing technologies will be undertaken to identify the most suitable technologies to optimise liquid wastewater sludge thickening. The additional data being gathered in the asset register, as further detailed in Section 10.5 will be used to inform the site specific upgrade requirements [Section 6.4.3 of draft NWSMP]	+/- +/-		0	0	+/- +/-		+	0	0
Research and Review Action_2	A feasibility study of wastewater sludge reed beds at potentially suitable sites is recommended [Section 6.4.4 of draft NWSMP]	+/- +/-	+/-	+/-		+/- +/-		+/- +/-	+/-	
Research and Review Action_3	A review of options for reuse of wastewater sludge in non-agricultural land will be undertaken [Section 8.7 of draft NWSMP]	+/- +/-	+/-	+/-		+/- +/-		+/- +/-	+/-	
Research and Review Action_4	A review of new sludge hub centres and all sites with thermal drying will be undertaken to assess whether anaerobic digestion is feasible as a new sludge treatment process or to replace or supplement the existing thermal drying plant [Section 9.7 of draft NWSMP]	+/- +/-	+/-	+/-		+/- +/-		+	+/- +/-	

Action Ref.	PROPOSED ACTIONS	BFF	PHH	FPS	SG	W	AQ/ CF	MA	CH	L
Research and Review Action_5	It is proposed that standards for monitoring of wastewater sludge in the EU and international research will be reviewed on an ongoing basis to determine if additional monitoring of wastewater sludge or soil samples is required [Section 10.8 of draft NWSMP]	+	+	+	+	+	+	+	0	0
Research and Review Action_6	Irish Water is currently reviewing all non-domestic discharges to municipal sewers and WWTPs. As part of this review, a risk assessment of significant industrial discharges will be undertaken. This will include an assessment of potential impact on the wastewater sludge and on its proposed disposal/recovery options [Section 10.3 of draft NWSMP]	+	+	+	+	+	+	+	+	+
	INFRASTRUCTURE ACTIONS									
Infrastructure Action_1	Fifty existing WWTP sites have been identified as requiring infrastructure upgrades to act as satellite sites [Section 7.4 of draft NWSMP]	+/-				+/-		+	+/-	
Infrastructure Action_2	6 new wastewater sludge hub centres have been identified as being (Cork, Waterford, Tuam, Longford, Navan and Fingal). Two of these hubs may be developed at existing WWTP sites with full wastewater sludge treatment to produce biosolids. Three of the remaining sites are proposed to be developed at existing WWTPs where new wastewater sludge treatment is proposed with anaerobic digestion and pasteurisation the preferred solution. The Fingal wastewater sludge hub centre is proposed to be located on the site of the new North Dublin WWTP (*Greater Dublin Drainage Scheme www.greaterdublindrainage.ie*) [Section 7.4 of draft NWSMP]	+/- +/- +/-	+/- +/- +/-	+/- +/- +/-		+/- +/- +/-		+ +	+/- +/- +/-	
Infrastructure Action_3	Detailed site assessment will be undertaken for all sites where wastewater sludge infrastructure proposed [Section 9.3 of draft NWSMP]	+	+	+	+	+	+	+	+	+
	PROTECTION									
Protection Action_1	Standard operating procedures (SOPs) will be developed by Irish Water, including procedures for on-site wastewater sludge management. These SOPs will address all areas of wastewater sludge management including potential environmental impacts and compliance with Wastewater Discharge Licences [Section 6.1 and 10.1 of draft NWSMP].	+	+	+	+	+	+	+	+	+
Protection Action_2	Future lime stabilisation will be restricted to Irish Water owned sites with the use of off-site lime eliminated as soon as possible [Section 10.4 of draft NWSMP].	+	+	+	+	+	+	+	0	0
Protection Action_3	Irish Water will develop and set more detailed minimum requirements for the use of lime stabilisation [Section 10.4 of draft NWSMP]	+	+	+	+	+	+	+	0	0

Action Ref.	PROPOSED ACTIONS	BFF	PHH	FPS	SG	W	AQ/ CF	MA	CH	L
Protection Action_4	Research and recommendations in relation to emerging contaminants will be reviewed regularly to mitigate against any risk to soils or health due to the presence of organic pollutants [Section 9.11 of draft NWSMP]	+	+	+	+	+	+	+	0	0
Protection Action_5	Irish Water will develop a new template for Nutrient Management Plans which must be complied with by all contractors proposing to spread wastewater sludge on land. This will explicitly require contractors to consider environmental impacts and potential to impact on European Sites.	+	+	+	+	+	+	+	+	+

***Key**: BFF – Biodiversity, Flora and Fauna; PHH – Population, Human Health; FPS – Food Production Safety; SG – Soils and Geology; W – Water; AQ /CF– Air Quality and Climatic Factors; MA – Material Assets; CH – Cultural Heritage; L – Landscape.*

Chapter 9 of the Environmental Report includes a discussion of the main likely significant impacts (positive and negative, direct and indirect, cumulative and synergistic), which are anticipated from implementation of the actions contained within the draft NWSMP.

1.9 MITIGATION AND MONITORING (CHAPTER 10)

1.9.1 Mitigation

Following an assessment of the draft NWSMP, the SEA Environmental Report and Natura Impact Statement have proposed mitigation measures and text alterations to the draft NWSMP. Irish Water has incorporated these amendments into the draft NWSMP. The actions within the draft NWSMP promote the sustainable management of wastewater sludge, protection of the environment and the Natura 2000 network ensuring that environmental considerations have been integrated into the draft NWSMP.

The draft NWSMP has outlined actions to address concerns from the food sector through better oversight of the wastewater sludge management process from WWTP to reuse / disposal. The draft NWSMP also includes specific actions to enable farmers and growers to utilise the beneficial properties in wastewater sludge as a valuable and cost effective source of nutrients and organic matter while providing greater comfort in the quality of the wastewater sludge product by improving transparency / compliance in the treatment process.

The development of any new wastewater sludge facilities will comply with a set of siting criteria, which are included in the draft NWSMP. In addition, both existing and new wastewater sludge facilities are required to comply with requirements and conditions required through the relevant planning and licensing systems.

The treatment and recovery of wastewater sludge will be required to comply with stringent measures that will be further developed by Irish Water, including: Standard Operating Procedures (SOPs) and Annual Audits of facilities and operators.

Many of the actions within the draft NWSMP relate to development of systems to better manage and coordinate existing wastewater sludge activities within Ireland. This will offer protection of the environment, agriculture and human health and as such, the draft NWSMP will result in a broadly positive impact on the environment. Potential negative impacts have been identified, particularly in relation to provision of infrastructure. To offset this impact, siting criteria have been developed and integrated into Chapter 9 of the draft NWSMP. This will contribute to avoiding and/or reducing potential negative impacts on the environment. Potential impacts are also identified in relation to land spreading. To offset this impact, a preliminary sensitivity map have been developed and will become integrated into the SOP for reuse to be developed by Irish Water. It is also proposed that a new Nutrient Management Plan template will be developed as part of the SOP to ensure consistency in reporting and to explicitly require consideration of the environment when compiling the plans.

In line with the amended text of the draft NWSMP, all projects arising from the actions and recommendations will be required to complete screening for Appropriate Assessment under the Habitats Directive and to comply with the provisions of the Birds and Habitats Regulations 2011-2016.

1.9.2 Monitoring

Member States are required to monitor the significant environmental effects of the implementation of plans so that any unforeseen adverse effects can be identified appropriate action taken. The primary purpose of monitoring is to cross-check significant environmental effects which arise during

the implementation stage against those predicted during the NWSMP preparation stage. A monitoring programme is developed based on the indicators selected to track progress towards reaching the targets paired with each SEO, thereby enabling positive and negative impacts on the environment to be measured. The environmental indicators have been developed to show changes that would be attributable to implementation of the NWSMP. The monitoring programme is outlined in **Table 1.12**.

The NWSMP is a Tier II plan sitting below the Water Services Strategic Plan (WSSP) and therefore the monitoring programme for NWSMP has been developed in line with the WSSP monitoring programme. The monitoring has focused on aspects of the environment that are likely to be significantly impacted by the NWSMP.

Table 1.12 – SEA Monitoring Programme

Environmental Component	Strategic Environmental Objectives (SEOs)	SEA Indicators	SEO Targets	Data Source for Indicators
Biodiversity and flora and fauna (BFF)	Prevent damage to terrestrial, aquatic and soil biodiversity, particularly EU designated sites and protected species resulting from Irish Water's activities.	The Status of EU Protected Habitats and Species (Article 17 Conservation Status Assessment Reports due every 6 years, current reports published in 2013) (Ire and NI).	Maintenance / achievement of favourable conservation status for all habitats and species protected under national and international legislation to be unaffected by implementation of the NWSMP[2].	NPWS/ NIEA (6 yearly reporting)
		Provision of appropriate and effective wastewater treatment	Achievement of WSSP indicators in relation to "operating water services infrastructure in a manner that facilities the achievement of the water body objectives under the Birds and Habitats Directives" *(pg. 48 of the final WSSP).*	Irish Water (yearly reporting)
Population and Human Health (PHH)	Protect and reduce risk to human health in undertaking water services.	Indicators as listed in Chapter 4 and Chapter 5 of the WSSP* *Strategic Objective to Ensure a Safe and Reliable Water Supply (pg. 39-40 of the final WSSP); and* *Strategic Objective to Provide Effective Wastewater Management (pg. 42-43 of the final WSSP).*	In line with WSSP, contribute to the achievement of: ▪ All drinking water areas (including groundwater), as identified on the register of protected areas, to achieve good status, or maintain high status. ▪ All bathing waters, as identified on the register of	Irish Water and EPA

[2] Except as provided for in Section 6(4) of the Habitats directive viz. There must be (a) no alternative solution available; (b) imperative reasons of overriding public interest for the plan to proceed; and (c) adequate compensatory measures in place.

Environmental Component	Strategic Environmental Objectives (SEOs)	SEA Indicators	SEO Targets	Data Source for Indicators
			protected areas, to achieve good status, or maintain high status. ▪ All economic shellfish waters, as identified on the register of protected areas, to achieve good status, or maintain high status. ▪ All water bodies designated for salmonids, as identified on the register of protected areas, to achieve good status, or maintain high status. ▪ Long term reduction in drinking water restriction notices.	
Food Production and Safety (FPS)	To contribute to protection of food safety by ensuring the quality of the sludge product for land spreading on agricultural land.	Audit of contractor compliance with the COGP and the legislation, as a minimum, prior to development of a quality assurance scheme.	To develop a quality assurance scheme for all Irish Water wastewater sludge to ensure that only treated and tested sludge of suitable quality is used for land spreading on agricultural lands.	Irish Water
Water (W)	Prevent deterioration of the status of water bodies with regard to quality and quantity due to Irish Water activities and contribute towards the improvement of water body status for rivers, lakes, transitional and coastal waters and groundwaters to at least good	Indicators as listed in Chapter 4 and Chapter 5 of the WSSP* *Strategic Objective to Ensure a Safe and Reliable Water Supply (pg. 39-40 of the final WSSP); and* *Strategic Objective to Provide Effective Wastewater*	In line with WSSP, contribute to the achievement of: ▪ No deterioration in status of waters currently with high or good status (WFD Objective). ▪ Restoration to good status of waters currently at	Irish Water and EPA

Environmental Component	Strategic Environmental Objectives (SEOs)	SEA Indicators	SEO Targets	Data Source for Indicators
	status, as appropriate to the Water Framework Directive.	*Management (pg. 42-43 of the final WSSP).*	moderate, poor or bad status (WFD Objective). ▪ Progressively reduce chemical pollution in waters (WFD). ▪ Limit pollution inputs to groundwaters and prevent deterioration (WFD Objective).	
Air and Climatic Factors (AQ)	Minimise contributions to climate change ad emissions to air (including greenhouse gas emissions) as a result of Irish Water activities and ensure the resilience of water supply and treatment infrastructure to the effects of climate change.	*EN1b on pg. 59 of the final WSSP* - Preparation and implementation of the Sustainable Energy Strategy. % increase in overall energy efficiency at Irish Water facilities.	Improve energy efficiency by 33% by 2020 (from the 2009 baseline).	Irish Water
		Number of complaints received related to odour.	Compliance with odour criteria to prevent deterioration in amenity beyond the site boundary for new or upgraded wastewater infrastructure and minimise emissions to air from wastewater sludge spreading.	Irish Water
		EN1c on pg. 59 of the final WSSP - Preparation and implementation of the Climate Change Adaptation and Mitigation Strategy)	Ensure resilience of infrastructure to the effects of climate change.	Irish Water
Material Assets (MA)	Provide new, and upgrade existing, wastewater management infrastructure to protect human health and ecological status of water bodies.	Wastewater services investment expenditure per annum.	Increase investment in wastewater management infrastructure.	Irish Water

Environmental Component	Strategic Environmental Objectives (SEOs)	SEA Indicators	SEO Targets	Data Source for Indicators
Soil and Geology (SG)	Avoid conflicts with, and contribute towards, the appropriate management of soil quality and quantity.	Audit of contractors compliance with the COGP and the legislation, as a minimum, prior to landspreading.	Accurate Nutrient Management Plan (NMP) for all lands proposed for spreading of Irish Water wastewater sludge.	Irish Water
Cultural Heritage (CH)	Avoid damage to cultural heritage resources resulting from Irish Water's activities.	*Implementation of Strategy EN1e on pg. 59* [Adherence to environmental and planning legislation]. Any change in the condition of monuments on the Record of Monuments and Places due to Irish Water activities.	No unauthorised physical damage or alteration of the context of cultural heritage features due to Irish Water activities.	Irish Water Archaeological Survey of Ireland Sites and Monuments Record
Landscape (L)	Avoid damage to designated landscapes resulting from Irish Water's activities.	*Compliance with WSSP Strategy EN1e on pg. 59* [Adherence to environmental and planning legislation]	Avoid damage to designated landscapes as a result of NWSMP implementation.	Irish Water

***See Appendix C**

1.10 NEXT STEPS (CHAPTER 11)

There is still some important work to complete before the National Wastewater Sludge Management Plan can be adopted.

Irish Water is inviting feedback as part of a public consultation closing on 18th May 2016.

The draft NWSMP, SEA Environmental Report and Natura Impact Statement are available to view at planning counters in main Local Authority Offices, and online at www.water.ie/projects-plans/wastewater-sludge-management/.

Written submissions or observations can be sent to Irish Water by Wednesday 18th May 2016:

By Email: nwsmp@water.ie

Or by Post: National Wastewater Sludge Management Plan, Irish Water, Colvill House, 24-26 Talbot Street, Dublin, Ireland

Submissions will be reviewed and relevant feedback incorporated into the final NWSMP. It is expected that the final NWSMP and SEA Statement will be published in Summer 2016. **Table 1.13** provides a summary of the remaining steps in this process.

Table 1-13 - Remaining Steps in the NWSMP, SEA and AA processes

Milestone	
National Wastewater Sludge Management Plan	**Strategic Environmental Assessment and Appropriate Assessment**
Publication of draft NWSMP	Publication of Environmental Report and Natura Impact Statement
End of statutory consultation (18th May 2016)	End of statutory consultation Review of submissions and preparation of SEA Statement
Review of submissions and amendments to NWSMP	Review of submissions and preparation of SEA Statement
Adoption of NWSMP	n/a
Publication of final NWSMP (anticipated Summer 2016)	Publication of SEA Statement and final Natura Impact Statement

2 INTRODUCTION

Irish Water is currently preparing a National Wastewater Sludge Management Plan (referred to as the NWSMP) which will set out Irish Water's high level strategies for wastewater sludge management over a 25 year horizon. A national water sludge management plan will be developed in due course but is not the subject of this plan.

This document forms part of the official Strategic Environmental Assessment (SEA) of Irish Water's draft NWSMP. It sets out how the SEA has been undertaken and presents the findings of the assessment of the aims and strategies contained in the draft NWSMP as well as reasonable alternatives.

The purpose of this Environmental Report is to:

- Inform the development of the NWSMP;
- Identify describe and evaluate the likely significant effects of the NWSMP and its reasonable alternatives; and
- Provide an early opportunity for the statutory authorities and the public to offer views on any aspect of this Environmental Report, through consultation.

The Environmental Report complies with the requirements of the Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment (the SEA Directive) as implemented in Ireland through the European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations (S.I. 435 of 2004 as amended by S.I. 200 of 2011). The Strategic Environmental Assessment has been completed by RPS on behalf of Irish Water.

2.1 IRISH WATER

Irish Water was incorporated in January 2014 under the Water Services (No. 2) Act of 2013. Irish Water has been established as a single utility providing water and wastewater services nationally. Irish Water now has the responsibility for the provision of water and wastewater services in Ireland from 34 Local Authorities. This includes the management of approximately 900 water treatment plants and over 1,000 wastewater treatment plants (WWTPs), see **Figure 2.1**.

2.1.1 Asset Management Planning Hierarchy

Irish Water has prepared a Water Services Strategic Plan (WSSP) which is required under Section 33 of the Water Service No. 2 Act of 2013 (WSA). The WSSP forms the highest tier of asset management plans which Irish Water will prepare and it sets the overarching framework for subsequent detailed implementation plans and water services projects. **Figure 2.2** illustrates the position of the WSSP in terms of the overall Irish Water asset management planning and environmental assessment hierarchy context. An SEA and Appropriate Assessment (AA) of the WSSP has already been undertaken.

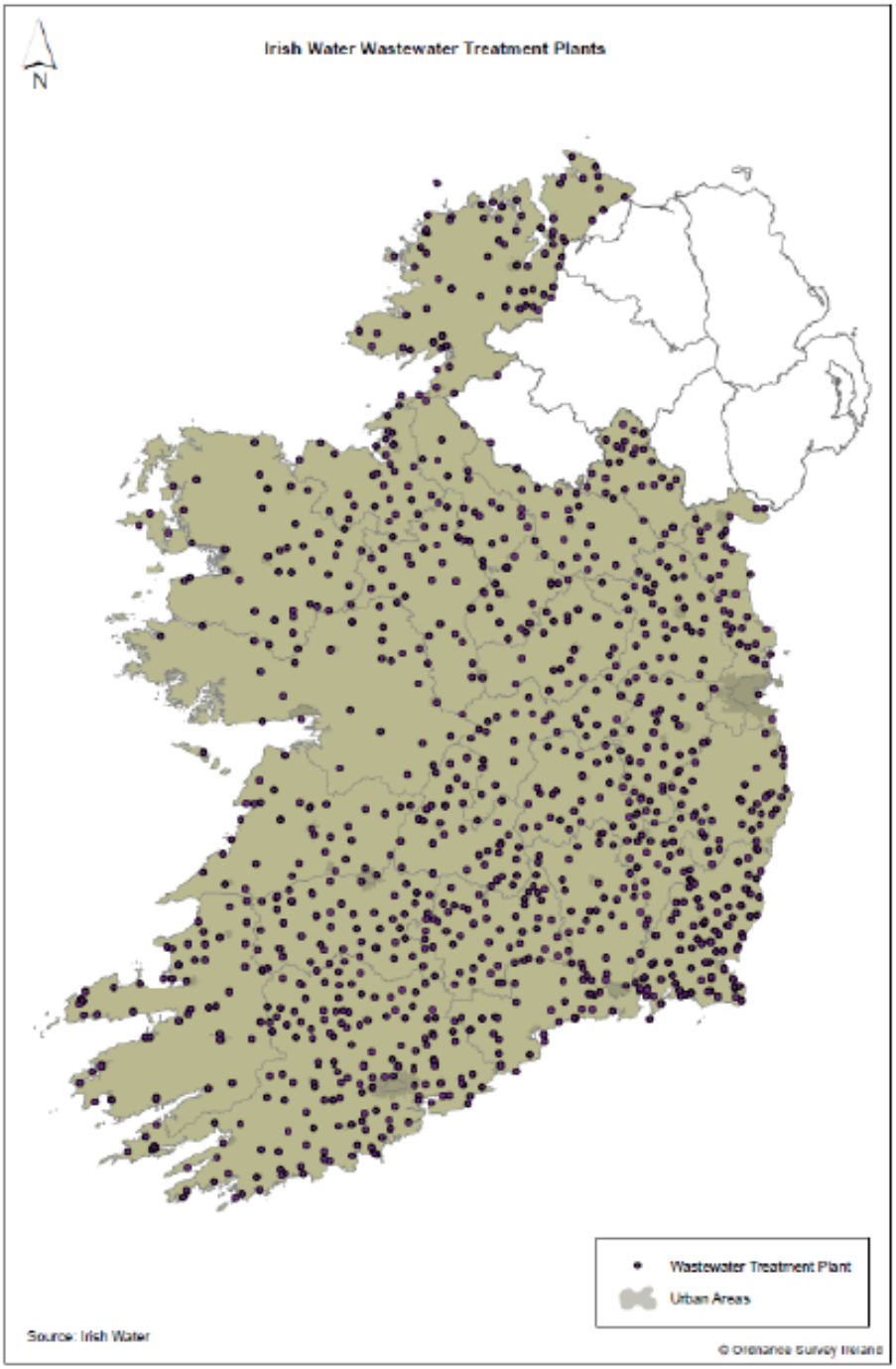


Figure 2.1 - Wastewater Treatment Plants in Ireland

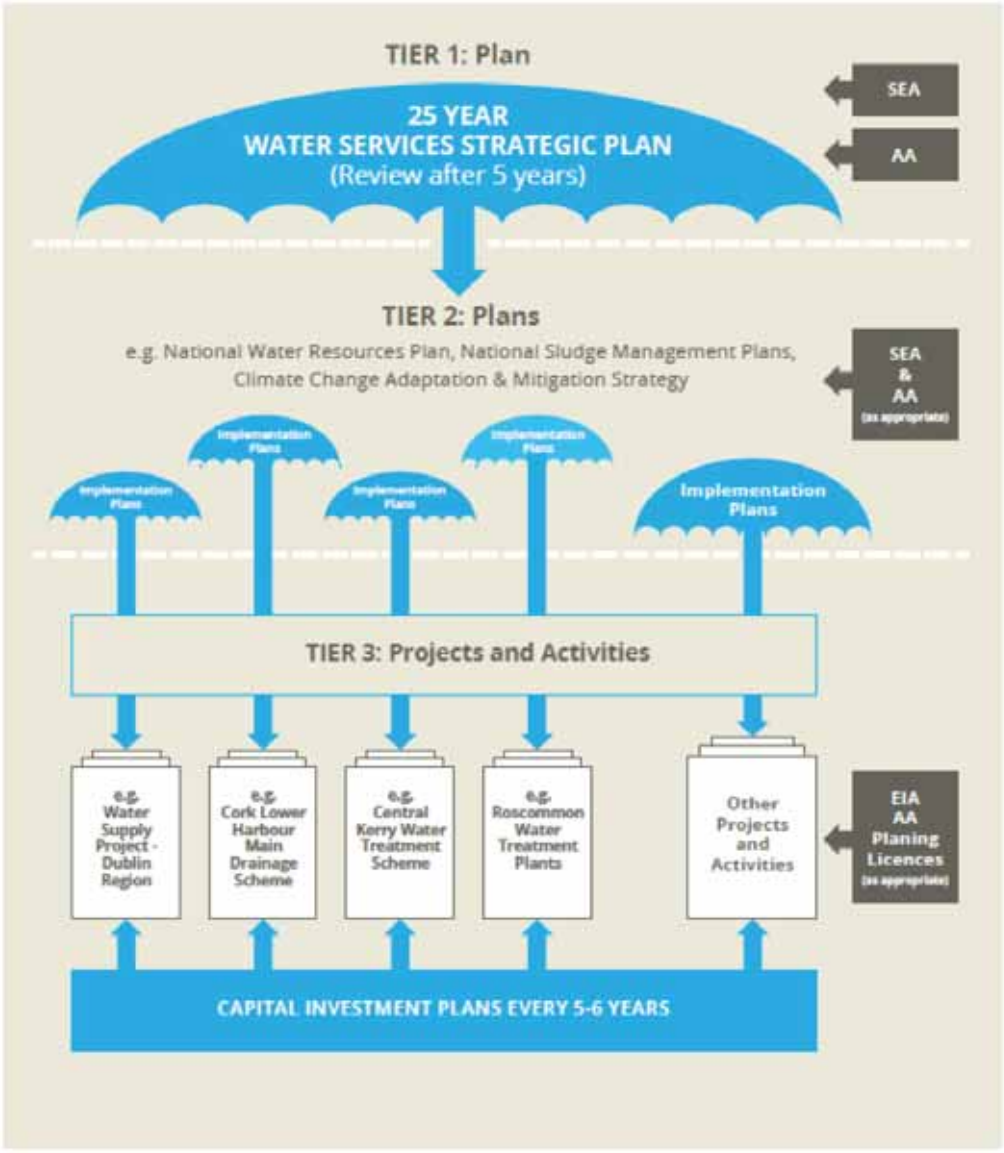


Figure 2.2 – Hierarchy for Irish Water Plans and Projects

The implementation of the strategies identified in the WSSP will be detailed in a number of Implementation Plans (Tier II) which will be prepared by Irish Water. These Implementation Plans will include, for example, a National Water Resources Management Plan, this National Sludge Management Plan, Water Conservation Plans, Water Safety Plans (note: this list is not exhaustive and titles of plans may change). These plans will be reviewed on a cyclical basis; and will be subject to environmental assessment as appropriate. As the NWSMP is a Tier II plan sitting below the Water Services Strategic Plan (WSSP) it is intended that, where appropriate, the links between these plans will be recognised throughout this SEA and AA of the NWSMP.

2.2 WASTEWATER MANAGEMENT IN IRELAND

We all generate wastewater in our everyday lives. At home, we access water with ease; we turn the tap, we flush the toilet and we hit the button on the washing machine. Wastewater is the term normally applied to the post usage liquid stream discharged from homes, factories, industrial process facilities, hotels and other public centres. These streams contain organic matter (carbon and

nutrients) and a number of other contaminants, which if not substantially removed these discharges would give rise to very significant environmental impact on the ultimate receiving waters.

Irish Water's responsibilities for wastewater commences when effluent reaches the public wastewater network. Irish Water is responsible for its transfer to WWTPs, its treatment and the subsequent discharge of the treated effluent back into the water environment. The wastewater treatment process generates sludge which require further treatment prior to reuse or disposal. Irish Water is also responsible for the treatment and reuse / disposal of the sludge that is generated from its WWTPs.

The majority of such waste stream discharge flows are discharged to the public sewer system which acts as the conveyance system to transfer the sewer flows to the treatment works in which the contaminants are treated/ removed. The treatment process generally involves two main processes; the main liquid treatment process and a subsidiary sludge treatment process.

Figure 2.3 illustrates Irish Water's responsibilities for water and wastewater services including sludge management.

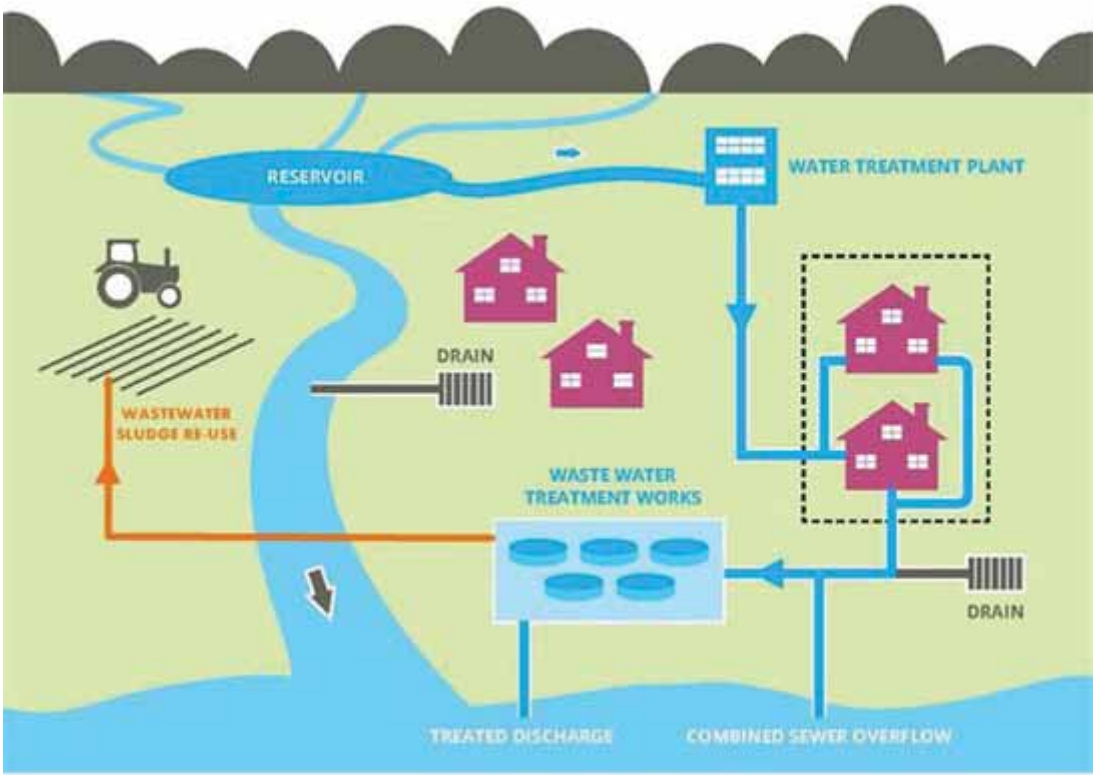


Figure 2.3 – Irish Water's Responsibilities for Water and Wastewater Services

The main stream involves a number of treatment stages generally referred to as preliminary, primary, secondary and tertiary treatment. The level of treatment required depends mainly on the volume of discharge, type of contaminants and the sensitivity of the receiving waters. Treatment involves the removal of rags, deleterious material, suspended solids, metals, pathogens, nutrients (nitrogen/phosphorous) and also the conversion of biological contaminant material into a waste sludge liquor (a sludge with a very high water content) which receives further treatment. The

residual contaminant level is sufficiently reduced to permit the final treated effluent to be released into and without adversely impacting the quality of the receiving water.

Waste sludge liquor is commonly referred to by the percentage of dry solids (DS) content. Solids are the portion of a liquid that is left behind when water is removed. For example, the wastewater sludge liquor removed from a WWTP, prior to any treatment process would have low dry solids content, while post treatment the percentage would increase.

The waste sludge liquor produced is removed from the main treatment stream at a consistency of 0.5-0.7% dry solids (DS) content. This liquor may undergo further volume reduction onsite prior to removal or be exported to a larger WWTP site for further treatment. Volume reduction is achieved by thickening the liquor to 2-4% dry solids content which is followed by dewatering to increase dry matter content to 15-25% DS. Further volume reduction may be achieved with thermal drying where thermal treatment achieves dry solids content up to 92% DS. The level of treatment for volume reduction is dependent on the size of the WWTP and the site location relative to a sludge satellite centre or sludge hub centre. Smaller sites, typically less than 3,000 PE will export liquid sludge (also referred to as sludge liquor) in either thickened or unthickened sludge form to satellite dewatering sites. Dewatering of wastewater sludge takes place at all medium to large WWTPs with selected sites operating as Satellite Dewatering Sites meaning that they also dewater liquid sludge imported from smaller WWTPs and in some cases imported sludge from domestic WWTPs.

Final sludge treatment takes place at large WWTPs or at sludge treatment facilities. The sludge product receives further treatment either by anaerobic digestion with pasteurisation, lime stabilisation, composting or thermal drying in order to reduce pathogen content following which, the material is disposed of. These sites may treat sludge produced at the WWTP only (known as Sludge Treatment Centres), or also treat sludge imported from the surrounding region acting as sludge hub centres.

3 CONTENTS AND MAIN OBJECTIVES OF THE PLAN

3.1 RESPONSIBLE AUTHORITY

Irish Water is responsible for the preparation of the National Wastewater Sludge Management Plan for wastewater sludge generated by public wastewater facilities. Irish Water was incorporated in January 2014 under the Water Services (No. 2) Act of 2013. Irish Water has been established as a single utility providing water and wastewater services nationally. The NWSMP is a national plan for the management of sludge arising primarily from facilities under the control of Irish Water. As such the assessment is focussed at a national strategic level.

3.2 CONTENT OF THE NWSMP

The draft NWSMP contains the following information:

Chapter No.	Content
Chapter 1	Introduction sets out the purpose and objectives of the NWSMP in relation to wastewater sludge management.
Chapter 2	Overview of Sludge Composition, Loads and Outlets, including quantity, type and current level of treatment. The predicted future changes to sludge loads are assessed in terms of population projections. Recommendations for collection and assessment of future data to optimise future sludge management are included.
Chapter 3	Review of Standards and Plans including a review of current legislation and guidance documents in order to assess current requirements and recommendations.
Chapter 4	Consultation Process outlines the consultation with relevant stakeholders and consultees.
Chapter 5	Sludge Treatment Process outlines the current level of sludge treatment along with appropriate treatment processes for agricultural reused, energy recovery and alternative outlets to be considered.
Chapter 6	Sludge Transport Strategy deals with options for minimising sludge transport by capital works and optimising use of existing infrastructure.
Chapter 7	Sludge Infrastructure reviews the infrastructure required at sites for sludge satellite centres and sludge hub centres. It also deals with options for future sludge satellite and hub centres for sludge dewatering including assessment of potential for energy recovery.
Chapter 8	Sludge Outlet Options deals with potential sludge treatment and disposal options with respect to their ability to meet the criteria of providing a secure, sustainable, cost-effective solution over the life of the NWSMP taking into account current and anticipated legislative and operational constraints.
Chapter 9	Options Assessment and Alternatives deals with the selection of options and alternatives. This includes a review of environmental, social and economic aspects and risks associated with the preferred options.
Chapter 10	Quality Assurance, Monitoring and Reporting reviews current requirements for monitoring and reporting of sludge management activities.
Chapter 11	Review Research and Opportunities gives an overview of research identified in relation to sludge treatment and disposal, particularly where related to energy recovery and reduction of sludge volumes for disposal.
Chapter	Financial Evaluation includes a cost estimate for treatment and disposal of sludge over the life of the plan and assesses the potential impact changes in the availability of the agricultural outlet for

Chapter No.	Content
12	sludge.
Chapter 13	Conclusions and Recommendations sets out the current status and the short, medium and long-term goals for management of wastewater sludge. Recommendations include the preferred options to achieve sustainable sludge management including regional plans for future infrastructure.

3.3 MAIN OBJECTIVES OF THE NWSMP

Irish Water's responsibilities for wastewater commences when effluent reaches the public wastewater network. Irish Water is responsible for its transfer to WWTPs, its treatment and the subsequent discharge of the treated effluent back into the water environment. The wastewater treatment process generates sludge which require further treatment prior to reuse or disposal. Irish Water is also responsible for the treatment and reuse / disposal of the wastewater sludge that is generated from its WWTPs.

The WSSP identified that there is a deficit of sludge management facilities nationally. The proper management of sludge presents a challenge to Irish Water in terms of identifying an appropriate management strategy and identifying options that can potentially generate revenue and reduce management costs. The National Wastewater Sludge Management Plan (NWSMP) is required in order to set out the short, medium and long-term management strategy for the next 25 years for wastewater sludge produced at treatment plants under its control.

The NWSMP will take into account current legislation and guidance documents in relation to the treatment and utilisation of wastewater sludge in addition to potential environmental impacts and sustainability of proposals. The recommendations of the NWSMP will be used to inform future capital and operational activities in relation to sludge management. A separate report will be undertaken for sludge from water treatment plants.

The principle criterion which must be met by the sludge management strategies is that it must provide a secure, sustainable, cost-effective solution to management of wastewater sludge over the life of the NWSMP, taking into account current and anticipated legislative and operational constraints. This includes a review of existing and new technologies and risks associated with all options within the plan.

The following sludge management objectives are considered in the NWSMP:

- To avoid endangering human health or harming the environment;
- To maximise the benefits of wastewater sludge as a soil conditioner and source of nutrients;
- To ensure that all regulatory and legislative controls are met, and due regard is taken of non-statutory Codes of Practice and industry guidance;
- To establish long term, secure and sustainable disposal routes and outlets;
- To ensure cost-effective and efficient treatment and reuse/disposal techniques;
- To reduce potential for nuisance from sludge transport and sludge facilities;
- To extract energy and other resources where economically feasible; and
- To drive operational efficiencies, e.g. through use of sludge hub centres.

4 STRATEGIC ENVIRONMENTAL ASSESSMENT METHODOLOGY

4.1 THE STRATEGIC ENVIRONMENTAL ASSESSMENT PROCESS

The Strategic Environmental Assessment (SEA) Directive requires that certain Plans and Programmes, which are likely to have a significant impact on the environment, be subject to the SEA process. The SEA process is broadly comprised of the following steps, as outlined in **Table 4.1**.

Table 4.1 – SEA Stages

SEA Step/Stage	Purpose	Status
Screening	The purpose of this stage of the process was to reach a decision, on whether or not an SEA of the NWSMP was required.	This stage was completed in Q2 2014 with a decision to undertake SEA of the NWSMP.
Scoping and statutory consultation	The purpose of this stage of the process was to clarify the scope and level of detail to be considered in the environmental assessment. This was done in consultation with the defined statutory bodies for SEA in Ireland and consultation was also undertaken with the authorities in Northern Ireland.	This stage was completed in Q2 / Q3 2015.
Environmental assessment and consultation	The purpose of this stage of the process is to assess the likely significant impacts on the environment as a result of implementation of the NWSMP and consideration of reasonable alternatives. The output from this stage of the process is an SEA Environmental Report which records this assessment. Consultation on the draft NWSMP, Environmental Report and appropriate assessment are also part of this stage.	This stage was completed in Q4 2015/ Q1 2016. Subject of this report.
SEA Statement	The purpose of this stage of the process is to identify how environmental considerations and consultations have been integrated into the final plan culminating in the production of an SEA Statement.	To be published with Final NWSMP in Summer 2016.

4.2 WORK COMPLETED TO DATE

4.2.1 Screening

The SEA Directive requires that certain plans and programmes, prepared by statutory bodies, which are likely to have a significant impact on the environment, be subject to the SEA process. Screening of the proposed NWSMP was undertaken by Irish Water in 2014 and a decision was taken to undertake SEA. A copy of the SEA Screening Statement is available on www.water.ie.

4.2.2 Scoping

Geographical Scope: The NWSMP is a national plan for the management of sludge arising from facilities under the control of Irish Water and as such the assessment will be focussed at a national strategic level. The assessment will be focused on sludge produced at WWTPs under the control of Irish Water. It is noted that Irish Water has no statutory obligation in relation to sludge arising from domestic wastewater treatment systems, however recognition will be given within the plan to the management of sludge arising from domestic wastewater treatment systems and other sludge imports, such as from private WWTPs, in the context of overall capacity and expected future loading.

Temporal Scope: The NWSMP will set out Irish Water's strategies for wastewater sludge management over the next 25 years. It is proposed that the NWSMP will have ongoing five yearly reviews. In line with the SEA Directive, short, medium and long-term impacts (including reference to secondary, cumulative, synergistic, permanent and temporary, positive and negative effects) will be considered during the assessment. While the review period for the plan is every five years, some of the recommendations put forward in the plan have a longer perspective and will take a number of years for certain aspects to be implemented and take effect due to improvements and emerging technologies becoming economically viable and available.

Scoping of the SEA Environmental Topics: The environmental topics, in the SEA Directive that have been scoped in for the assessment of the plan following SEA scoping in consultation with the statutory consultees for the SEA and public consultation are: Biodiversity, Flora and Fauna; Population; Human health; Soil and Landuse; Water; Air Quality; Climate Factors; Material Assets; Architectural, Archaeological and Cultural Heritage and Landscape. An additional topic area of Agri-Food has also been scoped in following significant public consultation feedback at scoping stage from organisations such as the IFA and Glanbia. This topic area will specifically assess the implications of the plan on the agri-food sector.

Consultation Feedback: Scoping was carried out between May and June 2015. In line with the SEA Directive, specific environmental authorities (statutory consultees) were consulted on the scope and level of detail of the information to be included in the Environmental Report. The relevant statutory consultees that were consulted as part of the SEA Scoping phase for the NWSMP SEA were:

- Environmental Protection Agency (EPA);
- Department of Agriculture, Food and the Marine (DAFM);
- Department of Arts, Heritage and the Gaeltacht (DAHG);
- Department of Communications, Energy and Natural Resources (DCENR); and
- Department of Environment, Community and Local Government (DECLG).

In recognition of the potential for transboundary effects with Northern Ireland, as some proposed sludge satellite and sludge hub centres border Northern Ireland, the Northern Ireland Environmental Agency (NIEA) was also consulted on the scope and level of detail of the information to be included in the Environmental Report.

Scoping for the NWSMP SEA was carried out with these statutory environmental authorities, based on an initial draft scoping report for the NWSMP which was provided to the statutory consultees on May 12th 2015. A scoping workshop was subsequently held on 7th July at the offices of Irish Water. Representatives from all statutory consultees were invited to attend this workshop. The following statutory consultees were represented on the day: EPA and DCENR. Comments made at the workshop have been taken into account in this Environmental Report. Following the workshop written submissions were received from the EPA; DAFM; DAHG; DCENR and NIEA. These written comments have also been taken into consideration in compiling this report.

In addition to this statutory consultation, a decision was taken to hold a wider non-statutory public consultation on the SEA scoping, to encourage further participation by stakeholders and the public given the strategic nature of the proposed NWSMP and the wide stakeholder base affected by the policies and objectives being developed. To facilitate this wider consultation, an advertisement was placed in the national newspaper, the Irish Independent on 12th May 2015. The advertisement stated that an SEA would be undertaken of the NWSMP and that SEA scoping had commenced. Written submissions were invited from interested parties, specifically in relation to the scope of the SEA. The deadline for receipt of submissions was June 24th 2015. Written submissions received from this public consultation have been taken into account in this Environmental Report.

A summary of the issues raised in the submissions from statutory consultees is presented below with a more detailed table indicating how the comments have been taken into account in this environmental report and / or the draft plan presented in **Appendix A** of this report.

- Suggestions in relation to other relevant plans, programmes & legislation that should be included in the SEA;
- Suggestion of additional key issues, data and information sources for consideration in the SEA;
- The management of sludge from domestic wastewater treatment systems;
- Commitment to ensure that sludge applied to agricultural lands is both environmentally and agronomically safe and appropriate to do so and complies with the *Sewage Sludge in Agriculture Regulations;*
- Concerns over minimum safe standards required when land-spreading sludge on agricultural land for food production.

Additionally submissions were received from individuals and groups as part of the non-statutory public consultation which ran in parallel to the scoping consultation. The main themes raised as part of this consultation are summarised below with a more detailed table indicating how the comments have been taken into account in this environmental report and / or the draft plan presented in **Appendix A** of this report.

- Suggestions in relation to the policies, plans and programmes that should be included in the SEA;
- Issue of food safety concerns, environmental issues in relation to food production, the importance of Ireland's agri-food sector and effects on human health resulting from landspreading of sludge;
- Consideration of farms participating in certain Quality Assurance schemes which cannot receive municipal wastewater sludge for landspreading;

- Consideration of alternatives to examine any emerging new technologies, innovative ways of treating and/or disposing of sludge; and
- Transportation costs in sludge treatment and disposal.

4.3 ENVIRONMENTAL ASSESSMENT

4.3.1 Assessment Approach

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

In order to streamline the assessment process, this report has used broad themes, based on the environmental topics listed in the SEA Directive, to group large environmental data sets, e.g., human health, cultural heritage and climate. Assigned to each of these themes is at least one high-level Strategic Environmental Objective that specifies a desired direction for change, e.g. reduce CO_2 emissions, against which the future impacts of the NWSMP can be measured. These high-level Strategic Environmental Objectives are then paired with specific targets. The progress towards achieving these specific targets is monitored using environmental indicators, which are measures of identified variables over time. The environmental assessment includes a combination of qualitative and quantitative assessment and expert judgement. **Table 4.2** outlines the type of assessment that has been carried out.

Table 4.2 – SEA Environmental Assessment

Environmental Assessment	Is it Quantifiable?
Biodiversity, Flora and Fauna	National and regional datasets are available for aspects relating to biodiversity, flora and fauna. The assessment has considered all nature conservation sites, including European sites protected under national legislation, National Parks, Refuges for Fauna etc.
Population	National datasets are available for population density and distribution and the potential impacts of the NWSMP can be assessed relative to the available information.
Human Health	There is no available national datasets for Human Health however, this topic is often referenced in relation to indirect impacts from air quality, noise, water quality etc.
Agri-food	There are statistics available on trade, imports and exports in relation to the Agri-food Industry. There are national high level datasets are available for landcover and landuse. Data on membership of Bord Bia's Quality Assurance Schemes is available. Agricultural areas under crops and the Census of Agriculture are available from the Central Statistics Office (CSO).
Soil, Geology & Landuse	National high level datasets are available for soil and land use resources at a county / national scale. This is in keeping with the strategic nature of the plan and is considered adequate at this scale.
Water	National datasets are available for surface water and groundwater and issues relating to water quality can be identified.
Air Quality	National and regional datasets are available for relevant air quality parameters.
Climatic Factors	National datasets are available for carbon emissions and greenhouse gases.

Environmental Assessment	Is it Quantifiable?
Material Assets	National datasets are available for certain resources that may be affected by the NWSMP including transport, wastewater infrastructure, waste infrastructure etc.
Architectural, Archaeological & Cultural Heritage	National datasets are available for archaeology and architectural heritage, however the scale of the datasets are directed towards local project specific sources.
Landscape	There are no national datasets available for landscape and the information that is available at a county level is not consistent across all of the counties.

4.3.2 SEA Environmental Report

Based on the legislation and guidance, the Environmental Report must include the information outlined in **Table 4.3**.

Table 4.3 – Requirement of SEA Directive and Relevant Chapter in Environmental Report

Requirement of SEA Directive (Article 5(1) Annex I)	Chapter of Environmental Report
An outline of the contents and main objectives of the plan or programme, or modification to a plan or programme, and relationship with other relevant plans or programmes.	Chapter 3: Content and Main Objectives of the Plan Chapter 5: Review of Relevant Plan, Policies and Programmes
The relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme, or modification to a plan or programme.	Chapter 6: Relevant Aspects of the Current State of the Environment (Baseline)
The environmental characteristics of areas likely to be significantly affected.	Chapter 6: Relevant Aspects of the Current State of the Environment (Baseline)
Any existing environmental problems which are relevant to the plan or programme, or modification to a plan or programme, including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to the Birds Directive or the Habitats Directive.	Chapter 6: Relevant Aspects of the Current State of the Environment (Baseline)
The environmental protection objectives, established at international, European Union or national level, which are relevant to the plan or programme, or modification to a plan or programme, and the way those objectives and any environmental considerations have been taken into account during its preparation.	Chapter 5: Review of Relevant Plan, Policies and Programmes
The likely significant effects on the environment, including on issues such as biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and the interrelationship between the above factors.	Chapter 9: Assessment of Preferred Strategy
The measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment of implementing the plan or programme, or modification to a plan or programme.	Chapter 10: Mitigation and Monitoring
An outline of the reasons for selecting the alternatives dealt with, and a description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of	Chapter 8: Alternatives

Requirement of SEA Directive (Article 5(1) Annex I)	Chapter of Environmental Report
know-how) encountered in compiling the required information	
A description of the measures envisaged concerning monitoring of the significant environmental effects of implementation of the plan or programme, or modification to a plan or programme	Chapter 10: Mitigation and Monitoring
A non-technical summary of the information provided under the above headings	Non-Technical Summary

4.4 SEA STATEMENT

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

The SEA Statement for the NWSMP will be compiled after the statutory consultation on the draft NWSMP and Environmental Report has been completed.

4.5 APPROPRIATE ASSESSMENT

Pursuant to Regulation 27 of the European Communities (Birds and Natural Habitats) Regulations 2011, all public authorities "having or exercising functions, including consent functions, which may or have implications for or effects on nature conservation shall exercise those functions in compliance with and, as appropriate, so as to secure compliance with, the requirements of the Habitats Directive and the Birds Directive and these Regulations" and amongst other things, "shall take the appropriate steps to avoid, in European sites, the deterioration of natural habitats and the habitats of species as well as the disturbance of the species for which the areas have been designated in so far as such disturbance could be significant in relation to the objectives of the Habitats Directive."

An Appropriate Assessment of the NWSMP has been carried out in parallel with the SEA process pursuant to the Birds and Natural Habitats Regulations, 2011 (S.I. 477/2011), with the findings of the Appropriate Assessment used to guide the development of the alternatives considered as part of the SEA. The assessment undertaken as part of the AA process has also fed directly into the assessment of biodiversity, flora and fauna in this SEA.

It is noted that the requirements of Article 10 and Article 12 of the Habitats Directive are not specifically considered under the Appropriate Assessment (except in so far as they support a qualifying feature) but it is noted such features have been considered in the SEA under the broader heading of Biodiversity, Flora and Fauna.

4.6 DIFFICULTIES ENCOUNTERED

In undertaking the assessment a number of difficulties and data gaps were encountered. These included the following:

- Limitations in relation to the accuracy of data that is available on sludge quantities generated. It should be noted that there is a data collection and validation process ongoing within Irish Water currently. This process includes sites surveys of all wastewater assets and will take a period of 2-3 years before asset register data is gathered, validated and as such the accuracy of data and details on sludge management infrastructure will be improved in future cycles of the NWSMP;
- Limitations in relation to available GIS datasets on where sludge is currently landspread;
- Limitations in relation to the availability of GIS data of the area of land that is currently under Bord Bia's Quality Assurance Schemes;
- Irish Water is in the process of preparing a number of Tier II plans and several have not yet commenced therefore the implications of these for sludge management cannot be fully assessed e.g. Lead in Drinking Water Mitigation Plan; and
- The first cycle of Water Framework Directive (WFD) River Basin Management Plans for the period 2009 to 2015 outline objectives and measures for water bodies within the River Basin Districts in order to meet the requirements of the WFD. The RBD's are entering their 2nd cycle which relate to the period 2015 to 2021 and as such are in a transition phase. The 2nd cycle will include the development of a new Programme of Measures to manage the waters up until 2021.

5 REVIEW OF RELEVANT PLANS, POLICIES AND PROGRAMMES

5.1 INTRODUCTION

As documented in the SEA Directive the purpose of SEA is "to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations in the preparation and adoption of plans and programmes with a view to promoting sustainable development". Therefore it is imperative that environmental considerations are documented and taken into account in the development of this NWSMP. In order to do this the environmental protection objectives from relevant key plans, programmes, policy and legislation must be first identified and then explored in relation to the NWSMP.

The SEA Directive also states in Article 5(1) of Annex 1, that the environmental assessment must identify "the environmental protection objectives, established at International, European Union or national level, which are relevant to the plan or programme, or modification to the plan or programme, and the way those objectives and any environmental considerations have been taken into account during its preparation". Therefore the main objectives of the NWSMP must be outlined along with the "relationship with other relevant plans or programmes".

This chapter follows on from the overview of the NWSMP provided in Chapter 3. Its purpose is to set out how the NWSMP interacts with other relevant plans and programmes and environmental protection objectives.

5.2 METHODOLOGY

In order to undertake these specific tasks, this chapter has taken consideration of the plan/ programme/ policy and legislative framework within which the NWSMP has been developed. The NWSMP is a Tier II Plan within the Irish Water planning framework and sits under the overarching Tier I Water Services Strategic Plan (WSSP). The NWSMP will in turn inform projects and activities required to implement the sludge management plan.

The NWSMP is a national plan and therefore the review has focused on relevant National, European and International frameworks. As part of the review process, a comprehensive list of plans and programmes, policy and legislation, relevant to the management of sludge produced at WWTPs under the control of Irish Water has been documented and is presented in **Appendix B** of this report. It is not intended to be an exhaustive list but rather is focused on those considered key to the NWSMP and takes on board comments made during the SEA scoping stage from both statutory consultees and the wider public.

In exploring the relationships between the NWSMP and plans, programmes, policy and legislation the following two questions have framed the review:

- Does the NWSMP contribute to the fulfilment of environmental protection objectives set in other Plans/ Programmes/ Policy/ Legislation; and
- To what degree are the environmental protection objectives set in these other Plans/ Programmes/ Policy/ Legislation impacted by the NWSMP?

5.3 RELEVANT PLANS AND PROGRAMMES

Table 5.1 identifies the European, national and regional plans and programmes which are considered to be key drivers and influencers in relation to the NWSMP.

Table 5.1 – Key Relevant Plans and Programmes

Level	Key Relevant Plans and Programmes
European	Seventh Environmental Action Programme
	Roadmap to a Resource Efficient Europe
	A Blueprint to Safeguard Europe's Water Resources
	European Union Biodiversity Strategy to 2020
National	Our Sustainable Future: A Framework for Sustainable Development in Ireland (2012)
	National Biodiversity Plan (2011-2016) and NPWS Conservation Plans for SACs and SPAs
	National Climate Change Strategy (2007 – 2012)
	National Hazardous Waste Management Plan 2014-2020
	National Waste Prevention Programme
	Water Services Strategic Plan (complete)
	National Water Resources Plan (to be prepared)
	National Lead in Drinking Water Mitigation Plan (in preparation)
	National Water Sludge Management Plan (to be prepared)
	National Bioenergy Plan (in preparation)
	Climate Change Adaption and Mitigation Strategy (in preparation)
	Wastewater Compliance Strategy (to be prepared)
	Water Compliance Strategy (to be prepared)
	National Spatial Strategy for Ireland 2002- 2020 People, Places and Potential
	National Renewable Energy Action Plan
	Offshore Renewable Energy Development Plan
	2025 Agri-Food Strategy – Foodwise (in preparation)
	Harvest 2020
	Agri-vision 2015 Action Plan
	Green, Low-Carbon, Agri-environment Scheme (GLAS)
	Harnessing Our Ocean Wealth - An Integrated Marine Plan for Ireland (HOOW).
	Northern Ireland Water Resources Management Plan 2012
	Ireland's Nitrates Action Programme (NAP)
	National Peatland's Strategy (Draft)
	National Raised Bog SAC Management Plan
	National Forestry Programme
	Heritage Plans and Framework and Principles for the Protection of Archaeological Heritage
	Northern Ireland Waste Management Strategy, Delivering Resource Efficiency (2013)
Regional	Regional Planning Guidelines
	Regional Waste Management Plans – Eastern Midlands, Southern; and Connaught Ulster.

Level	Key Relevant Plans and Programmes
	River Basin Management Plans (2009-2015). Note 2nd cycle of plans is under preparation.
	Catchment Flood Risk Assessment and Management Plans
	Water Quality Management Plans
	Shellfish Pollution Reduction Programmes
	Freshwater Pearl Mussel Sub-Basin Management Plans
	North West Region Group Waste Management Plan 2013–2020; and SWaMP2008 Waste Management Plan 2013–2020.

5.4 RELEVANT POLICY AND LEGISLATION

Table 5.2 identifies the international, European and national policy and legislation which are considered to be key drivers and influencers in relation to the NWSMP.

Table 5.2 – Key Relevant Policy and Legislation

Level	Key Relevant Policy and Legislation
International	Kyoto Protocol to the UNFC on Climate Change (1997)
	OSPAR Convention (1992)
	RAMSAR Convention (1975)
European	SEA Directive (2001/42/EC)
	EIA Directive (2014/52/EC)
	EU Habitats Directive (92/43/EC)
	Conservation of Wild Birds Directive (2009/147/EC codified)
	Environmental Liabilities Directive (2004/35/CE)
	Waste Framework Directive (2008/98/EC)
	Waste Statistics Regulation (2150/2002/EC as amended)
	Sewage Sludge Directive (86/278/EC)
	Urban Waste Water Treatment Directive (91/271/EEC)
	Nitrates Directive (91/676/EEC)
	Water Framework Directive (2000/60/EC)
	Drinking Water Directive (98/83/EC)
	Bathing Water Directive (2006/7/EC)
	Priority Substances Directive (2013/39/EU)
	Floods Directive (2007/60/EC)
	Marine Strategy Framework Directive (2008/56/EC)
	Groundwater Directive (2006/118/EC)
	Industrial Emissions Directive (2010/75/EU)
	Renewable Energy Directive (2009/28/EC)

Level	Key Relevant Policy and Legislation
	The EU 20-20-20 climate and energy package Agreement
	Shellfish Waters Directive (2006/113/EC)
	Fish Directive (2006/44/EC)
National	Water Policy Regulations S.I. 350/2014
	Drinking Water Regulations S.I. 122/2014
	Good Agricultural Practice for the Protection of Waters Regulations S.I. 31/2014
	Biocidal Products Regulations 2013 (as amended) S.I. 427/2013
	Industrial Emissions Regulations S.I. 138/2013
	Birds and Habitats Regulations S.I. 477/2011 (as amended)
	Bathing Water Quality (Amendment) Regulations S.I. 351/2011
	Renewable Energy Regulations S.I. 147/2011
	Ireland Transition to a Low Energy Future 2015-2030
	Marine Strategy Framework Regulations S.I. 249/2011
	Environmental Objectives (Groundwater) Regulations S.I. 9/2010
	Assessment and Management of Flood Risks Regulations S.I. 122/2010
	Food and Feed Hygiene Regulations S.I. 432/2009 (as amended)
	Environmental Objectives (Surface Water) Regulations S.I. 272/2009
	Environmental Liability Regulations S.I. 547/2008
	Hygiene of Foodstuffs Regulations S.I. 369/2006
	Quality of Shellfish Waters Regulations S.I. 268/2006 (as amended)
	Planning and Development Regulations S.I. 600/2001 (as amended)
	Urban Wastewater Treatment Regulations S.I. 254/2001
	Waste Management (Use of Sewage Sludge in Agriculture) (Amendment) Regulations 2001 (S.I. No. 267 of 2001)
	Planning and Development Act 2000 (as amended)
	Waste Management Act 1996 (as amended)
	Environmental Impact Assessment Regulations S.I. 349/1989 (as amended)
	Foreshore Acts 1933 (as amended)

5.4.1 Codes of Practice, Quality Assurance Schemes and Standards

Feedback from the SEA scoping consultation included a number of significant responses raising the issue of codes of practice and quality assurance schemes with direct relevant to land spreading on agricultural lands. In response to this, **Table 5.3** outlines the main codes and assurance schemes which both impose controls on land spreading from an environmental protection perspective and also present significant limitations on where wastewater sludge may be acceptable for land spreading in the wider agricultural landscape.

Table 5.3 – Key Codes of Practice, Quality Assurance Schemes and Standards

Type	
Code of Practice	Irish Grain Assurance Scheme Code of Practice, 2012
	Code of Good Practice for the Use of Biosolids in Agriculture (COGP), DECLG 2009
	Code of Good Agricultural Practice to Protect Waters from Pollution by Nitrates, DAFF 1996
Quality Assurance Schemes	Bord Bia Sustainable Dairy Assurance Scheme Producer Standard Revision 01, 2013
	Bord Bia Beef and Lamb Quality Assurance Scheme Producer Standard Revision 01, 2010
	Bord Bia Horticulture Quality Assurance Scheme Producer Standard Revision 02, 2008
	CQAS 441 Compost Quality Assurance Scheme
Standards	CEN/TS 13714:2013 Characterization of sludges. Sludge management in relation to use or disposal
	CEN/TR 13097:2010 Characterization of sludges. Good practice for sludge utilisation in agriculture
	CEN/TR 15809:2008 Characterization of sludges. Hygienic aspects. Treatments
	CEN/TR 13983:2003 Characterization of sludges. Good practice for sludge utilisation in land reclamation
	CEN/TR 15584:2007 Characterisation of sludges. Guide to risk assessment especially in relation to use and disposal of sludges
	CR 13846:2000 Recommendations to preserve and extend sludge utilization and disposal routes
Other	FSAI Food Safety Implications of Land-spreading Agricultural, Municipal and Industrial Organic Materials on Agricultural Land used for Food Production in Ireland (2008)
	Landspreading of Organic Waste: Guidance on Groundwater Vulnerability Assessment of Land, EPA 2004

5.5 KEY INFLUENCES

The tables above have highlighted key texts which drive and influence the NWSMP. This section explores the relationship of the NWSMP to texts and establishes the environmental protection objectives which have influenced the assessment of the NWSMP.

5.5.1 Wastewater Treatment and Sludge Management

The **Urban Wastewater Treatment Directive (91/271/EEC)** which was transposed into Irish law by the **European Union (Urban Wastewater Treatment) Regulations 2001 (S.I. No. 254 of 2001)** are the primary legislative instruments concerning discharges from urban waste water treatment plants. The legislation places obligations on the competent authority in respect of the collection, treatment, and monitoring of urban waste water. Of particular significance to the NWSMP is Article 14 of the Urban Waste Water Directive which states: *sludge arising from wastewater treatment shall be reused whenever appropriate.*

Where wastewater sludge is reused, the vast majority of sludge treatment standards and legislation relate to agricultural reuse. The main legislation in relation to the use of wastewater sludge is Directive 86/278/EEC on the protection of the environment, and in particular of the soil, when wastewater sludge is used in agriculture - referred to hereafter as the **Sewage Sludge Directive (86/278/EEC)**. This was transposed into Irish law by **Waste Management (Use of Sewage Sludge in Agriculture) Regulations 1998**, as amended by S.I. 267/2001. The regulations prescribe standards for the use of wastewater sludge in agriculture, giving effect to the Directive, which seeks to encourage the appropriate use of wastewater sludge in agriculture, and to regulate its use in such a way as to prevent harmful effects on soil, vegetation, animals and humans. Restrictions to the application of sludge for use in agriculture are imposed where naturally-occurring background levels of heavy metals exceed the maximum levels set out in the regulations and sludge is not used except in accordance with a Nutrient Management Plan. All Local Authorities were required to prepare sludge management plans, however the majority of plans are now outdated and obsolete.

The European Union (Good Agricultural Practice for Protection of Waters) Regulations 2014, S.I. 31/2014, known as the **Nitrates Regulations 2014**, gives legal effect in Ireland to Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources - referred to hereafter as the **Nitrates Directive (91/676/EEC)**. The Nitrates Directive has the objective of reducing water pollution caused or induced by nitrates from agricultural sources. Under the regulations, wastewater sludge is considered a fertiliser under the definitions of the regulations: "fertiliser" means any substance containing nitrogen or phosphorus or a nitrogen compound or phosphorus compound utilised on land to enhance growth of vegetation and may include livestock manure, the residues from fish farms and wastewater sludge. The Nitrates Regulations provide for the mandatory implementation of agricultural measures for protecting surface and groundwater quality by all Irish farmers. The measures include limits on storage and land spreading of nutrients, including no-spread zones adjacent to drinking water abstraction points, and uncultivated buffer/riparian strips, to prevent nutrients and sediment from entering water.

Where wastewater sludge is not used in agriculture, the management of the sludge is governed by waste legislation. The **European Waste Framework Directive (2008/98/EC)** sets out the approach for the sustainable management of waste in the Member States of the European Community and has been transposed into Irish law by the **Waste Management Act 1996** and the **European Communities (Waste Directive) Regulations 2011**. The main waste legislation in Ireland impacting wastewater sludge management is the **Waste Management (Facility Permit and Registration) Regulations S.I. 821/2007** as amended by S.I. 86/2008 and S.I. 320/2014, which requires that any facility which is involved in the recovery or disposal of waste shall hold a Licence, Permit or Certificate of Registration depending on the nature of the activity. There is also the **Waste Management (Registration of Sewage Sludge Facility) Regulations S.I. 32/2010**, which requires all operators of wastewater sludge facilities to be registered with the relevant local authority in whose functional area the facility is located. Both these regulations exclude facilities which hold a Waste Licence and also WWTP.

The EPA is responsible for licensing certain activities in the waste sector under the Protection of the Environment Act 2003. The **Waste Water Discharge (Authorisation) Regulations 2007 (S.I. No.684 of 2007) (as amended)** provide for the authorisation by the EPA of urban wastewater discharges by a water services authority. All discharges to the aquatic environment from sewerage systems owned, managed and operated by water service authorities require a wastewater discharge licence or certificate of authorisation from the EPA. The authorities are required to apply to the Agency for a licence or certificate of authorisation by set dates depending on the population equivalent of the

area served by the sewer network. The process does not regulate sludge disposal from wastewater treatment operations.

Although not responsible for Domestic Wastewater Treatment Systems (DWWTS), Irish Water operated facilities are a receptor for some such sludge brought there by licensed contractors. Recent changes to the legislation require that all DWWTS are registered. In addition, the Minister also published new regulations **(Performance Standards S.I. 223/2012)** governing domestic systems and these require that they be maintained, including desludging. This will add to sludge volumes seeking appropriate outlets.

5.5.2 Nature Conservation

At the top of the European protection hierarchy is the **Habitats Directive (92/43/EC)** and the Birds Directive (2009/147/EC) which has been transposed into Irish law principally through the **European Communities (Birds and Natural Habitats) Regulations 2011** which consolidates the European Communities (Natural Habitats) Regulations 1997 to 2005 and the European Communities (Birds and Natural Habitats)(Control of Recreational Activities) Regulations 2010, as well as addressing transposition deficiencies in the original implementing legislation. Also relevant to the Plan is the EU Biodiversity Strategy, which aims to prevent and eliminate the causes of biodiversity loss and maintain and enhance current levels of biodiversity. At a national level, protection and conservation continues with the National Biodiversity Plan and the National Parks and Wildlife Conservation Plans for SACs and SPAs

Article 6 of the Habitats Directive requires that any plan or project, which includes the NWSMP, be screened for Appropriate Assessment to determine if it, alone or in combination with other plans and projects, is likely to have a significant effect on a European Site. This screening has been undertaken in parallel to development of the draft NWSMP and it has been concluded that a Stage 2 Appropriate Assessment would be required due to the potential for impacts arising from the NWSMP. Further detail can be found in the Natura Impact Statement (NIS) which accompanies this SEA Environmental Report and the Draft Plan.

The **Water Framework Directive (2000/60/EC)** aims at improving the aquatic environment and as such it applies to rivers, lakes, groundwater, estuaries and coastal waters. Member states are required to achieve good status in all waters and must ensure that status does not deteriorate. This directive requires that water quality management be centred on river basins. The NWSMP will contribute to the fulfilment of these environmental protection objectives through participation in river basin management planning at a national and river basin level for the development and implementation of programmes of measures in relation to wastewater and sludge management services in support of the WFD.

The **Marine Strategy Framework Directive (2008/56/EC)** aims to protect the marine environment. It requires the application of an ecosystem-based approach to the management of human activities, enabling a sustainable use of marine goods and services. The objective of the directive is to achieve Good Environmental Status (GES) of the EU's marine waters by 2020 and to protect the resource base upon which marine-related economic and social activities depend.

The **Floods Directive (2007/60/EC)** requires Member States to undertake a Preliminary Flood Risk Assessment, to identify areas of existing or potentially significant future flood risk, to prepare flood hazard and risk maps and to prepare flood risk management plans setting objectives for managing

the flood risk within areas identified for further assessment. The directive was transposed into Irish Law by the **European Communities (Assessment and Management of Flood Risks) Regulations 2010 (S.I. No. 122 of 2010)**. These regulations set out the responsibilities of the Office of Public Works (OPW) and other public bodies in the implementation of the directive and detail the process for implementation of the measures set out in the flood risk management plans. As such the OPW works in close partnership with all Local Authorities in delivering the objectives of the Flood Management Programme. The potential risk of flooding to existing and future wastewater treatment infrastructure falls under the remit of this legislation and ongoing and future development/ operation/upgrade of supporting wastewater treatment infrastructure should be consistent with the Flood Risk Management Guidelines (DEHLG, 2009). These guidelines state that essential infrastructure such as water and wastewater treatment should not be located within Zone A flood zones – High probability of flooding. The critical aspects to consider relate to ensuring that existing and future WWTP related infrastructure is protected from the risk of flooding.

The **Environmental Liabilities Directive (2004/35/EC)** implements the "polluter pays principle". The aim of the directive is to hold those whose activities have caused environmental damage financially liable for remedying this damage. The directive was transposed into Irish Law in 2009 by the **European Communities (Environmental Liability) Regulations 2008** and comes under the remit of the EPA. Environmental damage under this legislation specifically relates to water damage with a significant adverse effect on water status as defined by the Water Framework Directive; land damage that creates a significant risk to human health; and damage to protected species and natural habitats. The Regulations were amended by the **European Communities (Environmental Liability) (Amendment) Regulations 2015 (S. I. No. 293 of 2015)** to include the Marine Strategy Framework Directive and for water damage that significantly adversely affects the environmental status of the marine waters concerned, as defined in the Marine Strategy Framework Directive not addressed through the WFD. The spreading of wastewater sludge from urban WWTPs, treated to an approved standard, for agricultural purposes falls under the remit of this legislation.

In relation to climate change, at the top of the hierarchy is the **EU-20-20-20 Agreement** which is comprised of a range of measures aimed at reducing greenhouse gas (GHG) emissions, renewable energy and energy efficiency. The Agreement consists of a package of legally binding legislation, the three key objectives of which are: reduce EU GHG emissions by 20% on 1990 levels; 20% of EU energy consumption to be derived from renewable energy sources; and to increase energy efficiency by 20%. At a national level, the National Climate Change Strategy has been outdated, and as such the EU-20-20-20 Agreement is the legally binding legislation, which currently commits Ireland to reducing GHG emissions. The NWSMP will adhere to the agreement by encouraging prevention, recycling and processing of wastewater sludge with a view to becoming resource-efficient and contributing to a low-carbon economy.

5.5.3 Quality Assurance Schemes and Codes of Practice

Following the consultation with the public, statutory consultees and interested bodies on the SEA Scoping Report, a number of submissions were received which raised issues for consideration. Issues raised by a number of stakeholders were in relation to food safety & food production in addition to Quality Assurance Schemes (e.g. Bord Bia and the Irish Grain Assurance Schemes), and the consequences that arise from the schemes for restricted use of sludge in agriculture. As such existing codes of practice and best practice guidance for wastewater sludge are considered relevant to the NWSMP and have been taken into consideration during the preparation of the objectives and actions within the NWSMP.

"*The Code of Good Practice for the Use of Biosolids in Agriculture*" (COGP) produced by the DECLG sets guidelines for the treatment and use of wastewater sludge. The COGP is a mandatory code in response to the **Sewage Sludge Directive (86/278/EEC)**, and is intended to permit the safe and beneficial use of Biosolids in agriculture nationally. The COGP complements the "Code of Good Agricultural Practice to Protect Waters from Pollution by Nitrates". This code was in response to the **Nitrates Directive (91/676/EEC)**.

The Food Safety Authority of Ireland has produced a report "Food Safety implications of Land-spreading Agricultural, Municipal and Industrial Organic Materials on Agricultural Land used for Food Production in Ireland" which outlines food safety concerns. The report outlines recommendations relating to the minimum safe standards required when land-spreading organic agricultural (OA) and organic municipal and industrial materials (OMI) on agricultural land used for food production.

The European Committee for Standardisation, CEN, develops and publishes European Standards and technical specifications to meet the needs of European organisations to improve safety, quality and reliability of products, services, processes. CEN have produced a number of Technical Reports in relation to wastewater sludge covering but not limited to sludge management in relation to use or disposal, good practice for sludge utilisation in agriculture, guide to risk assessments and Hygienic aspects.

In addition, the importance of the agri-food sector has been recognised with food processors and individual farms participating in voluntarily national programmes such as Quality Assurance Schemes. These include schemes established by Bord Bia for the beef, lamb, dairy, pig, poultry, egg and horticulture sectors, the Bord Bia Origin Green Initiative and the Irish Grain Assurance Scheme. Each of these schemes has Producer Standards to which participants must adhere to. A critical criterion set in Bord Bia's quality assurance standards, for beef, lamb, dairy, eggs and horticulture, is that the use of raw or treated wastewater sludge are prohibited from being used on Bord Bia certified farms. This applies to all land owned or managed by the farmer member of the relevant scheme.

5.5.4 Irish Water Plans

At the top of the Irish Water Planning and Environmental Framework is the Water Services Strategic Plan. In October 2015, the Water Services Strategic Plan (WSSP), prepared by Irish Water under Section 33 of the Water Service No. 2 Act of 2013 (WSA), was formally approved by the Minister for the Environment, Community and Local Government. The WSSP, in accordance with requirements set out by the Minister, addresses the delivery of six strategic objectives: Meet customer expectations; Ensure a Safe and Reliable Water Supply; Provide Effective Management of Wastewater; Protect and Enhance the Environment; Support Social and Economic Growth; and Invest in Our Future.

The WSSP takes a 25 year view towards the vision that *'Through responsible stewardship, efficient management and strong partnerships, Ireland has a world class water infrastructure that ensures secure and sustainable water services, essential for our health, our communities, the economy and the environment'.* The WSSP forms the highest tier of asset management plans (Tier 1) which Irish Water prepare and it sets the overarching framework for subsequent detailed implementation plans (Tier 2) and water services projects (Tier 3). The National Wastewater Sludge Management Plan (NWSMP) is a Tier 2 Plan under the WSSP. **Figure 5.1** illustrates the position of the WSSP in terms of

the overall Irish Water asset management planning and environmental assessment hierarchy context.

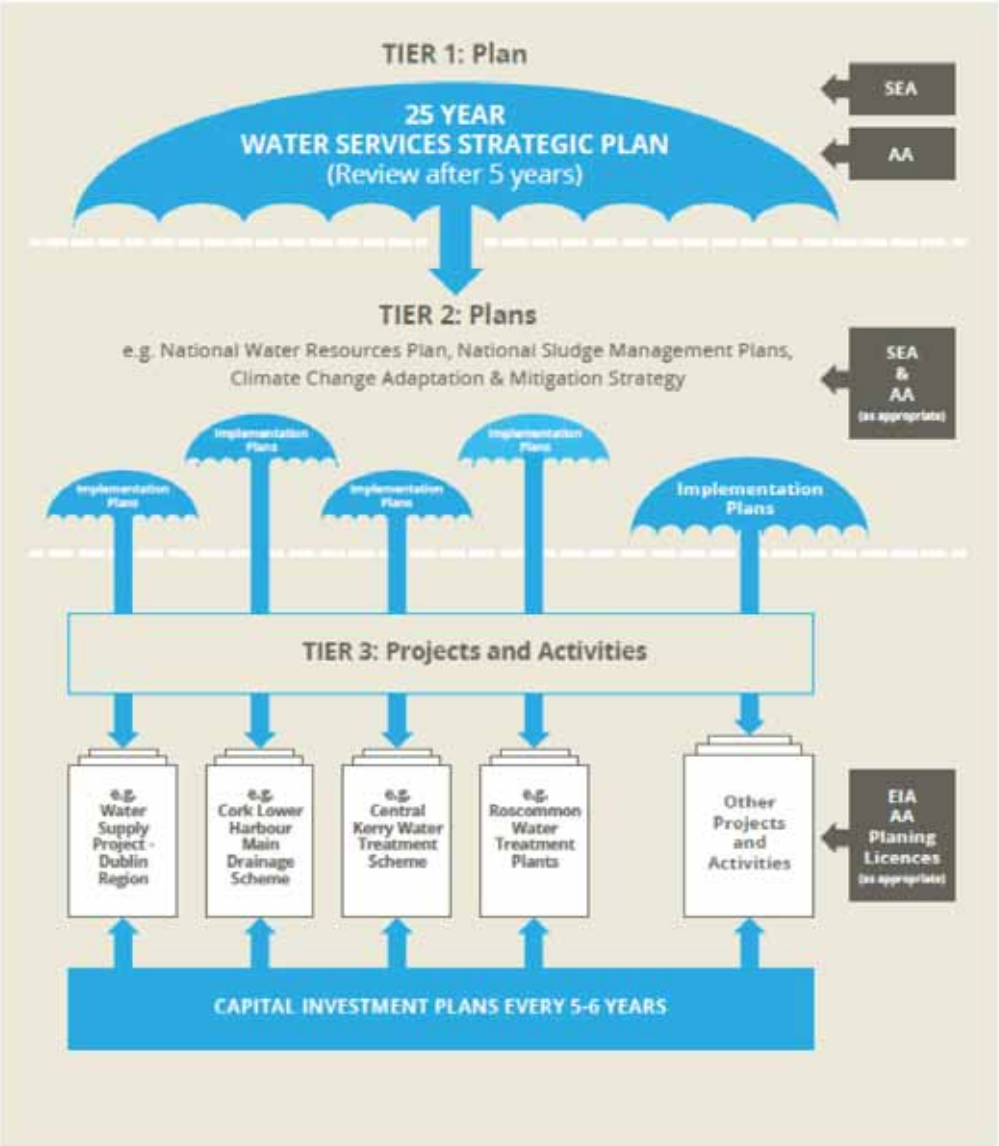


Figure 5.1 – Hierarchy for Irish Water Plans and Projects

The WSSP sets out the challenges we face as a country in relation to the provision of water services and identifies strategic national priorities. It includes Irish Water's short, medium and long term objectives and identifies strategies to achieve these objectives. As such, the plan provides the context for subsequent detailed implementation plans (Tier 2) which will document the approach to be used for key water service areas such as water resource management, wastewater compliance and sludge management. The plan underwent a Strategic Environmental Assessment (SEA) and an Appropriate Assessment (AA). Irish Water invited submissions on the Draft WSSP together with the SEA Environmental Report and Appropriate Assessment for a 6 week period. Following the consultation, the plan was revised, finalised and approved by the Minister for the Environment, Community and Local Government and a Strategic Environmental Assessment Statement has been

published. Of relevance to all Tier 2 Plans including the NWSMP are the specific environmental objectives included in the WSSP. These are:

EN1: Ensure that Irish Water services are delivered in a sustainable manner that contributes to the protection of the environment.

EN2: Operate our water services infrastructure to support the achievement of water body objectives under the Water Framework Directive.

EN3: Manage all our residual waste in a sustainable manner.

Both the Tier 1 and Tier 2 Plans will have relevance to the NWSMP including plans relating to the requirement for good water quality for use in drinking water and plans which will lead to producing additional loads that have to be dealt with through the Irish Water wastewater network. A number of Tier 2 Plans are in preparation and others have yet to be commenced hence there is a limit on what can be drawn from them at this time. A brief outline is provided below for those considered specifically relevant to the NWSMP.

A National Water Resources Plan (NWRP) will be prepared which will underpin the WSSP "*for the strategic development of water supplies that comply with the water quality standards and build in security of supply through the interconnection, where practicable, of our current water supply networks and the development of new, larger and more secure water sources serving regional schemes*". As such, the NWRP must deliver a sustainable water supply for all on a catchment and water resource zone basis, meeting growth and demand requirements and be maintained through drought and critical periods. A plan is proposed in relation to national drinking water sludge management to complement the NWSMP, but no details on the plan are yet available.

The Government published a National Strategy to reduce exposure to Lead in Drinking Water in June 2015. In support of this strategy Irish Water, as the national public water utility is drafting the Irish Water Lead in Drinking Water Mitigation Plan in collaboration with the HSE and EPA. Proposals under consideration include orthophosphate dosing to the water supply at various treatment sites as orthophosphate is a corrosion inhibiter that creates a coating on lead and other metal pipes which prevents the lead dissolving into the water. Orthophosphate dosing takes a period of 6-18 months to develop a full coating, after which dosing must be maintained in order to sustain the protective coating. As such, the Lead in Drinking Water Mitigation Plan has the potential to impact on the NWSMP, as the additional orthophosphate will increase the phosphorus loading to the WWTPs, thus potentially generating additional quantities of sludge and may require infrastructure upgrades for nutrient removal.

Along with all public bodies, Irish Water must prepare a Climate Change Adaption and Mitigation Strategy. The purpose of this document is to support national objectives for climate change mitigation and to meet our obligations under the National Climate Change Adaptation Framework to ensure the resilience and sustainability of water services. Climate change impacts in Ireland are expected to include more intense rainfall events as well as periods of increased drought along with a rise in sea level. These events will impact on water services through increased risk of sewer flooding, possible inundation of treatment plants and other assets; deterioration in water quality in rivers and lower dry weather river flows reducing the water available for abstraction or for diluting treated effluent.

A key issue for climate change mitigation will be measures aimed at reducing GHG emissions and increasing energy recovery and energy efficiency in order to build a resource-efficient, low carbon

economy. This will affect sludge production as high quantities of energy are required to reduce the volume of the waste sludge liquor, as previously discussed in **Section 2.2**. Wastewater treatment processes and the sludge treatment process will have to address energy efficiency within their facilities and processes. Technologies such as waste to energy facilities, which can use sludge as a fuel source, may need to be considered..

The environmental protection objectives and their relationship with the NWSMP and various plans, programmes, policy and legislation have been identified and discussed. These environmental protection objectives have been integrated into the development of the SEA objectives which are outlined in **Chapter 6, 'Relevant Aspects of the Current State of the Environment (Baseline)'**. In addition, **Appendix B** provides a comprehensive list of plans, programmes, policy and legislation containing environmental protection objectives, which have been considered relevant to wastewater sludge management.

6 RELEVANT ASPECTS OF THE CURRENT STATE OF THE ENVIRONMENT (BASELINE)

6.1 INTRODUCTION

This section of the Environmental Report examines the relevant significant issues of the current state of the environment in relation to biodiversity, fauna, flora, population, human health, water, soil, geology, climatic factors, air, material assets, cultural heritage, landscape and the interrelationship between these factors. The baseline has been compiled using available datasets and indicators developed through scoping and review of relevant supporting documentation. It is noted that the NWSMP is a national plan and as such the assessment is focussed at a national strategic level and this is mirrored in the level of detail presented for the baseline description which follows.

The baseline description is focussed in the first instance on the Republic of Ireland, however given that Ireland shares a land boundary with Northern Ireland, there is potential for environmental impact on water quality, biodiversity which are transboundary. As such (and in recognition of the scoping comments received by the NIEA) the description below includes reference, where relevant, to baseline conditions and pressures in Northern Ireland.

6.1.1 State of the Environment Overview – Republic of Ireland

Ireland's natural environment, although under increasing pressure, generally remains of good quality and represents one of the country's most essential national assets, however pressures have increased significantly (EPA, 2008 and 2012). As Ireland's economy grew, these pressures accelerated at a rate which exceeded that observed in other EU countries. In their 5th and most recent state of the environment review, the EPA identified four priority challenges for the environment, which, if addressed successfully, should benefit the present and future quality of Ireland's environment. These comprise:

- Valuing and Protecting our Natural Environment;
- Building a Resource-Efficient, Low Carbon Economy;
- Implementing Environmental Legislation; and
- Putting the Environment at the Centre of Our Decision Making.

These challenges are summarised below in **Table 6.1**.

Table 6.1 – EPA Key Challenges and Relevance to the NWSMP

Challenge	Relationship to NWSMP
Challenge 1: Valuing and Protecting our Natural Environment	The NWSMP will first and foremost introduce a clear and transparent framework for the management of sludge generated through wastewater treatment in Ireland. The management of sludge has the potential for significant impact on the natural environment, particularly in relation to soils, water and air. The plan presents the opportunity to ensure that wastewater sludge management and related activities are carried out in compliance with all existing EU and national objectives, policies and

Challenge	Relationship to NWSMP
	legislation which also seek to protect the natural environment.
Challenge 2: Building a Resource-Efficient, Low Carbon Economy	The NWSMP sets out the approach for the sustainable management of wastewater sludge and includes objectives focussed at minimisation, treatment, transport and energy recovery, all of which would contribute to the effective and safe management of wastewater sludge. The NWSMP also considers the generation of greenhouse gas emissions from collection, transport and processing of sludge in addition to new sludge processing technologies utilising its potential for energy generation as an alternative to fossil fuels.
Challenge 3: Implementing Environmental Legislation	The NWSMP is undergoing both SEA and AA in line with existing EU and national legislation. Projects arising from the NWSMP in many cases will require planning and further environmental assessment. The SEA will also have regard to inter-related EU legislation such as the Water Framework Directive, the Floods Directive, among others.
Challenge 4: Putting the Environment at the Centre of Our Decision Making	As noted above, the draft NWSMP is undergoing both SEA and AA in line with existing EU and national legislation. This is ensuring that the environmental consequences are taken into account as part of the plan's development. Both processes are helping to shape the evolution of the draft NWSMP.

A summary of the relevant aspects of the current state of the environment in Ireland has been summarised in **Table 6.2**.

Table 6.2 – Summary of Current State of the Environment in Ireland

Theme	Key Findings
Air Quality	While air quality is of a good standard, monitoring shows that levels of some pollutants (e.g. NO_2) are at concentrations that may impact on health. PM_{10}, $PM_{2.5}$, ozone, and PAH are above the WHO guideline values and an EEA report indicates that around 1,200 deaths in Ireland in 2012 were directly linked to air pollution. Continued effort is being made to reduce air pollution through bans on bituminous coal in large towns and cities and implementing the actions set out in the Smarter Travel Policy for Sustainable Transport. Incentives in recent years to change from petrol to diesel in the personal car fleet has had unforeseen and significant effects on air quality, increasing key pollutants in cities especially PM_{10}, $PM_{2.5}$.
Climate	Irish per capita GHG emissions remain among the highest in Europe, with agriculture the largest source accounting for 33.3% of total national emissions. Sectors such as energy are showing decreases in GHGs due to increased use of renewables and improving standards. In 2013, Ireland was halfway to its Renewable Energy Directive target and the newly published Climate Action and Low Carbon Development Bill will also help transition to a low carbon economy. Further reductions, particularly in the agriculture and transport sectors, will be required to meet the 2020 EU Effort Sharing targets of 20% below 2005 levels. Longer term horizons will pose a serious challenge for Ireland based on current trajectories.
Water	Most of Ireland's water bodies are of good ecological status however nutrient loading from wastewater and diffuse agricultural sources continue to be the main threat. Measures to improve water quality are being implemented in order to achieve the targets of the WFD such as the development of River Basin Management Plans and control and licensing of industrial discharges. The implementation and enforcement of the Nitrates Action Plan is the most important measure to address diffuse agricultural pollution of freshwaters. This includes a code of Good Agricultural Practice (GAP) which is mandatory for all farms. Nitrogen and phosphorus levels are decreasing although the rate of improvement has been

Theme	Key Findings
	slow and the improvements are relatively modest. This may be tempered by proposals to add orthophosphate to the drinking water supply in response to unacceptable levels of lead in drink water supplies. The second cycle of the RBMP's are also in preparation and are anticipated for 2017.
Land and Landscape	The rate of change in land use and land cover since the early 1990s is relatively high by European standards. The main changes have been an increase in the amount of forested lands and artificial areas, and a decrease in the total amount of agricultural land and peatland. The main drivers of land use change over the coming decade will be the agricultural policy of Food Wise 2025 and afforestation policies associated of the National Forestry Programme 2014-2020.
Nature and Biodiversity	The majority of Ireland's most important habitats are reported to be of poor or bad conservation status but the number of species considered declining in status is low. Aquatic species are most at risk. Factors such as agricultural intensification, population growth and climate change are likely to bring additional pressures on a number of species and habitats in Ireland. Based on the poor conservation status of many important habitats and some species, considerable efforts and resources will be required to improve their status, both within and outside protected areas. Conservation of marine fisheries is highlighted as a major priority that needs to be addressed urgently.
Sustainable Economy	The quality of Ireland's environment is generally good though it has been under increasing pressure over the last decade as a result of economic changes, population growth and urbanisation, and changing consumer patterns. In Ireland, the recent economic recession had lowered pressure on the environment in areas such as waste generation and GHG emissions, but as key sectors of the economy have now started to recover, the main challenge for Ireland is to try to grow the economy in a sustainable way. Many of the persistent environmental problems that we face, such as air pollution, biodiversity loss, and hazardous waste, are rooted in unsustainable production and consumption patterns.
Waste	Ireland is moving from a position of almost total reliance on landfill, to a high level of recovery. More value is being derived from waste through recycling and use as fuel and waste per capita is decreasing, however it is still considered to be at an unsustainably high level. Targets under the Landfill Directive to divert waste from landfill were met in 2013 target, but the recent economic recovery may put achievement of the 2016 target at risk. Ireland's first municipal waste incinerator became fully operational in 2012, which contributed to increased recovery rates, with 17 % of managed municipal waste used as a fuel. The priority is to ensure that recyclable materials from waste streams continue to be recycled where possible. New Regional Waste Management Plans were published in 2015.
Environment and Wellbeing	The overall quality of the Irish environment is generally good, but health impacts associated with air pollution in Ireland are still an issue that requires further measures. The availability of high-quality green spaces (parks, woods, countryside) and blue spaces (ponds, river banks, lakeshores and seashores) helps to foster activity on the road to better health. EU Drinking Water Regulations 2014 set quality standards for water at the tap and over the past 10 years the quality of Ireland's bathing waters has remained high, with the vast majority meeting required EU standards. Damage to health associated with environmental pollution in Ireland is much less than that caused by lifestyle factors such as poor diet, lack of exercise, and tobacco use. The ongoing protection of Ireland's high-quality environment is vital.

6.1.2 State of the Environment Overview – Northern Ireland

The second State of the Environment Report for Northern Ireland (2013) is titled "From Evidence to Opportunity" and provides a five year update and commentary on forty-four indicators across eight themes to provide an evidence-based assessment of the state of the environment. The current state is mixed. Air quality continues to improve, water quality is benefitting from improved effluent

controls and there are increases in municipal waste recycling rates. However declines in quality have been recorded for biodiversity, freshwaters, landscapes, habitats and heritage. Like Ireland, Northern Ireland has experienced the effects of recession in recent years which has in turn reduced some of the pressure on the environment but this has been replaced by new pressures and challenges associated with trying to stimulate an economy and reliance on natural resources.

The seventh annual Northern Ireland Environmental Statistics Report (2015) provides an annual update to the figures and provides commentary around the trends outlined in the second State of the Environment Report for Northern Ireland (2013). The relevant aspects of the current state of the environment in Northern Ireland has been summarised in **Table 6.3**.

Table 6.3 – Summary of Current State of the Environment in Northern Ireland

Theme	Key Findings
Air Quality	There are 28 Air Quality Management Areas that are leading the activity to tackle air quality problems. There is continued improvement in air quality but problems do remain for nitrogen dioxide emissions due to transport. Agricultural emissions of ammonia still remain high and threaten ecosystems and habitats. Continued effort is required to reduce air pollution from key sources such as road transport and agriculture.
Climate	There is evidence that the climate in Northern Ireland is changing. There has been a reduction in greenhouse gas emissions but road transport emissions are still increasing. There are government targets towards reducing greenhouse gas emissions of at least 35% by 2025 based on 1990 levels but this will prove challenging. A key priority for climate change will be the implementation of the Northern Ireland Climate Change Adaptation Programme. The NI Environmental Statistics Report 2015 reported Greenhouse gas emissions in Northern Ireland have decreased since 1990, with a reduction of 16% by 2012. Most sectors have shown a decrease on the levels in the Base Year, with the exception of transport and land use change.
Water	The overall status of water bodies in Northern Ireland has not significantly changed from that recorded in 2009 but improvements have been identified in water utility discharges and drinking water quality. There has also been a reduction in water pollution incidents. The key challenges for the water bodies relate to diffuse nutrient pollution, chemical status of the water environment and measures to address physical modifications of beds, banks and shore of surface waters. Northern Ireland is broadly on track to implement the measures from the River Basin Management Plans developed under the Water Framework Directive. Water in particular provides a clear pathway for pollutants between the two jurisdictions.
Marine	There has been an improvement to the overall quality of the marine environment, including bathing water quality and beaches, around Northern Ireland's shores. This can be directly linked to improvements in wastewater treatment. One key remaining issue is marine litter. The next challenge will be the implementation of the Marine Strategy Framework Directive. The NI Environmental Statistics Report 2015 reported that almost 50% of marine water bodies around Northern Ireland's shores are classified as 'high' or 'good', with the remaining water body areas being classified as 'moderate' (33%), 'poor' (11%) or 'bad' (7%).
Land and Landscape	There is a marked change in the landscape with the development of upland wind farms and the significant decline in housing development has reduced pressure on land use. Investment is proposed in the agri-food sector but this will require innovative approaches to development within the countryside. Agri-environment schemes encourage farmers and landowners to manage their land to benefit the environment. The NI Environmental Statistics Report 2015 reported that at the end of 2014, 364,000 ha of land in Northern Ireland were under agri-environment scheme agreement.
Biodiversity	Despite continued action many key elements of biodiversity continue to decline. In

	particular since 2000 grassland habitats have shown the most decline, but in contrast woodland habitats have increased. The key pressures identified relate to land-use changes through agriculture and development with additional pressures such as pollution, invasive species and fisheries practices. The NI Environmental Statistics Report 2015 reported that at 31 March 2014, a total of 375 sites had been declared as Areas of Special Scientific Interest (ASSI), 57 sites as Special Areas of Conservation (SACs), 17 sites as Special Protection Areas (SPAs) and 21 sites as Ramsar sites (areas of wetland and waterfowl conservation)
Built Heritage	The key risks identified to archaeological resources come from agricultural land use and urban activities. It has been identified that protected sites have fared better. Through the Second Survey of Buildings of architectural or historic interest there has been an increase in the number of listed buildings. Built heritage has provided emerging opportunities in relation to regeneration, tourism and economic development. The NI Environmental Statistics Report 2015 reported that in 2013/14, there were a total of 1,950 scheduled historic monuments protected under Article 3 of the Historic Monuments and Archaeological Objects (NI) Order 1995. Listed buildings are those of special architectural or historic interest and there were a total of 8,621 buildings recorded by NIEA in 2013/14 with 480 listed buildings and structures classified as 'at risk' on the online Built Heritage at Risk in Northern Ireland (BHARNI) database.
Waste and Resources	Recycling has seen a significant increase with a fourfold rise since 2002. With the publication of the Northern Ireland Waste Management Strategy there is a focus towards greater waste prevention and a reduction in consumption. The single use carrier bag levy has given rise to a reduced consumption rate of more than 80% in its first year of operation.

6.2 ENVIRONMENTAL CHARACTERISTICS AND PROBLEMS

The following baseline information is prefaced for each environmental discipline by clarification on the nature and extent of effects considered for that discipline in relation to the NWSMP. The baseline information is then summarised in relation to the identified scope.

6.2.1 Biodiversity, Flora and Fauna

Biodiversity is the variety and variability of plants (flora) and animals (fauna) in an area and their associated habitats. The importance of preserving biodiversity is recognised from an international to a local level. Biodiversity is important in its own right and has value in terms of quality of life and amenity. The natural environment is also critical in delivering ecosystem services such as providing clean air and water, food and raw materials and cultural benefits.

Ireland has obligations under EU law to protect and conserve biodiversity. This relates to habitats and species both within and outside designated sites. Nationally, Ireland has developed a Biodiversity Plan (2011-2016) to address issues and halt the loss of biodiversity, in line with international commitments. The overall target for Irelands National Biodiversity Plan is *that biodiversity loss and degradation are reduced by 2016 and progress is made towards substantial recovery by 2020*. This follows on from the European Commission EU Biodiversity Strategy to 2020 which has a headline target *to halt the loss of biodiversity and ecosystem services by 2020, to restore ecosystems in so far as is feasible and to step up the EU contribution to averting global biodiversity loss.* This implements EU commitments under the Convention on Biological Diversity.

The preparation of the draft NWSMP has had regard to the EU Habitats Directive (Directive 92/43/EEC) on the Conservation of Natural Habitats and of Wild Fauna and Flora (as amended) – commonly referred to as the Habitats Directive. This is transposed into Irish law by the European Communities (Birds and Natural Habitats) Regulations (S.I. No. 477/2011) and requires that any plan or project not directly connected with or necessary to the management of a European Site but likely to have a significant effect on such a site must undergo an appropriate assessment in view of the conservation objectives of the site. The NWSMP falls under the remit of these regulations, and an Appropriate Assessment is being undertaken pursuant to these regulations.

As noted in **Chapter 5, 'Review of Relevant Plans, Policies, Programmes'** the draft NWSMP must have regard to these commitments and associated legal obligations. The key issues associated with sludge management and biodiversity relate to:

- Pollution (e.g. nutrient and metal losses) to soil and water as a result of disposal of treated sludge on agricultural and non-agricultural outlets leading to impacts on ecosystems;
- Habitat deterioration from spreading of sludge and subsequent changes to chemical composition of overland flows leading to impacts on ecosystems;
- Species loss and / or disturbance as a result of changes to environmental receptors;
- Species loss and / or disturbance associated with new or expanded sludge infrastructure, transport of sludge, disposal of sludge.

Given the strategic nature of the draft NWSMP, focus of the baseline for biodiversity is primarily at a national level however consideration has been given to the following in compiling the baseline:

- Nature conservation sites including European Sites and those protected under national legislation, e.g. National Parks etc.;
- Species of wild flora and fauna, including rare and protected species and their habitats; Annex IV (Habitats Directive) species of flora and fauna, and their key habitats;
- Other species of flora and fauna and their key habitats which are protected under the Wildlife Acts, 1976-2000;
- Protected species and natural habitats' as defined in the Environmental Liability Directive (2004/35/EC) and European Communities (Environmental Liability) Regulations, 2008;
- Stepping stones and ecological corridors; and
- Watercourses, surface water bodies and associated wetlands.

6.2.1.1 Designated Sites

Ireland has designated sites and species of conservation value and/or concern in an effort to protect its biodiversity resource. There are eleven types of nature conservation sites considered for the purposes of the NWSMP. The number of each type of designation on a national level is presented in **Table 6.4** and their locations are presented on **Figure 6.1**.

Table 6.4 – Number and Type of Nature Conservation Sites in Ireland

Designation Type	Description	Number
Important Bird Areas	The Important Bird Areas (IBA) Programme is a BirdLife International initiative aimed at identifying and protecting a network of critical sites for the conservation of the world's birds. BirdWatch Ireland is the BirdLife partner, and is responsible for promoting and updating the status of Ireland's birds and their key sites.	140
National Nature Reserves	A National Nature Reserve is an area of importance to wildlife, which is protected under Ministerial order. Most are owned by the State but some are owned by organisations or private landowners. The NPWS does not provide spatial datasets to represent National Nature Reserves.	75
National Parks	National parks are areas that exist to conserve natural plant and animal communities and scenic landscapes and which facilitate public access. They exist in accordance with international criteria established by the world conservation union (IUCN)	6
Natural Heritage Areas (NHA)	Natural Heritage Areas (NHAs) are protected under the Wildlife Amendment Act 2000. NHAs are areas considered important for the habitats present or which hold species of plants and/or animals whose habitat needs protection.	155
Proposed Natural Heritage Areas (pNHA)	Proposed Natural Heritage Areas (pNHAs) were published on a non-statutory basis in 1995, but have not since been statutorily proposed or designated. These sites are of significance for wildlife and habitats.	1,089
Ramsar	Ramsar sites are wetlands of international importance designated under the Ramsar Convention on Wetlands 1971, which Ireland joined in 1984. This intergovernmental treaty provides for national action and international cooperation for the conservation and wise use of wetlands and their resources with a particular focus on birds.	45
Refuges for Fauna	Refuges for Fauna are designated by ministerial order under Section 17 of the Wildlife Act 1976 as amended by Section 28 of the Wildlife (Amendment) Act 2000.	7
Special Areas of Conservation (SAC)	Special Areas of Conservation (SAC) are designated under the EU Habitats Directive (92/43/EEC) and Special Protection Areas are designated under the Birds Directive (2009/147/EC). Together these sites form the backbone of the Natura 2000 network. Further details on these sites can be found in the Appropriate Assessment for the NWSMP.	424 + 6 offshore SACs
Special Protection Areas (SPA)		165
UNESCO Biosphere Reserve	Biosphere Reserves are areas of terrestrial and coastal/marine ecosystems, designated to reconcile the conservation of biodiversity with the quest for economic and social development and the maintenance of cultural values. They are internationally recognised within the framework of UNESCO's Programme on Man and the Biosphere.	2
Wildfowl Sanctuary	A Wildfowl Sanctuary is an area that has been excluded from the 'Open Season Order' so that game birds can rest and feed undisturbed.	68

Numbers taken from the NPWS website (www.npws.ie) January 2016.

In Northern Ireland there are 57 SACs, 16 SPAs, 20 Ramsar and 385 Areas of Special Scientific Interest (ASSIs). The ASSIs are areas of land with national conservation value. Some designations,

such as Carlingford Lough SPA and Carlingford Shore SAC extend into Northern Ireland and as such present potential for transboundary effects.

6.2.1.2 Protected Habitats and Species

In 2008 and again in 2013 the National Parks and Wildlife Service published a report detailing the conservation status in Ireland of habitats and species listed in the EU Habitats Directive (92/43/EEC)[3]. Under Article 11 of the Habitats Directive, each member state is obliged to undertake surveillance of the conservation status of the natural habitats and species in the Annexes and under Article 17, to report to the European Commission every six years on their status and on the implementation of the measures taken under the Directive.

There are 59 habitats in Ireland that are listed under Annex I of the Habitats Directive. Sixteen of these habitats are considered priority habitats, which are those that the EU considers require particular protection. There are 26 species listed in Annex II of the Habitats Directive. These are animal or plant species whose conservation requires the designation of Special Areas of Conservation. There are a further 41 species of animals and plants listed in Annex IV of the Habitats Directive, which require strict protection. There are 48 Annex V species, whose taking in the wild may be subject to management measures.

The NPWS Conservation Status report indicated that many Irish species of flora and fauna have a moderately satisfactory conservation status; however, a small number are in urgent need of concerted efforts to protect them. Flora Protection Orders (S.I. No. 356/2015 - Flora (Protection) Order, 2015) protect certain plant species and prohibit their uprooting or damage to their habitats. These orders apply wherever the plants are found and are not confined to areas designated for nature conservation. Two groups which have received recent attention as a result of EU intervention are Shellfish and Freshwater Pearl Mussel (FPM). Both have the potential to be impacted by wastewater sludge management activities as a result of emissions to water e.g. nutrient run-off from landspreading activities, leachate and release of material during construction of new infrastructure.

Ireland's raised bogs have also been the subject of recent EU judgements. For the 2013 Article 17 Report, 9% of habitats were assessed as "*favourable"*, 50% as "i*nadequate*" and 41% as "*bad*". Among the key findings were:

- Some of the marine habitats are considered to be improving, and to have better prospects, due in part to implementation of other EU environmental Directives.
- The status of Raised bogs in Ireland is "Bad"; and the trend is for an ongoing decline as restoration is necessary to cause improvement, notwithstanding the cessation of cutting on SAC bogs.
- Blanket bog is also assessed as "Bad"; the latest Article 17 report notes that, as one of the main impacts on this habitat is grazing, an improving trend might be expected due to the implementation of Commonage Framework Plans. However, this improvement appears to be offset and even exceeded by on-going deleterious effects such as peat cutting, erosion, drainage and burning.
- Although some of our woodlands are rated as "Bad" because they are patchy and fragmented, considerable improvements have been noted due to afforestation, removal of alien species and control of overgrazing.

[3] The Status of EU Protected Habitats and Species in Ireland, NPWS 2007 (Vol 1-3) and 2013 (Vol 1 -3)

- Losses of limestone pavement has been recorded outside the SAC network, however the BurrenLIFE and Burren Farming for Conservation Programme have significantly improved the quality of pavement and its associated habitats.

For the 2013 overview of the condition of protected species, 52% are assessed as "Favourable", 20% as "Inadequate", 12% as "Bad" and 16% as "Unknown" or considered to be vagrant species. Among the key findings are:

- Irish Hare is now considered "Favourable" status, due in part to better knowledge and data.
- Otter has also been assessed as "Favourable" with evidence of an expanding range.
- Salmon is showing signs of improvement and the Killarney Shad is assessed as "Favourable", but some other fish remain at "Bad" status.
- Freshwater Pearl Mussel is "Bad" and declining.

Similarly, the requirements for reporting under Article 12 of the Birds Directive (79/409/EEC) are every 6 years. The National Summary Report for the period 2008 – 2012 covers 196 species, which includes species which live in Ireland all year round, and others which migrate here for summer or winter. The NPWS has confirmed that some species have had significant increases in population over the long term, including Raven, Collard Dove, Buzzard and Blackcap. However, other species have undergone significant declines in their long-term breeding distribution: Corncrake (92%), Curlew (89%), Whinchat (77%), Grey Partridge (74%), Woodcock (68%), Lapwing (56%), Red Grouse (52%) and Redshank (50%). The Hen Harrier, which had been increasing in numbers, shows an overall short-term decrease of 11%. The results confirm that there is an urgent need for measures to halt the declines noted above, most of which are due largely to changes in farming practices and intensity, and also the increase of activity in extensively farmed uplands through forestry and wind farm construction.

6.2.1.3 Other Protected Areas and Species

In addition to protected Habitats and Species listed in the Habitats Directive and birds listed in the Birds Directive, specific legislation also exists for other protected species such as Shellfish, Freshwater Pearl Mussel etc.

Shellfish Waters

There are 64 protected shellfish waters designated under the Shellfish Waters Directive (2006/113/EC). This is implemented in Ireland by the European Communities (Quality of Shellfish Waters) Regulations 2006 (S.I. No. 268 of 2006). Shellfish Pollution Reduction Programmes (PRPs) for these designated shellfish areas have been completed in accordance with the Shellfish Directive.

Freshwater Pearl Mussel Areas

The Freshwater Pearl Mussel is protected under Annex II and V of the Habitats Directive and is legally protected in Ireland under Schedule 1 of the Wildlife Act. There has been a considerable decline in species distribution and numbers of FPM in Ireland and across the EU. The NPWS Conservation Status report states that freshwater pearl mussels are widespread in Ireland, occurring in more than 160 rivers and a handful of associated lakes. The national population estimate of 10.99 million adult mussels represents a decline of 8% since 2007. In 2009, legislation was enacted to support the achievement of favourable conservation status for FPM - S.I. 291 of 2009 and NPWS

developed 27 FPM Sub-basin Management Plans as designated under S.I. 291 of 2009 to address measures to halt the decline in the species.

Salmonid Rivers

Salmonid waters must be able to sustain Atlantic salmon (*Salmo salar*), trout (*Salmo trutta*), char (*Salvelinus*) and whitefish (*Coregonus*). They have been designated under the EU Freshwater Fish Directive (78/659/EEC) which was transposed into Irish law in 1988 through the European Communities Regulation on Quality of Salmonid Waters (S.I. No. 293/1988). In order to sustain these species, rivers must have good water quality, allow upstream movement and provide suitable habitat for spawning. There are 34 rivers that are designated as salmonid waters under S.I. 293 of 1988.

Flora Protection Order

The current list of plant species protected by Section 21 of the Wildlife Act, 1976 is set out in the Flora (Protection) Order, 2015. It is illegal to cut, uproot or damage the listed species in any way. In addition, it is illegal to alter, damage or interfere in any way with their habitats. This protection applies wherever the plants are found and is not confined to sites designated for nature conservation. The list includes vascular plants, mosses, lichens and stoneworts.

6.2.2 Relevant Policy

Ireland's Prioritised Action Framework published in November 2014 identifies a range of actions needed to help improve the status of Ireland's habitats and wildlife. The key priorities outlined in the framework are outlined below:

- Restoration of raised bogs;
- Better protection for blanket bogs and Ireland's uplands generally;
- Better management of Ireland's dunes and machair systems;
- Better protection for turloughs;
- Measures to protect Ireland's remaining Freshwater Pearl Mussels; and
- New measures to protect birds in decline such as the Corncrake, waders and Hen Harrier.

In addition there is a growing awareness and recognition of importance of Ecosystem Services supported at Policy Level. Target 2 of the Convention on Biological Diversity (CBD) Strategic Plan 2011-2020 requires that: *By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.* This is mirrored in both the EU Biodiversity Strategy to 2020 (Target 5) and Irelands national Actions for Biodiversity 2011-2016 (Target 3).

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

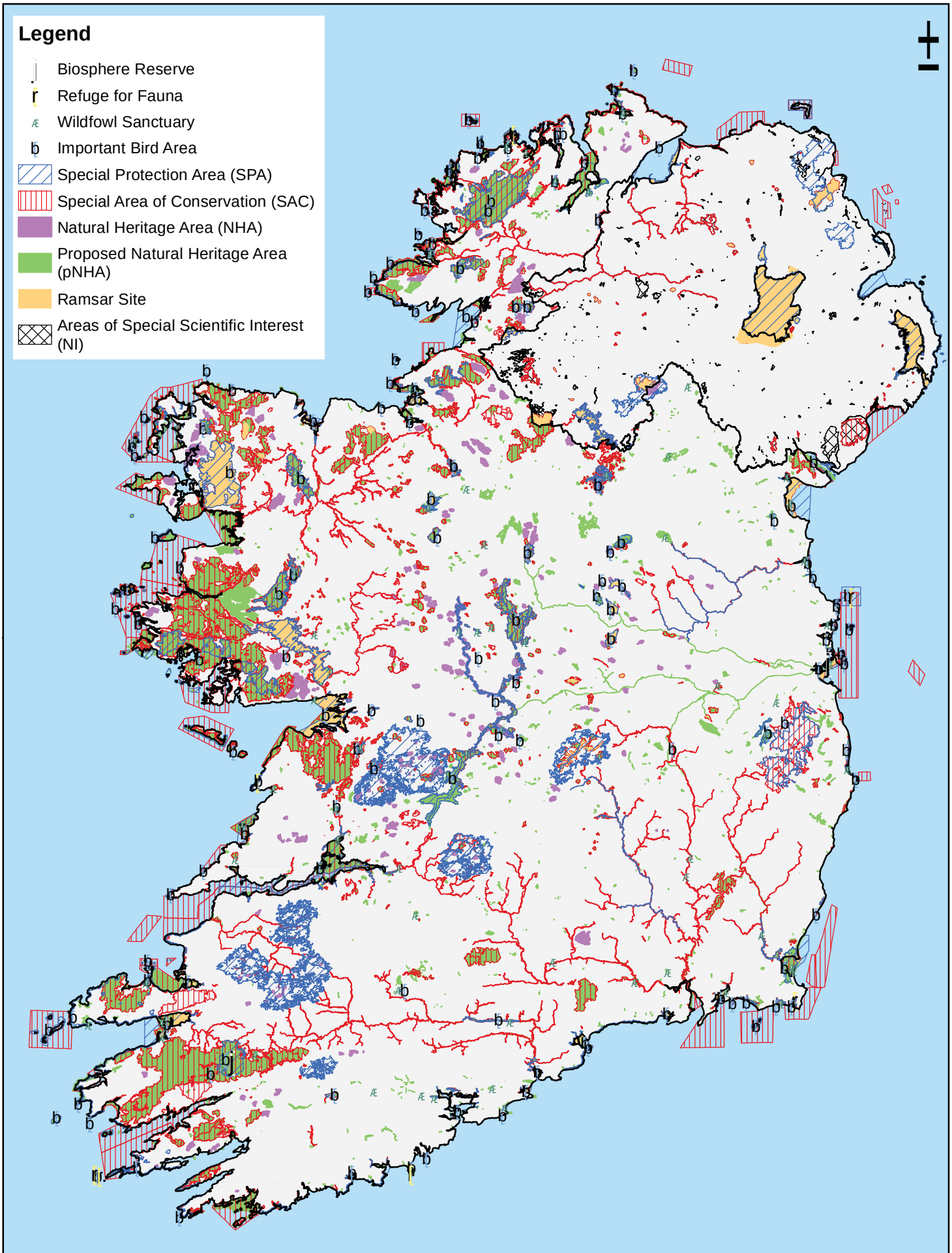
The main drivers and pressures on biodiversity flora and fauna noted by the EPA in their most recent State of the Environment Report (SOE), 2012 which are relevant to the NWSMP include direct habitat loss and damage as a result of infrastructural developments and land reclamation; water pollution particularly from nutrients and silt; unsustainable exploitation of natural resources (including land) and invasive alien species. Relevant indirect pressures include population growth; and climate change. A general lack of environmental awareness, especially the ecosystem services it provides were also cited as pressures to our biodiversity.

The quantity of wastewater sludge being produced in Ireland has increased in line with the increase in secondary wastewater treatment since the implementation of the Council Directive 91/271/EEC concerning urban waste water treatment. In 2014 over 93% of waste water produced in Ireland received secondary or more stringent treatment. This has increased from 25% in 1998. There has consequently been a significant increase in sludge production. Proposed works to provide secondary or more stringent treatment for existing agglomerations and works to reduce stormwater overflows will further increase wastewater sludge production in the coming years

Over 98% wastewater sludge produced at Irish Water WWTPs is currently disposed to agriculture including sludge which is composted and subsequently disposed of to agriculture. Over 95% of this was treated, in accordance with the treatment processes recommended in the COGP in 2014 with further improvements to treatment levels introduced during 2015.

The key pressures and threats in relation to the NWSMP include:

- Habitat loss and fragmentation from sludge infrastructure;
- Deterioration in habitat quality as a result of land spreading and subsequent changes to chemical compositions of surface water run-off;
- Deterioration / disturbance of species as a result of changes soil / air / water quality; and
- Leaching of heavy metals, nutrients and pathogens to soil and water following landspreading.



Data source: National Parks and Wildlife Service (npws.ie); Northern Ireland Environment Agency (doeni.gov.uk); Marine Irish Digital Atlas (mida.ucc.ie); and BirdLife International (birdlife.org).

Title

Figure 6.1 - Designated Sites

Project
SEA and AA of the National Wastewater Sludge Management Plan

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ervia

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Issue Details			
Drawn By:	NON	Project No.	MDE1189
Checked By:	EO	File Ref:	MDE1189Arc0001F01
Approved By:	AG		
Scale:	1:1,900,000 @ A4	Projection:	ITM (IRENET95)
Date:	15/03/2016		

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6.2.3 Population and Human Health

Population and human health are broad topic areas within the assessment framework which encompass consideration of the presence of people, their activities, their use of the receiving environment and their wellbeing. Population distribution and growth forecasts are important indicators of both pressure on services such as wastewater treatment and potential exposure to pollution and risk. In terms of health and wellbeing, these can be effected by a number of direct and indirect environmental pathways, typically through emissions to air, water and soils. These emissions are generally considered in the context of reference to international and national standards of safety in doses, exposure and risk (EPA 2002[4]).

As noted previously, the quantity of wastewater sludge being produced in Ireland has increased in line with the increase in secondary wastewater treatment since the implementation of the Council Directive 91/271/EEC concerning urban waste water treatment. The other main factors effecting sludge volume is population growth. As such population distribution and growth forecasts are important as the quantity of sludge produced at wastewater treatment plants will increase in line with increased populations which may put stress and capacity requirement on wastewater networks and treatment plants. The key issues associated with sludge management and population relate to:

- Population growth forecasts as quantity of sludge produced at WWTPs will increase in line with increased populations;
- Number of households with domestic wastewater treatment systems for the provision of acceptance of sludge from DWWTS's at Irish Water WWTPs;
- Population effects associated with increased provision of production, treatment and storage including noise, transport, health effects;
- Potential for odour to cause nuisance at all stages of sludge management; and
- Improving the function and operation of wastewater management facilities and infrastructure affecting land quality and water quality.

Given the strategic nature of the draft NWSMP, the focus of the baseline for population and human health is at the national level.

6.2.3.1 Population

The 2011 Census for Ireland showed that the country had a population of 4,588,252. The population of Ireland has generally been rising since the 1960s as a result of declines in emigration, an increase in birth rate and falling death rates. Between 2006 and 2011, the population grew by an average of 1.6% per year. Census 2011 found that 33% of our population live in cities, 31% in rural areas, and the remainder in towns of varying size. The distribution of main population centres (with a population > 500) and the location of WWTPs is shown in **Figure 6.2**.

In 2011 Ireland had an average population density of 67 persons per km^2 (an increase from 62 persons per km^2 in 2006). There is a significant difference in population density depending on location, with 1,736 persons per km^2 in urban areas compared to 26 persons per km^2 in rural areas. The urban population represents 62% of the total population in Ireland.

[4] EPA 2002 Guidelines on information to be contained in EIS

6.2.3.2 Housing

Housing needs to be considered as households may connect to the public wastewater network under the ownership of Irish Water or alternatively households and communities may be served by individual domestic wastewater treatment plant systems (DWWTS) or private wastewater treatment plants that are outside the scope of Irish Water's remit.

For households that connect to the public wastewater network, the wastewater being transferred to WWTPs for treatment is producing wastewater sludge. Future wastewater service connections to the public wastewater network for domestic, non-domestic and multi-use properties will increase the quantity of wastewater for treatment and thus increase the quantity of sludge produced.

The 2011 Census for Ireland showed that there were a total of 1.65 million private households, containing an average of 2.7 persons per household. A total of 290,000 dwellings were identified as vacant at the time of the Census. There was an increase in housing stock from 2006 to 2011 although this was at a slower rate than during previous periods. Households living in rented accommodation rose to 29% and home ownership accounted for 70% of households.

Public sewerage facilities were used for disposing the wastewater of 1,092,418 households, or two-thirds of all private dwellings in April 2011. A further 437,652 (27.5%) households used an individual septic tank while 50,259 (3.2%) households adopted other individual sewerage systems.

Census 2011 found that there was a clear difference between the sewerage facilities used by rural and urban households. Just over three-quarters of rural homes (455,584 households) used an individual system (septic tank or other), of which 408,381 households used a septic tank and 47,203 households used other types of individual treatment systems. In urban areas, dwellings were predominantly connected to the public mains (92.4%) with just 2.8% per cent of homes indicating that they used individual systems.

Overall the Census 2011 data confirmed that the number of households using a septic tank or other individual treatment system increased by 9 per cent between 2006 and 2011, while households using the public sewerage scheme rose by 14 per cent over the same period.

6.2.3.3 Population and Economic Forecasts

Ireland's population increased from 3.53 million in 1991 to 4.59m in 2011. Within the last five years the population in Dublin has increased by 4%, whilst Dublin commuter towns have expanded at rates as high as 51%.

The total national population in the 2011 census was 4.59 million. The CSO states in their report *Population and Labour Force Projections 2016-2046* (CSO, 2013), that the total population is predicted to grow to between 4.7 and 5.3 million over the period 2016-2026. The CSO predicts the average annual population growth rate during this period (taking account of fertility and migration) to be between 0.4 and 1%, compared to the 1.6% growth rate observed during the last inter-censal period (2006-2011).

As such the quantity of sludge produced at WWTPs will increase in line with increased populations. An estimate of current and future sludge production for all municipal WWTPs has been undertaken by Irish Water and these estimates are provided in **Table 6.5**.

Table 6.5 – Estimated Wastewater Sludge Loads

County	TDS/a (2015)	TDS/a (2020)	TDS/a (2030)	TDS/a (2040)
Carlow	1,032	1,066	1,137	1,214
Cavan	1,217	1,321	1,557	1,842
Clare	1,538	1,656	1,921	2,229
Cork[1]	5,087	5,331	5,856	6,433
Cork City	3,243	3,409	3,768	4,164
Donegal	1,768	1,848	2,021	2,212
Dublin City	18,036	18,922	20,828	22,925
Dun Laoghaire-Rathdown	1,011	1,061	1,167	1,285
Fingal	3,007	3,155	3,472	3,822
Galway	1,326	1,391	1,531	1,684
Galway City	2,089	2,294	2,765	3,332
Kerry	1,789	1,897	2,134	2,403
Kildare	3,301	3,807	5,067	6,747
Kilkenny	1,332	1,407	1,569	1,751
Laois	1,083	1,154	1,309	1,487
Leitrim	342	343	344	346
Limerick	3,557	3,746	4,153	4,605
Longford	395	399	407	416
Louth[2]	2,284	2,359	2,516	2,684
Mayo	1,708	1,838	2,132	2,482
Meath	2,075	2,546	3,836	5,796
Monaghan	927	966	1,049	1,139
Offaly	1,204	1,249	1,343	1,446
Roscommon	875	916	1,004	1,103
Sligo[2]	845	864	905	948
Tipperary[2]	2,808	2,875	3,013	3,163
Waterford	1,788	1,862	2,017	2,186
Westmeath	1,439	1,495	1,612	1,738
Wexford	2,019	2,071	2,178	2,290
Wicklow	1,768	1,905	2,212	2,570
Total	**70,894**	**75,150**	**84,820**	**96,442**

Notes: 1) Predicted sludge loads in Cork include sludge from wastewater treatment plants in Youghal and the Cork Lower Harbour which are currently under construction and will significantly increase sludge production.

2) The sludge quantities in Louth, Sligo and Tipperary are based on predicted sludge quantities at individual wastewater treatment plants. The reduction in sludge following transport to off-site sludge hub centre with anaerobic digestion has not been taken into account

6.2.3.4 Health

The CSO statistical publication "Measuring Ireland's Progress 2013" stated that life expectancy at birth for males in Ireland in 2012, as calculated by Eurostat, was 78.7 years, 1.2 years higher than the EU average. Female life expectancy at birth in 2012 was 83.2 years in Ireland, just above the EU average of 83.1 years.

At the time of the 2011 Census, 88.3% of the total population considered themselves to be in 'very good' or 'good' health. Perceptions of healthiness showed substantial deterioration with age, with 11.6% of the population aged 85 and above identifying themselves as having 'bad' or 'very bad' health compared to 0.4% of 20 - 24 year olds. Cities were also found to have the poorest levels of health compared to suburbs, smaller towns and rural areas.

A total of 13% of the population indicated that they have a disability, with the number of people with a disability generally rising with age. The counties with the greatest number of persons with a disability were those with the largest populations, led by Dublin city and followed by County Cork.

There are over 1,000 WWTPs operated by Irish Water. There are 16 Composting/Anaerobic Digestion facilities licensed by the EPA, and there are also 22 facilities registered with the EPA for wastewater sludge treatment and storage under the Waste Facility Permit and Certification of Registration system. It is noted that these regulated facilities require licenses and permits, which contain emission limits to media such as water, air, soil, etc. These emission limits are based on the most current EU / WHO guidelines and limits which have been developed to protect human health. However it is recognised that exceedances do occur as evidenced from EPA Annual Environmental Reporting. The relationship between wastewater and sludge management infrastructure and the potential impacts to human health are summarised below.

Clean air is important to a population's general health. Ireland has in general good air quality and as such the population receives a health benefit from having access to clean fresh air. A potential risk to human health is from air emissions. The emissions to air arising from sludge management can include those from thermal drying, composting or anaerobic digestion and also exhaust emissions from the transportation of sludge associated with heavy goods vehicles. The types of emissions with key potential for impact on air quality and climate include: volatile fatty acids and a variety of reduced sulphur compounds. While not causing a direct impact to health, malodours associated with sludge treatment and storage can reduce quality of life and the enjoyment of one's surroundings if odours are particularly strong or persistent. See **Section 6.2.7** for more details on the current status of air quality.

The emissions to water arising from sludge management can include leaching of metals and other materials bound in sludge, chemical or microbial contamination from managed sludge and direct runoff of sludge or indirect nutrient runoff causing eutrophication in receiving waters. These types of pollution can impact on the ecological status of water bodies and can result in negative impacts on invertebrates, plant life and on all stages of fish and shellfish life cycles. This in turn can impact negatively on human health where commercial fisheries and fish stocks become contaminated by harmful chemicals or microorganisms as a result of runoff or poorly managed discharge, or where wastewater sludge is used in agriculture for food production and is a matter of concern for food safety with regard to microbiological and chemical risk to human health. See **Section 6.2.6** for more details on the current status of water quality.

Ireland relies heavily on good quality soils for the agricultural sector. The current outlet for wastewater sludge is almost exclusively agriculture with over 98% of wastewater sludge produced at Irish Water WWTPs is currently disposed to agriculture including sludge which is composted and subsequently recovered to agriculture. Contamination of this resource has significant economic and social impacts as it relates directly to the food chain. See **Section 6.2.5** for more details on the current status of soils.

6.2.3.5 Economy

As noted, the current outlet for wastewater sludge is almost exclusively agriculture with over 98% of wastewater sludge produced at Irish Water WWTPs currently disposed to agriculture, including sludge which is composted and subsequently recovered to agriculture. This figure is up from 95% in 2013[5] as recovery to land displaces landfill disposal.

The agri-food and drink sector is a significant part of the economy in Ireland accounting for 7.2% of Ireland's economy-wide gross value added (GVA), 12.3% of Ireland's exports and 8.8% of total employment (DAFM 2014). Further details on the baseline for the agri-food and drink sector are included in **Section 6.2.4**, Food Production and Safety.

Food Wise 2025 is a national strategic policy for the agriculture, food and fishing sector and seeks to significantly increase the agricultural outputs from Ireland. This roadmap for the sector set out key targets for growth. As such Food Wise 2025 is a roadmap for the Irish food industry setting out key targets for growth in specific sectors, as it seeks to innovate and expand in response to increased global demand for quality foods. Within the Food Wise 2025 Strategy produced by leading industry stakeholders for the DAFM it outlines the key actions required to ensure that the agri-food sector maximises its contribution to economic growth and exports in an environmentally sustainable manner over the coming decade, building on the progress achieved under previous strategies. Food Wise 2025 predicts that over the next decade Ireland can increase the value of agri-food exports by 85% to €19 billion.

These policies and strategies which have set targets and which are supported by industry stakeholders are anticipated to result in an increase in food production, which may reduce the existing national landbank available to Irish Water for landspreading.

Tourism plays an important role in Ireland's economy, particularly for the accommodation and food services sector. Expenditure by tourists visiting Ireland grew by 12% from 2012 to €4.5 billion in 2013 and this figure rises to €5.9 billion when spending by Irish residents is taken into account. This represents a notable increase compared to previous years where revenue had remained relatively static since 2009. Strongest growth by overseas tourists came from the long haul markets such as North America. Dublin was the most visited region of Ireland in 2013 and the majority of domestic trips were short (up to three night) holidays. Food tourism is a growing market and closely relates to the agri-food and drink sector. Ireland has much to offer in terms of our food, artisan products, local and regional produce and can provide an emerging opportunity in relation to tourism and economic development.

[5] Focus on urban waste water treatment in 2013, EPA 2014.

6.2.3.6 Existing Environmental Pressures/ Problems: Population and Human Health

The CSO states in their report *Population and Labour Force Projections 2016-2046* (CSO, 2013), that the total population is predicted to grow to between 4.7 and 5.3 million over the period 2016-2026. As such the quantity of sludge produced at WWTPs will increase in line with increased populations and this rising population and growing economy will need to be accommodated through the delivery of sludge outlets without placing undue pressure on the environment.

Irish Water has no statutory obligations in relation to Domestic WWTSs (septic tanks and individual WWTPs). However, following the system of registration put into place over the last number of years, and ongoing inspections, it is expected that emptying of septic tanks will become more frequent and the demand for acceptance of septic tank sludge at WWTPs will increase. An EPA Strive Report Series No. 23 on the *Management Options for the Collection, Treatment and Disposal of Sludge Derived from Domestic Wastewater Treatment Systems* identifies that upgrades are needed at existing WWTPs to provide for acceptance of sludge from individual septic tanks.

Recent revelations regarding Lead in Drinking Water have resulted in proposals to dose drinking water with orthophosphate. This will have implications for sludge quantity and composition for WWTPs if the proposal goes forward.

Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Data source: CSO Census 2011 settlements; Irish Water.

Title

Figure 6.2 - Main Population Centres

Project
SEA and AA of the National Wastewater Sludge Management Plan

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ervia

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Issue Details			
Drawn By:	NON	Project No.	MDE1189
Checked By:	EO	File Ref:	
Approved By:	AG		MDE1189Arc0002F01
Scale:	1:1,900,000 @ A4	Projection:	
Date:	15/03/2016		ITM (IRENET95)

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6.2.4 Food Production and Safety

There is an ever-increasing global demand for food and for new and innovative food solutions. Ireland is well placed to meet these demands given our comparative advantage in producing a range of sustainable, safe, nutritious and innovative food products. As such, the agri-food sector is one of Ireland's most important indigenous industries. It is a significant part of the economy and throughout the recent economic unrest, remained very resilient with significant development within the sector. The key to this success has been Ireland's reputation to produce high quality food products and access to international markets. The success of the agri-food industry in accessing international markets is underpinned by Quality Assurance Schemes and National Food Safety Controls.

The current outlet for wastewater sludge is almost exclusively agriculture with over 98% of wastewater sludge produced at Irish Water WWTPs currently disposed to agriculture, including sludge which is composted and subsequently recovered to agriculture. The key issues associated with sludge management and food production and safety relate to:

- Food safety concerns related to introduction and transfer of pathogens through the food chain;
- Increased levels of toxic metals and environmentally persistent chemicals;
- Negative perceptions in relation to the spreading of sludge;
- The prohibited use of raw or treated wastewater sludge under Quality Assurance Schemes; and
- The merits of sludge as a fertiliser and the potential to reduce imports of chemical fertilisers.

6.2.4.1 The Agri-Food Sector

The agri-food and drink sector is a significant part of the economy in Ireland accounting for 7.2% of Ireland's economy-wide gross value added (GVA), 12.3% of Ireland's exports and 8.8% of total employment (DAFM, 2014)[6]. In 2014, Irish agri-food and drink exports increased by an estimated 4% to approximately €10.5bn and a 45% increase since 2009 (Bord Bia, 2015). The sector accounts for approximately 170,000 jobs or 9% of total employment and makes a significant contribution to employment in rural areas.

The UK was the main destination for Irish agri-food and drink exports in 2014 accounting for 40% of all exports. Thirty-one percent of exports went to Continental EU markets while the remaining 29% went to international markets.

The Food Wise 2025 Strategy discussed in **Chapter 5, 'Review of Relevant Plans, Policies, Programmes'** is anticipated to result in an increase in food production, due to the ambitious targets for increasing agricultural outputs in specific sectors and increasing the value of agri-food exports by 85% to €19 billion over the next 10 years. The target for 50% volume increase in milk production under agricultural policies will increase the number of certified farms in quality assurances schemes, increase the dairy herd and reduce tillage area which in turn will result in a loss of suitable landbank available to Irish Water for landspreading of wastewater sludge.

[6] Fact Sheet on Irish Agriculture – July 2014, Department of Agriculture, Food and the Marine

Information sourced from Bord Bia estimates the distribution of agri-food and drink exports in 2014 by sector in **Figure 6.3**:

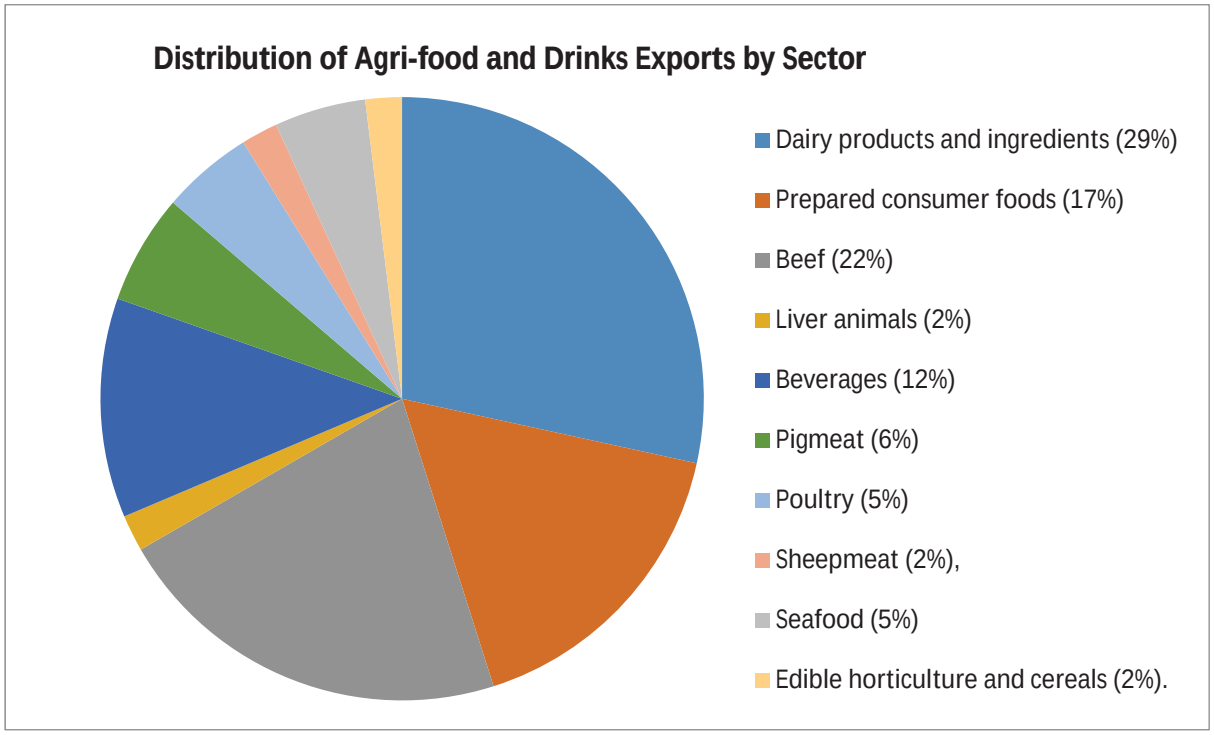


Figure 6.3 – Distribution of Agri-Food and Drinks Exports by Sector

6.2.4.2 Regulation of the Food Industry

The food industry in the Republic of Ireland is supported and regulated by a number of Government Departments and state agencies. The Department of Agriculture, Marine and Food is the primary government department, but others such as the Department of Health and the Department of Enterprise, Jobs and Innovation have specific functions in relation to the industry. Other agencies such as Bord Bia (Irish Food Board), which is charged with the the promotion of Irish food at home and abroad and the Food Safety Authority of Ireland (FSAI), which is tasked with ensuring that food produced, distributed or marketed in the State meets the highest standards of food safety and hygiene, also regulate the food industry.

6.2.4.3 Quality Assurance Schemes

Quality assurance plays a fundamental role in promoting food, providing consumers with a quality assured product and to demonstrate products are produced sustainability under an accredited scheme. There are a number of schemes in operation. Bord Bia operates Quality Assurance Schemes for the key primary production enterprises at processor and at farm level. There are currently 64,552 farms certified under these voluntary schemes and there are separate schemes for the Beef, Lamb, Pig, Poultry, Eggs, Horticulture and Dairy sectors. Membership of these schemes is outlined in **Table 6.6**.

Table 6.6 – Membership of Bord Bia Quality Assurance Schemes – June 2015

Quality Scheme	Farms Certified	% of Total Output
Beef	44,550	>90%
Lamb	12,287	70%
Pig	429	97%
Poultry	709	95%
Eggs	202	97%
Horticulture	275	75%
Dairy	6,100	34%

Source: An Bord Bia submission to the consultation process

It should be noted that a critical criterion set out in Bord Bia's quality assurance standards is that the use of raw or treated wastewater sludge are prohibited from being used on Bord Bia certified farms.

Origin Green, a Bord Bia initiative, is a sustainability programme operating on a national scale, uniting government, the private sector and food producers. The nationwide sustainability initiative is providing independently verified data that enables Ireland's farmers and producers to set and achieve measurable sustainability targets, which shows the commitment of Irish producers and processors to operate sustainably. This is the first initiative of its kind to operate on a national scale and has evolved as part of agricultural strategies to capitalise on Ireland's existing clean, green environment. To date 466 companies have signed up to Origin Green, with 191 registered companies and 112 classed as verified members. Origin Green aims to develop ways of working that will see 100% of Ireland's food and drink exports "*on the road to sustainability by 2016*".

Irish Grain and Feed industry have a Grain Quality Assurance Scheme (IGAS). Membership is voluntary and participation in the scheme is from grain suppliers and grain growers. The IGAS Code of Practice states that "*The Food and Grain Industry will not purchase grain from land treated with OMI*", that is organic municipal and industrial materials/sludge.

Other organisations producing quality food and drink for a global market operate quality assurance schemes also place restrictions on the use of wastewater sludge and biosolid on lands producing their raw materials.

In addition to Quality Assurance Schemes, associations representing industry stakeholders such as the Food and Grain Industry, the Irish Dairy Industries Associations (IDIA) and the Irish Creamery Milk Suppliers Association (ICMSA) have outlined that the growing sentiment among processors and their customers in relation to the use of municipal sludge on agricultural land is strongly negative with some processors simply not accepting products from lands on which wastewater sludge has been landspread. A significant portion of the feedback on the SEA Scoping process was from these associations and their industry stakeholders.

6.2.4.4 Asset Value of Wastewater Sludge as Fertiliser

Wastewater sludge is a by-product of the wastewater treatment process and includes biosolids removed from wastewater during treatment as well as residual organic matter from the treatment process. The sludge is rich in nutrients such as nitrogen and phosphorous and contains valuable organic matter that makes its use in agriculture as a fertiliser or an organic soil improver suitable

offsetting the need to purchase and apply commercial compound fertilizers (a recent online report[7] indicated that over 1.2m tonnes of fertilizer was purchased between October 1, 2014 and June 30, 2015).

The use of wastewater sludge in agriculture is controlled by EU legislation which has been implemented in Ireland through national legislation and supplemented by codes of practice from Government Departments and Local Authorities such as the "*Code of Good Practice for Use of Biosolids in Agriculture*" (COGP). The COGP was produced in response to Directive 86/278/EEC on the protection of the environment and in particular of the soil, when wastewater sludge is used in agriculture. It is Irish Water policy to contractually require compliance with the COGP in addition to all applicable legislation. Wastewater sludge and landbanks are currently tested in accordance with the requirements of the Sewage Sludge in Agriculture Regulations (S.I. No. 267 of 2001).

In general, untreated sludge is no longer applied to land within the EU and in several member states it is prohibited. National, and in some case regional, requirements vary across the EU. In Belgium (Brussels and Flanders), the Netherlands and Germany (Bavaria) the use of wastewater sludge in agriculture is essentially prohibited due to stringent standards on heavy metal concentrations. Denmark, Finland and Sweden also have legislation in place which is substantially more stringent than that required by the *Sewage Sludge Directive* with regulations in Denmark, Finland, France, Italy, Luxembourg and Poland on maximum values on pathogens, particularly Salmonella. In the UK and Sweden voluntary agreements set more stringent requirements than those in the Directive or in national regulations. It is noted that, unlike Ireland, many of these countries e.g. France, Italy, Hungary, Denmark and the UK, have significant levels of heavy industry and as such the wastewater sludge produced there would be expected to have higher contaminant level. These contaminants vary according to the nature of industries and may include heavy metals and Persistent Organic Pollutants (POPs), Environmental Persistent Pharmaceutical Pollutants (EPPP) and other contaminants.

There are certain limited circumstances where untreated wastewater sludge can be applied to land in Ireland under legislative requirements. However, it is Irish Water policy to treat all wastewater sludge prior to use in agriculture. These are further discussed in **Section 6.2.8** of this document.

6.2.4.5 Food Safety Implications

Food Safety concerns are a key issue that was highlighted by a number of key stakeholders during the consultation process.

Untreated wastewater sludge may contain bacteria, viruses, parasites and other potentially disease causing micro-organisms as well as metals and environmentally persistent chemicals. The main concerns in relation to food safety is the potential risk of direct microbiological contamination of food and the potential risk of the transfer of chemical contaminants and pathogens into the food chain from landspreading of wastewater sludge on land used for food production.

Reuse of wastewater sludge to land, particularly agricultural land, can typically only be undertaken provided the sludge has received appropriate treatment (either biological, chemical, or heat treatment including pasteurisation) which effectively neutralises any micro-organisms and ensures

[7] www.agriland.ie Farming News Roundup dated 19/11/15

that it attains the standards necessary to be used in agriculture. As noted in **Section 6.2.8** of this document, there are certain circumstances where untreated materials can be landspread.

The Food Safety Authority Scientific Committee report "Food Safety Implications of Land-spreading Agricultural, Municipal and Industrial Organic Materials on Agricultural Land used for Food Production in Ireland" (FSAI, 2008) recognizes that appropriately managed land-spreading provides a sustainable option for the utilisation of organic agricultural (OA) materials and some treated organic municipal and industrial (OMI) materials. However, such use is conditional on the implementation of effective controls and the consistent application of good practice at every level. The report further outlines recommendations relating to the minimum safe standards required when land-spreading organic agricultural (OA) and organic municipal and industrial materials (OMI) on agricultural land used for food production.

All wastewater sludge and soils are currently tested to provide robust food safety protection. This includes monitoring of sludge and soil samples for metals and pathogens to ensure that the sludge has met the required criteria as outlined in the Use of Sewage Sludge in Agriculture Regulations 1998.

6.2.4.6 Existing Environmental Pressures / Problems: Food Production and Safety

The agri-food sector is one of Ireland's most important indigenous industries. It is a significant part of the economy and throughout the recent economic unrest remained very resilient with significant development within the sector. The key to this success has been Ireland's reputation to produce high quality food products and access to international markets.

Quality assurance plays a fundamental role in promoting food, providing consumers with a quality assured product. Bord Bia operates Quality Assurance Schemes for the key primary production enterprises at processor and at farm level. The schemes are voluntary and a critical criterion set out in Bord Bia's quality assurance standards is that the use of raw or treated wastewater sludge are prohibited from being used on Bord Bia certified farms. In addition, it is acknowledged that there is a strongly negative sentiment among processors and their customers in relation to the use of municipal sludge on agricultural land, with some processors simply not accepting products from lands on which wastewater sludge has been landspread.

The Food Wise 2025 Strategy is anticipated to result in an increase in food production, due to the ambitious targets for increasing agricultural outputs over the next 10 years. This increase will require both available agricultural landbank and also soil fertility through organic or chemical fertiliser application. Given that the main outlet for wastewater sludge in Ireland is currently agriculture, the landbank that is available and suitable for landspreading of wastewater sludge is expected to come under increasing pressure due to the growing negative sentiment among processors and customers, the number of farms certified under Quality Assurance Schemes where wastewater sludge is prohibited in addition to increasing agricultural outputs to meet the Food Wise 2025 Strategy which is expected to increase the number of farms committing to quality assurance schemes.

6.2.5 Soils and Geology

Soil is a valuable resource that performs many ecosystem services: production of food; production of biomass; storage, filtration and transformation of nutrients and water; carbon storage and cycling; and landscape and cultural environment. Such functions of soil are worthy of protection because of their socio-economic as well as environmental importance. Soils in any area are the result of the interaction of various factors, such as parent material, climate, vegetation and human action. Impacts on soils can occur through development generally as well as erosion, loss of organic matter, contamination, industrial pollution and agriculture.

Despite its importance, there is little in the way of direct EU or national legislation obliging Ireland to maintain soil quality, however indirectly issues such as contaminated land have been dealt with through other legislation (e.g. waste). As far back as 2006, the EC published a proposal Communication (COM(2006) 231) for a framework directive, leading the way for full EU legislation and more recently in 2012 they published a policy report on the implementation of the Strategy and ongoing activities (COM(2012) 46). However in May 2014, the European Commission decided to withdraw the proposal for this directive. The Seventh Environment Action Program has asserted that degradation of soil is a serious problem, both for member states and globally. It is proposed that by 2020 all land in the EU should be managed sustainably and soils afforded protection, with remediation of contaminated sites also a priority.

The key issues associated with sludge management and soils and geology relate to:

- Suitability of landspreading based on existing heavy metal content in soils e.g. Cadmium and Nickel levels;
- Soils quality and the effects on soil from land-spreading of sludge;
- Influence on land use practices; and
- Future wastewater management facilities and infrastructure land requirements.

Given the strategic nature of the NWSMP, focus of the baseline for soils and geology is at a national level. It is focussed on existing overall soil quality, presence of WWTPs and groundwater vulnerability and known activities which have the potential to impact on geology, soil and subsoil quality.

6.2.5.1 Soils

The quality of soils in Ireland is considered generally good although there are pressures impacting on its long-term protection and maintenance particularly from land use changes, intensification of use, urbanisation and disposal of organic wastes to soils (EPA, 2008). The soils of Ireland are an immensely valuable, and finite, national resource, which forms and evolves slowly over very long periods of time, and can easily be damaged and lost. Soil is a biologically active, complex mixture of weathered minerals (sand, silt and clay), organic matter, organisms, air and water that provides the foundation for life in terrestrial ecosystems. Key soils types categorised according to the landscape they are found in have been set out in **Table 6.7**.

Soil biodiversity is the foundation of many ecosystems and ecosystem services and it is estimated that our soils contain up to a quarter of all living species on earth. This massive resource is

responsible for regulating natural processes, controlling pollution, providing food and other resources.

Table 6.7 – Soil Classifications by Landscape Types

Landscape	Soil Type	Characteristics
Mountain	Lithosols, Groundwater and Surfacewater Gleys, Podzols, Blanket Peat	Shallow soils on steeper soils, with wet and acidic soils in less steep areas
Hill	Brown Podzolics, Brown Earths, Surfacewater Gleys	Mainly acidic in nature. Developed from shale, sandstone or granite
Drumlin (small oval hills)	Luvisols, Brown Earths, Brown Podzolics, Surfacewater Gleys, Groundwater Gleys and Peats	Soils vary in thickness, with thin deposits typically containing drier soils than the wetter soils found at the base of Drumlins.
Flat to Undulating	Rendzinas, Luvisols and Surface-water Gleys	Varying thickness soils, some very shallow. Deeper soils develop on glacial till
Lowland	Brown Earths, Brown Podzolics, Surface-water and Groundwater Gleys.	More acidic soils are found in the lowland areas underlain by sandstone, shales and granite than the surrounding hill areas.
Alluvial and Valley	Groundwater Gleys, Alluvial Soils and Peat	Soils found at the base of hills and across floodplains.

There is relatively little legislation relating directly to soil and soil protection. In 2006, the EC published a Thematic Strategy for Soil Protection and introduced a proposed Soil Framework Directive; however in May 2014 the European Commission decided to withdraw the proposal for a Soil Framework Directive opening the way for an alternative initiative in the next mandate. In Ireland some soil protection legislation has been enacted including the 2011 EIA Regulations for On Farm Development which include a requirement for EIA of soil operations such as soil drainage.

Teagasc, in conjunction with the EPA, launched the Third Edition Soil Map in 2014, part of the Irish Soil Information System, a project which combined traditional soil survey techniques with digital mapping in a GIS-based soil information system. Phase 1 of the project began in 2008 and was completed in 2014, with Phase 2 progressing from 2015. This project provides valuable information on existing soils in the county. The overall objective of the project is to produce a harmonized soil map of Ireland at a scale of 1:250,000 with an associated web-based soil information system in the public domain.

6.2.5.2 Soil Heavy Metals and Nutrients

The main technical limitations in relation to the use of wastewater sludge in agriculture are in relation to heavy metals and nutrients. The provisions of the Sewage Sludge Directive, which is transposed into national legislation by the Waste Management (Use of Sewage Sludge in Agriculture) Regulations 1998-2001, set threshold values for the concentration of heavy metals in soils receiving wastewater sludge. The maximum values for concentrations of heavy metals in soil are defined in Part I of the Schedule and are as follows: Cadmium (1 mg/kg), Copper (50 mg/kg), Nickel (30 mg/kg), Lead (50 mg/kg), Zinc (150 mg/kg) and Mercury (1 mg/kg). As such, sludge should

not be used on land where the concentration of one or more heavy metals exceeds the aforementioned values or the use of the sludge may result in these values being exceeded.

The National Soils Database has produced, for the first time, a national baseline database of soil geochemistry and baseline spatial distribution concentrations for the six heavy metals as defined in the Use of Sewage Sludge in Agriculture Regulations have been mapped. The mapping has indicated that thresholds in some soils are exceeded for one or more of these elements. An EPA Synthesis Report, Towards a National Soil Database (2001-CD/S2-D2) noted that "The situation with respect to Ni and Cd is more problematic. This study found that at a national level, 15% of soils exceeded the threshold value for Cd, while 23% of soils exceeded the threshold value for Ni. These elevated soil heavy metal concentrations are attributed to the composition of the soil parent material rather than to anthropogenic effects, except on a very local scale". **Figure 6.4** shows the areas nationally that exceed threshold limits for Cd and Ni.

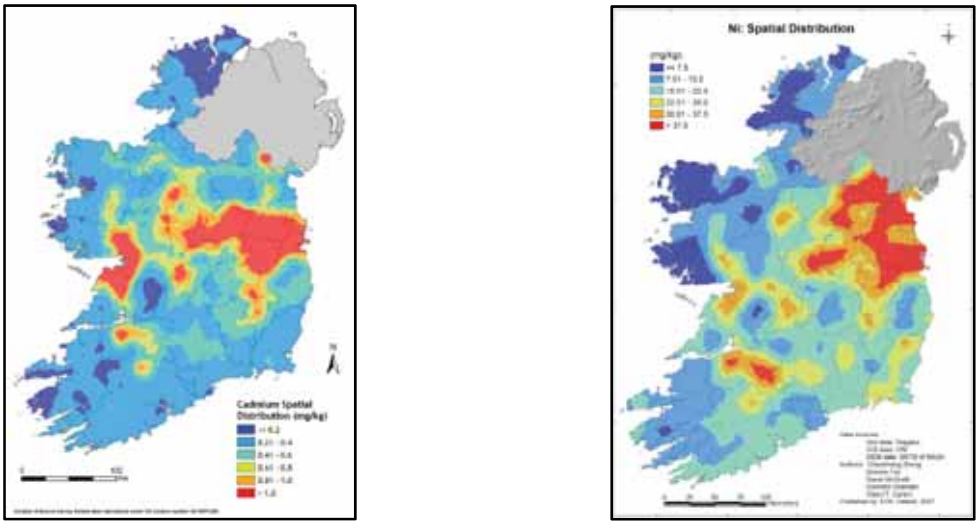


Figure 6.4 – Spatial Distribution of Cadmium (Cd) and Nickel (Ni) Nationally

6.2.5.3 Bedrock Geology

According to the GSI 1:100,000 scale Bedrock Map Series, the bedrock across a large areas of central Ireland comprises of Carboniferous limestones, which was deposited in tropical seas 350 million years ago. Sandstone and shale of varying ages from 500 – 300 million years ago are the next most prevalent across the country, some of which are interspersed with basalt and rhyolite, followed by Ordovician to Devonian granite intrusions. The bedrock in the south of Ireland is comprised of Devonian Old Red Sandstone (DORS), where thick layers of sediment were laid down in semi-arid and mountain river systems. The Northwest is comprised of Precambrian Quartzites, Gneisses and Schists (PQGS) and Granites and other Igneous intrusive rocks (GII). The Bedrock Geology of Ireland is illustrated **Figure 6.5**.

Approximately 50% of Ireland is underlain by limestone. Limestone pavement is a priority habitat for conservation under the EU Habitats Directive due to habitats relying on hydrological, hydrogeological and geological conditions. The most extensive limestone pavement occurs in the Burren/East Galway area. The nature of the limestone strongly influences its susceptibility to

karstification. Most of the largest springs in Ireland emerge from karst. Karst springs, both large and small, are ready sources of drinking water in areas where there are often no other alternatives due to the absence of adequate surface watercourses.

Due to its particular characteristics, including an irregular bedrock surface, the presence of large voids and rapid underground drainage, karst limestone presents special problems for landspreading of wastewater sludge as groundwater is most at risk where subsoils are absent or thin with contaminants entering the groundwater with little or no filtration or attenuation of contaminants.

6.2.5.4 Mines and Quarries

There is a mining legacy across some parts of the country. Minerals and metals that were mined include zinc, lead, gypsum, coal, silver, copper and gold. In addition to metals, crushed rock, sand and gravel are also currently quarried at over 400 sites in Ireland (Minerals Ireland). According to the Extractive Industries Register maintained by the EPA under the Waste Management (Management of Waste from the Extractive Industries) Regulations 2009 (S.I. 566/2009), there are 1,077 quarries nationally. The Geological Survey of Ireland's (GSI) active quarries database notes that the 436 quarries were active as of 2014.

6.2.5.5 Geology/Geological Heritage

The Geological Survey of Ireland (GSI), in partnership with NPWS (the National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht), is in the process of identifying and selecting important geological and geomorphological sites throughout the country for designation as geological NHAs (Natural Heritage Areas). County Geological Sites (CGS), as adopted under the National Heritage Plan, include additional sites that may also be of national importance but which were not selected as the very best examples for NHA designation. All geological heritage sites identified by GSI are categorised as CGS pending any further NHA designation by NPWS. There are 1,308 geological heritage areas within the country. This includes both county geological sites and those proposed sites of geological interest.

6.2.5.6 Existing Environmental Pressures / Problems: Soils and Geology

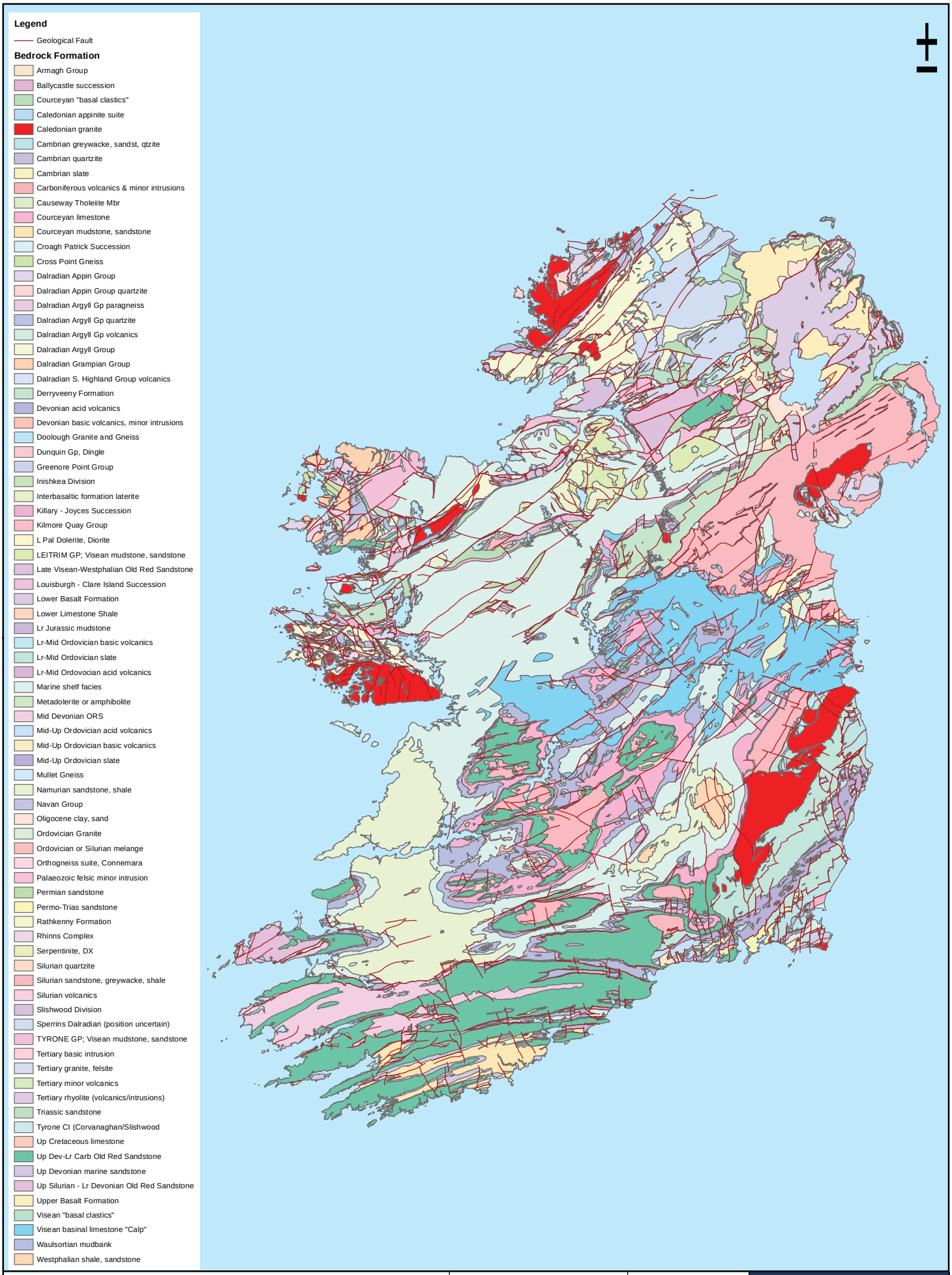
Despite the wide range of functions that soils perform from an ecosystem services perspective, there is little legislation relating directly to soils and soil protection and as such a targeted response to the pressure on soils in Ireland cannot be formulated to any great extent.

The EPA in 2002 identified the main pressures on the soil resource in Ireland as: intensive agriculture; forestry; industry; peat extraction; and urbanisation and infrastructure development. Little has changed in the intervening years and the 2012 SoE Report included pressures such as land use, population growth and soil contamination. Inter-related policies on land use, forestry, agriculture and energy all have potential impacts on the soil resource. While the pressures on the soil resource from the building sector have decreased in recent years, other intensifications are taking its place. Of particular note is Food Harvest 2020 which seeks to significantly increase the agricultural outputs from Ireland by 2020. Whilst it is acknowledged that environmental compliance is considered as part of this increased output [through separate SEA and AA of those plans], this intensification is nonetheless likely to put additional pressures on soils, due to

increased stock yields and increased use of organic and inorganic fertilisers.

The main outlet for wastewater sludge in Ireland is agriculture with over 98% of wastewater sludge being currently recovered to agriculture. The topsoil and subsoil, depending on their type, permeability and thickness, play a critical role in preventing groundwater contamination and mitigating the impact of many potential pollutants. Groundwater is most at risk where the subsoils are absent or thin and, in areas of karstic limestone, where surface streams sink underground at swallow holes.

The main technical limitations in relation to the use of wastewater sludge in agriculture are in relation to heavy metals and nutrients. As such, there are large areas in the west, midlands and north east of Ireland which are unsuitable for the landspreading of wastewater sludge due to groundwater vulnerability, and soil types as shown in **Figure 9.1**. The key environmental issues relating to soil which will be relevant to Irish Water's activities will be the need to help maintain the hydrogeological and ecological function of the soil resource.



Title

Figure 6.5 - Bedrock Geology

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Issue Details

Drawn By:	NON	**Project No.**	MDE1189
Checked By:	EO	**File Ref:**	MDE1189Arc0003F01
Approved By:	AG		
Scale:	1:2,345,000 @ A4	**Projection:**	ITM (IRENET95)
Date:	15/03/2016		

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6.2.6 Water

Water is essential for all life on earth and as such management of the water resource is a significant issue nationally and within Europe. While Ireland's surface and groundwater water quality compares favourably with other EU Member States, there are ongoing pressures and problems associated with achieving and maintaining at least good status in line with Water Framework Directive (2000/60/EC) objectives, as well as other water directives.

Sludge management can have significant potential to impact on the ecological status of a water body. Pollution by leachate, metals and other pollutants are a potential significant problem where management of wastewater sludge close to or over watercourses can have severe negative impacts on invertebrate and plant life and on all life stages of fish life cycles. The key issues relating to sludge management and water include:

- Impacts on water bodies from upgrading infrastructure and developing new infrastructure;
- Impacts on surface waters from run-off from sludge;
- Deterioration of water quality;
- Impacts on achieving objectives under the Water Framework Directive;
- Impact on achieving the objectives under the Marine Strategy Framework Directive;
- Vulnerability to flood risk;
- Suitability of landspreading based on groundwater aquifer vulnerability; and
- Groundwater contamination where landspreading of sludge is carried out, particularly in areas which are unsuitable due to groundwater vulnerability and soil type.

6.2.6.1 Background

To date, water protection efforts have succeeded in reducing the extent of serious pollution in rivers but there remains a need to improve the status of others which are currently at less than good ecological status as reported by the EPA in 2012. The status has been improved to date mainly through a focused effort on tackling emissions from point sources such as inadequate/poorly performing WWTPs. There is however still a need for significant and continued investment in wastewater infrastructure. A recent report by the EPA into urban wastewater treatment[8] noted that raw sewage is being discharged into 45 rivers, lakes and coastal sites around the country which was in turn contributing to poor quality at seven of Irelands 126 identified bathing water sites.

The three main challenges for water quality management are to eliminate serious pollution associated with point sources (waste water treatment plants); to tackle diffuse pollution (pollution from agricultural activities and septic tanks); and to use the full range of legislative measures in an integrated way to achieve better water quality (EPA, 2012).

A key development in meeting the requirements of the Water Framework Directive has been the publication of River Basin Management Plans. These plans have provided a coordinated approach to water management throughout Ireland and across Europe. The plans address many of the pressures on water however it will take time to fully resolve all the issues and residual pressures will remain. The first cycle River Basin Management Plans for the period 2009 to 2015 are in the process of being reviewed for the second cycle plans which will relate to the period 2017 to 2021. It has also become

[8] EPA (2014) Urban Waste Water Treatment in 2014

clear that the current governance and administrative arrangements for water management were not optimal or configured to ensure the delivery of Water Framework Directive objectives in an efficient and effective manner (EPA, 2012). A more integrated approach between key governmental departments, the EPA and Local Authorities was therefore considered to meet the challenges.

The Minister for the Environment, Community and Local Government has put in place new governance structures and administrative arrangements for the implementation of a second cycle of River Basin Management Plans and this will change the context for future reporting on water quality in Ireland. The existing seven River Basin Districts are to be reconfigured into three RBDs. The existing four national RBDs and the Shannon International RBD are to be merged into one national RBD for administrative and reporting reasons. The North Western and Neagh Bann International RBDs will remain.

6.2.6.2 Water Classification

Since 2000, the Water Framework Directive has directed water management in the EU. For the purpose of implementing the Water Framework Directive, Ireland was divided into eight River Basin Districts - areas of land that are drained by a large river or number of rivers and the adjacent estuarine/coastal areas. The first cycle River Basin Management Plans outlined measures for water bodies within the River Basin Districts in order to meet the objectives of the Water Framework Directive.

The area of influence of the NWSMP covers part or all of seven of the eight Water Framework Directive River Basin Districts (RBDs) in Ireland: the North Western International RBD; the Neagh-Bann International RBD; the Western RBD; the Shannon International RBD; the Eastern RBD; the South Eastern RBD; and the South Western RBD. The NWSMP does not directly apply to the remaining RBD wholly within Northern Ireland but it is acknowledged that there is potential for impacts on waterbodies within the district and as such transboundary impacts are considered in the assessment.

The Water Framework Directive requires that all Member States implement the necessary measures to prevent deterioration of the status of all waters (surface, estuarine and coastal) and protect, enhance and restore all waters with the aim of achieving at least good status by 2015. A "water status" assessment approach was implemented in Ireland as part of the Water Framework Directive implementation by Local Authorities. The approach incorporates chemical and biological monitoring into a status grade for each waterbody. Water Framework Directive water status is classified according to a scale of *high, good, moderate, poor* and *bad*. The current status of river, lake, transitional and coastal water bodies is summarised in **Table 6.8** and shown on **Figure 6.6**.

Table 6.8 – Water Framework Directive Ecological Status[9]

Status	River	Lake	Transitional*	Coastal*
High	11.8%	11%	3.6%	63.4%
Good	41%	32%	41.1%	30%
Moderate	28.6%	33%	43.4%	4.4%
Poor	17.9%	15%	11.4%	<0.01%

[9] Note: Water Quality Status is for Surface Waterbodies that are monitored as part of the Irish Water Framework Monitoring Programme, regardless of jurisdiction and as such takes into account some of Northern Ireland.

Status	River	Lake	Transitional*	Coastal*
Bad	0.7%	9%	0.5%	0

*Source: Water Quality in Ireland 2010-2012, EPA (2015). * Unassigned water bodies not included.*

A key finding of the "*Water Quality in Ireland 2010-2012*" Report (EPA, 2015) was that 53% of rivers, 43% of lakes, 45% of transitional waters, 93% of coastal waters and 99% of groundwater were satisfactory at good or high status. The report noted that while there has been some modest improvement in the quality of Ireland's waters over the period between 2010 and 2012, there is a significant challenge to meet the requirements of the Water Framework Directive, with some targets set in the first cycle of the river basin management planning unlikely to be achieved by 2015 such as the 13.6% target improvement in surface water ecological status.

The EPA also stated that 47% of rivers (water bodies), 57% of lakes (water bodies), 55% of transitional waters (area) and 7% of coastal waters (area) require improvement to achieve satisfactory condition. This will require significant additional targeted action to achieve the objectives set out in the Water Framework Directive. The recently published "*Significant Water Management Issues in Ireland*" Report (DECLG, 2015) identifies the key pressures on our water environment and states that "*Much of the water pollution identified in Ireland is caused by excessive nutrients entering waters resulting in eutrophication*". Other pressures which have been identified include fine sediment, abstractions and flows, hazardous chemicals, climate change, invasive alien species and changes to the physical environment.

Emerging pressures in meeting the objectives under the Water Framework Directive include agriculture as a sector in the context of increasing agricultural output under Food Wise 2025. The DECLG report has stated that "*Increased agricultural output will likely increase the pressures on waters which will have to be managed in a sustainable way within the context of the overall objective of protecting and improving water quality and meeting the requirements of the WFD*".

6.2.6.3 Water Framework Directive Protected Areas

Article 6 (Annex IV) of the Water Framework Directive requires each Member State to establish a register of protected areas for water bodies or parts of water bodies that must have extra controls on their quality by virtue of how their waters are used by people and wildlife. This register is split into five categories as follows:

(i) Areas designated for the abstraction of water intended for human consumption under Article 7;
(ii) Areas designated for the protection of economically significant aquatic species;
(iii) Bodies of water designated as recreational waters, including areas designated as bathing waters under Directive 76/160/EEC;
(iv) Nutrient-sensitive areas, including areas designated as vulnerable zones under Directive 91/676/EEC and areas designated as sensitive areas under Directive 91/271/EEC; and
(v) Areas designated for the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection, including relevant European Sites (Natura 2000) designated under Directive 92/43/EEC (1) and Directive 79/409/EEC (2).

In Ireland, waters intended for human consumption are protected under the Drinking Water Regulations (S.I. 122/2014). The actual protected areas for drinking water are not outlined within these regulations, so the protected area for drinking waters is represented by the water body from which the water is abstracted, be it groundwater, river or lake.

The Water Framework Directive protected areas are outlined in **Table 6.9** and are illustrated in **Figure 6.7.**

Table 6.9 – Water Framework Directive Protected Areas

Water Framework Directive Protected Areas	Counts
Drinking Waters (rivers and lakes)	540
Economically Significant Aquatic Species (shellfish areas)	64
Recreational and Bathing Waters	137
Nutrient Sensitive Areas (rivers and lakes)	79
Protection of Habitats and Species (SAC and SPA Conservation Objectives)	42,927
Salmonid Rivers	34

Source: EPA WFD Register of Protected Areas GeoDatabase, retrieved February 2016.

6.2.6.4 Groundwater

Ireland's groundwater resource accounts for approximately 25% of drinking water nationally. Furthermore it is also a contributor to many rivers, lakes and estuaries around the country. As such, impacts on groundwater can have significant ecological and social implications. The EPA Water Quality Report for 2014 indicated that 99% of groundwaters are achieving good status in line with Water Framework Directive objectives - just 1% of groundwater was at poor chemical status, an improvement from 13.6% since the previous assessment period. Those failing to meet these commitments are often related to their contribution of phosphate loading to surface waters as a result of diffuse pollution. This will be a significant issue for the NWSMP given the principle outlet for wastewater sludge is agricultural lands. Historical contamination from mining activities and industrial development are other pressures impacting groundwater. A further issue relates to contamination of drinking water well supplies by microbial pathogens; approximately 51% of samples taken from 205 sampling locations in 2012 as part of an EPA monitoring campaign were found to be polluted by microbial pathogens.

An aquifer is an underground body of water-bearing rock or unconsolidated materials (gravel or sand) from which groundwater can be extracted in useful amounts. The GSI classifies aquifers and the classes are divided into three main groups based on their resource potential, and further subdivided based on the type of openings through which groundwater flows. There are nine aquifer categories in total. Regionally important (karstified - conduit) aquifers are generally located to the west of the country, in the Burren/East Galway area. Gravel aquifers are much smaller in number and extent, covering only about 1,221km^2 nationally.

The Geological Survey of Ireland (GSI) also classifies the groundwater resource according to vulnerability i.e. the hydrogeological characteristics intrinsic to a groundwater body which determines how easily that water body may be contaminated through human activities. Groundwater vulnerability exhibits a range of vulnerability ratings classified by Low risk up to

Moderate, High, Extreme and 'X', where the rock is exposed near the surface or comprised of karst and is shown in **Figure 6.8**.

There are over 33,283 groundwater wells and springs at a national level (those with the highest positional accuracy). Of these, approximately 860 are at the appropriate abstraction yield to provide for potable water supply. In addition to groundwater data, the Geological Survey of Ireland also holds a database on karst features in the country. The majority of karst features (which can include swallow holes, caves, turloughs and enclosed depressions) occur in the midlands of the country and along the west coast of Ireland. As of 2014, there were just over 10,800 karst features recorded nationally by the GSI. The database is not comprehensive however, and new features are added as more information becomes available.

The Water Framework Directive requires that all Member States implement the necessary measures to prevent deterioration of the status of all waters including groundwater and protect, enhance and restore all waters with the aim of achieving at least good status by 2015. The current chemical status of groundwater (2011) is provided in **Table 6.10**.

Table 6.10 – River Basin District Summary of Chemical Status Classification Results for Groundwater Bodies

RBD	Good Status (No. of Water Bodies)	Good Status (% RDB Area, km^2)	Poor Status (No. of Water Bodies)	Poor Status (% RDB Area, km^2)
Eastern	73	5,789	2	477
South Eastern	149	12,869	2	24
South Western	83	11,284	1	6
Shannon	236	17,503	6	97
Western	104	11,732	0	0
North Western	72	7,421	0	0
Neagh Bann	28	1,805	0	0
National Total	**745 (99%)**	**68,403 (99%)**	**11 (1%)**	**604 (1%)**

Source: Water Quality in Ireland 2010-2012, EPA (2015).

Groundwater vulnerability is also important in determining the suitability of the use of wastewater sludge in agriculture. The GSI has produced a Groundwater Protection Response Matrix for Landspreading to assist in the selection and management of landspreading areas. The response matrix for landspreading is outlined in **Table 6.11** and outlines that landspreading of organic wastes is not acceptable (R4) in designated source protection areas (inner and outer zones) with an extreme vulnerability rating, and in inner source protection areas with high vulnerability.

Table 6.11 – Response Matrix for Landspreading of Organic Wastes

Vulnerability Rating	Source Protection Area		Resource Protection Aquifer Category					
			Regionally Important (R)		Locally Important (L)		Poor Aquifers (P)	
	Inner	Outer	Rk	Rf/Rg	Lm/Lg	Ll	Pl	Pu
Extreme (E)	R4	R4	R3[2]	R3[2]	R3[1]	R3[1]	R3[1]	R3[1]
High (H)	R4	R2[1]	R1	R1	R1	R1	R1	R1
Moderate (M)	R3[3]	R2[1]	R1	R1	R1	R1	R1	R1
Low (L)	R3[3]	R2[1]	R1	R1	R1	R1	R1	R1

R1 Acceptable, subject to normal good practice.

R2[1] Acceptable, subject to a maximum organic nitrogen load (including that deposited by grazing animals) not exceeding 170kg/hectare/yr.

R3[1] Not generally acceptable, unless a consistent minimum thickness of 1m of soil and subsoil can be demonstrated.

R3[2] Not generally acceptable, unless a consistent minimum thickness of 2m of soil and subsoil can be demonstrated.

R3[3] Not generally acceptable, unless it is shown that there are no alternative areas available and detailed evidence is provided to show that contamination will not take place (no spreading will be allowed within a 50m radius of a groundwater source).

R4 Not Acceptable.

The topsoil and subsoil - depending on their type, permeability and thickness - play a critical role in preventing groundwater contamination and mitigating the impact of many potential pollutants, and they act as a protecting filtering layer over groundwater. The vulnerability of the groundwater is a key consideration in deciding on the suitability of an area for landspreading. Groundwater is most at risk where the subsoils are absent or thin and, in areas of karstic limestone, where surface streams sink underground at swallow holes. See also **Section 6.2.5** Soils and Geology.

6.2.6.5 Flood Risk

Floods are a natural and inevitable part of life that pose a risk to human life and well-being, property and the environment. Flood risk presents a number of issues in relation to wastewater sludge management. Firstly it can negatively impact on wastewater treatment infrastructure causing inundation, leading to pollution of flood waters. This would equally apply to all phases of treatment at hubs, satellites etc. and storage sites for wastewater sludge prior to disposal on land. Flooding of outlet sites is also a potential risk where wastewater sludge has been surface spread and could be removed in receding flood waters.

Catchment Flood Risk Assessment and Management (CFRAM) Studies and Plans are currently being prepared in line with the European Directive 2007/60/EC (Floods Directive). It requires member states to carry out preliminary flood assessments in order to identify areas at risk from flooding. Each CFRAM Study is required to produce flood maps, flood risk objectives and Flood Risk Management Plans. The CFRAM programme is central to the medium to long-term strategy for the reduction and management of flood risk in Ireland. Flood Risk Management Plans (FRMPs) are to be developed by 2016. It is likely that these plans will rely to some extent on agricultural land to facilitate flooding to offset the risk to sensitive area including residential and commercial centres. This would further add to the pressure for lands suitable for land spreading.

In addition, in 2009 the DECLG published '*The Planning System and Flood Risk Management Guidelines for Planning Authorities'* which will ensure that flood risk assessment and management is incorporated within the planning system. In relation to flooding, it is important for Irish Water to ensure the resilience of water supply and treatment infrastructure to the effects of climate change, including flood protection of assets and ensure that its activities do not increase flood risk of other development located downstream within a catchment.

6.2.6.1 Existing Environmental Pressures / Problems: Water

The most recent audit of the significant water management issues in Ireland was launched by the DECLG in 2015. This document highlighted the following key issues in relation to the environment:

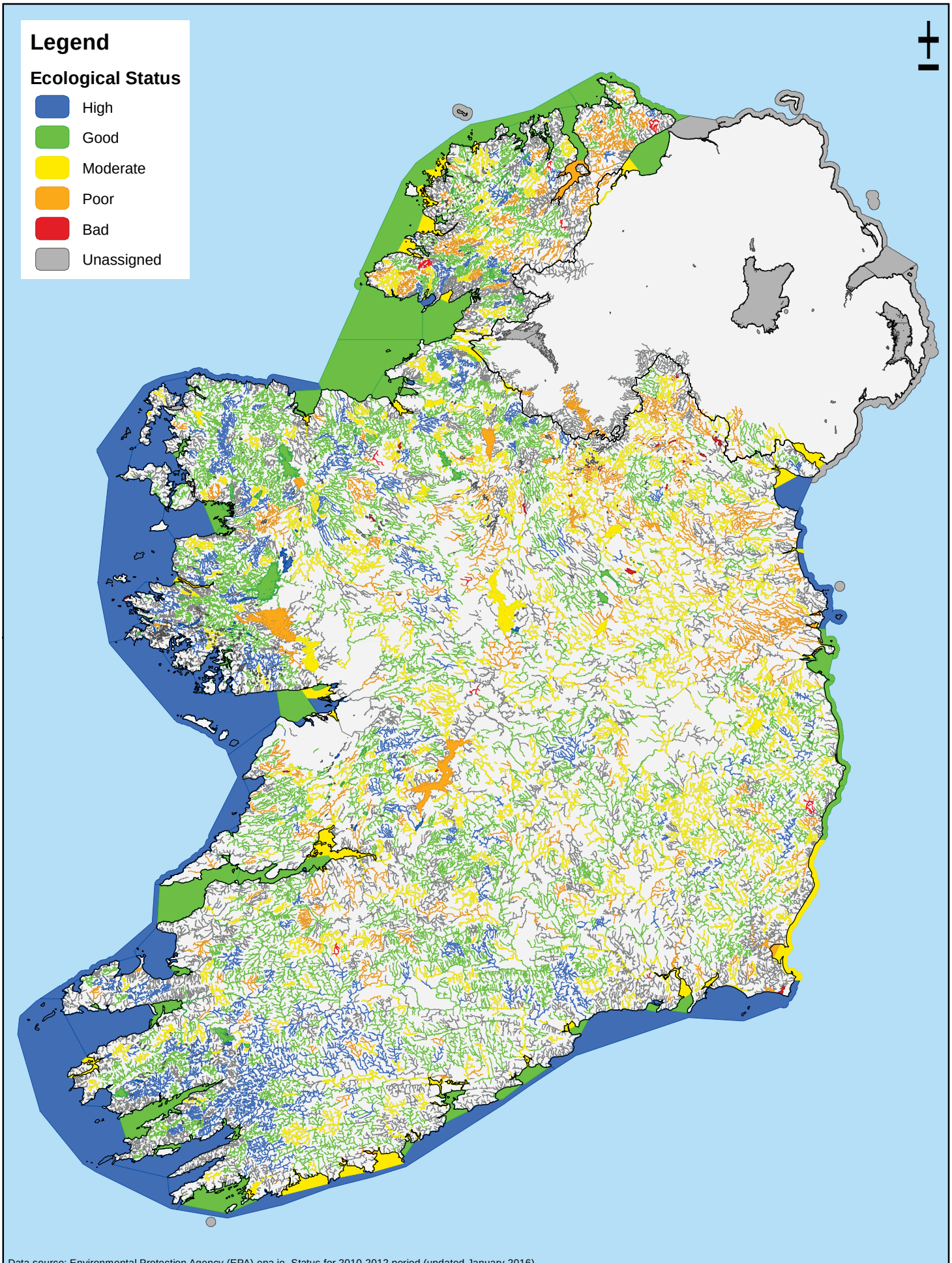
- Urban waste water treatment plants;
- Agriculture;
- Forestry;
- Homes and gardens (including domestic waste water treatment systems);
- Industrial Discharges; and
- Activities which spread invasive alien species.

The most significant surface water quality issue in Ireland continues to be excessive nutrient enrichment which leads to eutrophication; agriculture and municipal sources are the most important suspected causes of pollution to rivers. Twelve large urban areas did not meet the EU Urban Waste Water Treatment Directive requirement for the provision of secondary treatment, and untreated sewage was discharged from 45 areas. For groundwaters, nitrogen and phosphorus levels in general have remained stable or have been decreasing since 2007. Coliforms in groundwater however remain a risk for drinking waters in areas where treatment is inadequate. Waste water discharges also contributed to poor water quality at 7 out of 136 bathing waters.

Improving the operation and standards of waste water infrastructure across industries will be critical to mitigate against future pressures arising from population growth and planned expansion of the agricultural and industrial sectors under Food Wise 2025.

Other significant pressures include forestry; forest cover in Ireland is approximately 10.7% (EU average: 38%) and the main pressures to water from forestry activities relate to sediment and nutrients entering watercourses. On-site domestic waste water systems are another source of nutrients and organic pollution and the number of such systems are estimated by the CSO to be approximately 500,000 (or about one third of all households). Industrial pollution accounts for approximately 5% of slight and moderate pollution cases, with discharges from the food and beverage sectors tending to carry large nutrient loads.

Invasive alien animal and plant species (e.g. zebra mussel, Japanese knotweed etc.) compete with and can displace native species and can contribute to river bank destabilisation. Movement of boats and fishing gear between locations in the aquatic environment can spread such species, as well as moving soil.



Data source: Environmental Protection Agency (EPA) epa.ie. Status for 2010-2012 period (updated January 2016).

Title

Figure 6.6 - Surface Water Body Status

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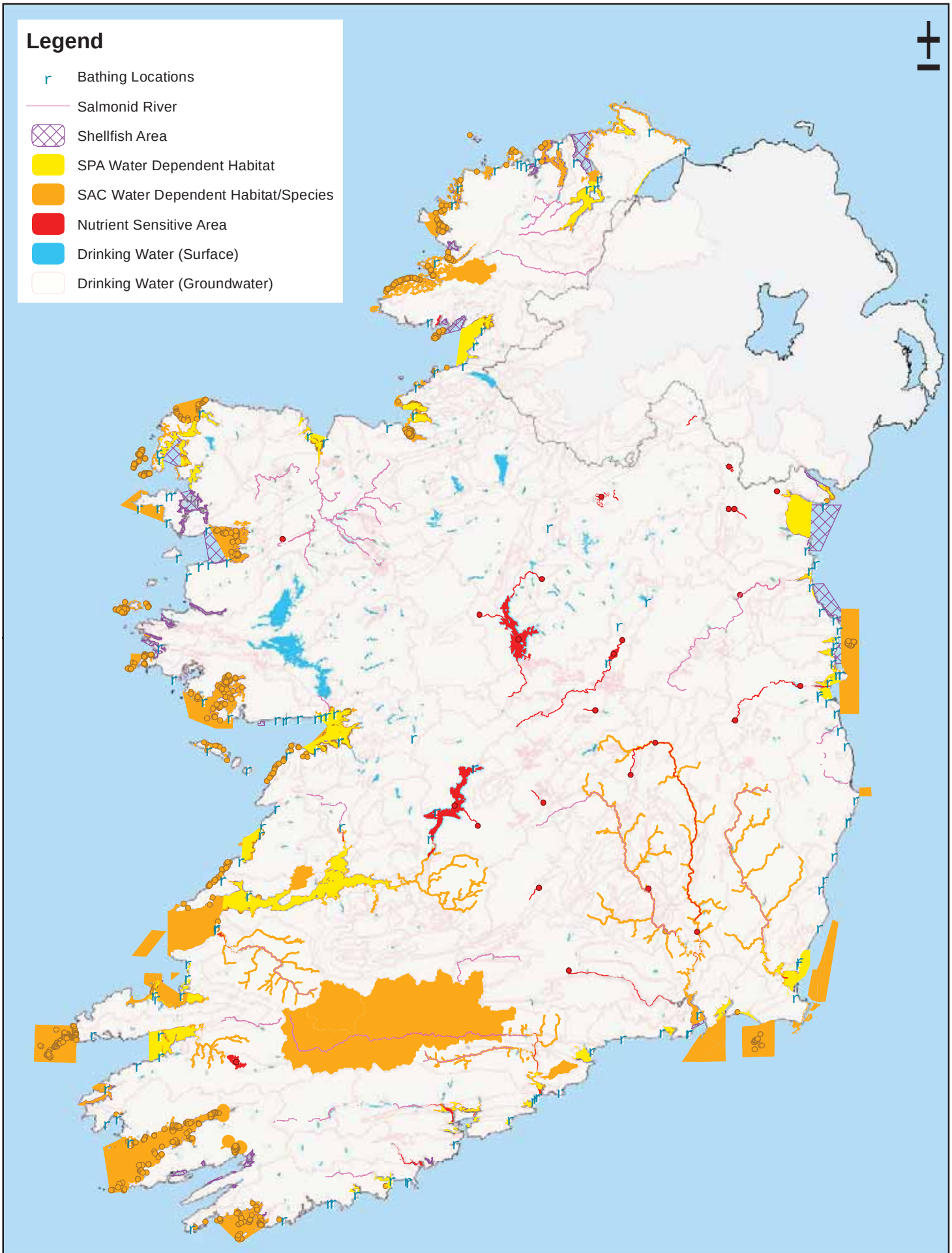
Issue Details			
Drawn By:	NON	Project No.	MDE1189
Checked By:	EO	File Ref:	
Approved By:	AG		MDE1189Arc0005F01
Scale:	1:1,910,000 @ A4	Projection:	
Date:	15/03/2016		ITM (IRENET95)



Data source: Environmental Protection Agency (EPA) www.epa.ie.

Title

Figure 6.7 - WFD Register of Protected Areas

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Issue Details			
Drawn By:	NON	Project No.	MDE1189
Checked By:	EO	File Ref:	MDE1189Arc0006F01
Approved By:	AG		
Scale:	1:1,910,000 @ A4	Projection:	ING (Ireland1965.ING)
Date:	15/03/2016		

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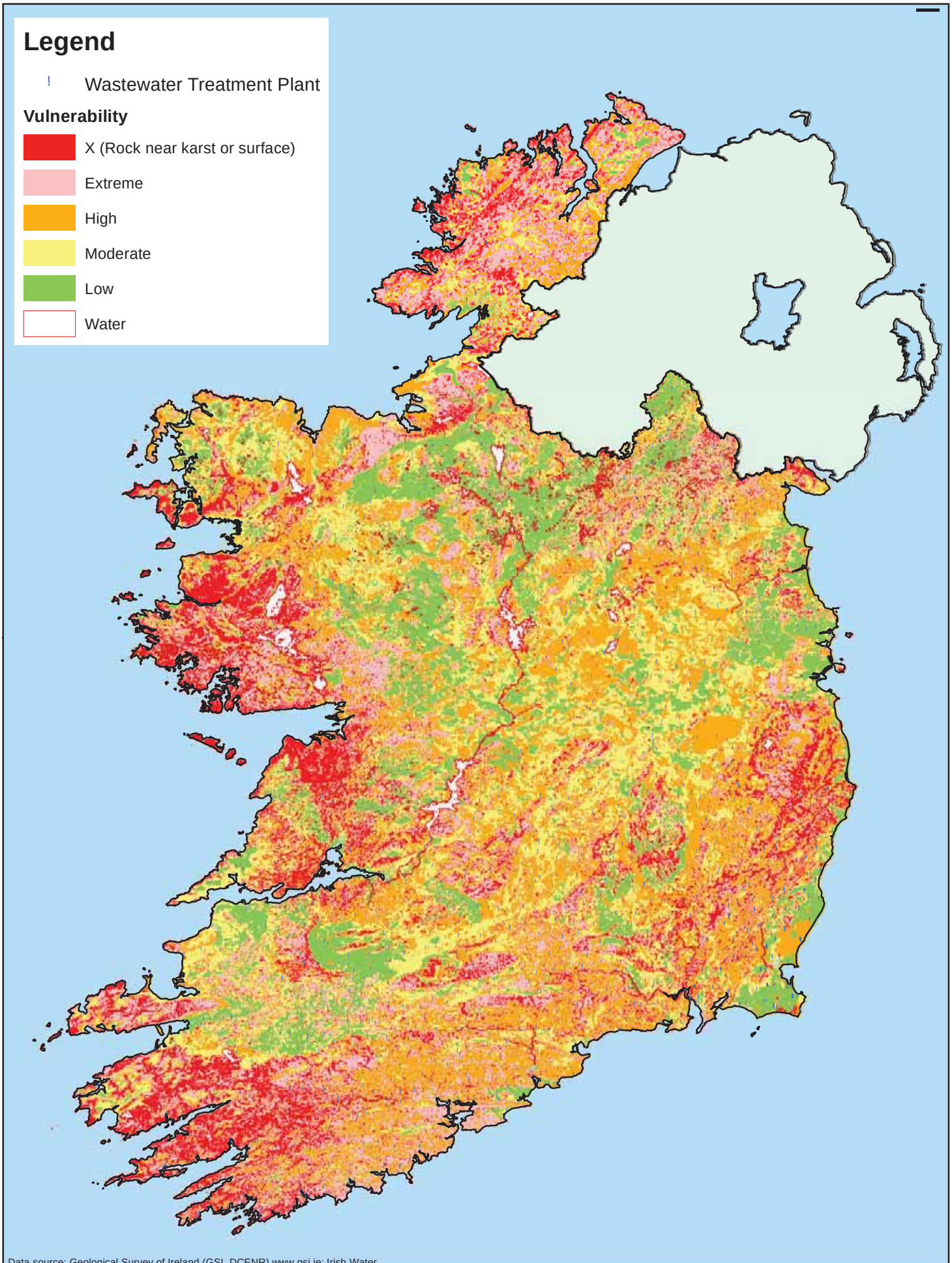

Data source: Geological Survey of Ireland (GSI, DCENR) www.gsi.ie; Irish Water

Title

Figure 6.8 - Groundwater Vulnerability

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Issue Details			
Drawn By:	NON	Project No.	MDE1189
Checked By:	EO	File Ref:	MDE1189Arc0004F01
Approved By:	AG		
Scale:	1:1,900,000 @ A4	Projection:	ITM (IRENET95)
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6.2.7 Air Quality and Climatic Factors

One of the biggest challenges in relation to wastewater sludge management is the relevant forms of energy demand (electricity, heat, chemicals, fossil fuels, transport) and greenhouse gas emissions from off-site transport, treatment and disposal. As such, the key issues related to wastewater sludge management and air quality and climatic factors relates to:

- Direct process emissions from the controlled degradation of organic wastes from aerobic, anaerobic digestion and other treatment processes.
- Indirect emissions from the collection and transport of wastewater sludge by road caused by the burning of fossil fuels in combustion engines, emissions from landspreading practices and odours generated by wastewater sludge management.
- Energy recovery and potential energy generation as an alternative to fossil fuels.

The relative contribution and extent of the direct and indirect emissions is largely dependent on the nature of the wastewater treatment process and the distance and mode of transport involved in transportation.

Air quality impacts can be on a local scale or a regional/national scale. Local air quality impacts such as dusts, bio-aerosols and odours can have significant health and nuisance impacts in the vicinity of the wastewater treatment sludge facilities. These local impacts are typically addressed through the consent processes with restrictions imposed by planning and/or EPA regulation. On a regional scale, both direct and indirect emissions can generate transboundary gases i.e. greenhouse gases such as carbon dioxide (CO_2) and methane (CH_4). Given the geographic scope of the NWSMP this baseline assessment addresses the national scale emissions as local impact will be addressed through the planning, EIA and EPA processes.

6.2.7.1 Air Quality

Ireland has good air quality which is consistently rated among the best in Europe. This is due largely to the prevailing clean westerly air-flow from the Atlantic and the relative absence of large cities and heavy industry.

The Clean Air for Europe (CAFE) Directive (2008/50/EC) deals with each EU member state in terms of "zones" and "agglomerations" for managing air quality. For Ireland, four zones are defined in the Air Quality Standards Regulations (S.I. 180/2011), amended in 2013 to take account of population counts from the 2011 census and to align with the coal restricted areas in the 2012 Regulations (S.I. 326/2012):

Zone A: Dublin;

Zone B: Cork;

Zone C: Other cities and large towns comprising Limerick, Galway, Waterford, Drogheda, Dundalk, Bray, Navan, Ennis, Tralee, Kilkenny, Carlow, Naas, Sligo, Newbridge, Mullingar, Wexford, Letterkenny, Athlone, Celbridge, Clonmel, Balbriggan, Greystones, Leixlip and Portlaoise; and

Zone D: Rural Ireland i.e. the remainder of the State excluding Zones A, B and C.

Monitoring of black smoke was mandatory until 2005, and was revoked on the introduction of the Air Quality Framework Directive and the CAFE Directive, where PM_{10} monitoring has replaced it. Air

quality in Ireland is monitored at 33 stations and in comparison to the rest of Europe is considered good quality. In 2014, measured sulphur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone, particulate matter (PM_{10} and $PM_{2.5}$), heavy metals, benzene and polycyclic aromatic hydrocarbons (PAH) concentrations were all below their individual limit and target values, as set out in the CAFE Directive and 4th Daughter Directive (2004/107/EC). Ireland was however above the tighter World Health Organisation (WHO) guidelines for: PM_{10} (2 locations), $PM_{2.5}$ (2 locations) and ozone (8 locations). The European Environment Agency (EEA) level for PAHs was also exceeded in 2014 (4 locations).

This may have future implications for Ireland should these tighter guidelines become adopted by the EU following the Commission's review of air quality directives[10]. The Clean Air Policy Package was announced by the European Commission in 2014 and will involve a shift in tackling air emissions at source with the possibility of introducing these tighter air quality standards from 2020 onwards.

6.2.7.2 Greenhouse Gases

Greenhouse gases (GHGs) in the atmosphere are rising as a result of human activity. Wastewater treatment, primarily due to high energy processes, has the potential to generate greenhouse gas emissions.

According to the EPA publication "Ireland's Provisional Greenhouse Gas Emissions in 2014", the key highlights published in 2015 indicate that emissions of greenhouse gases in Ireland in 2014 are estimated to be 58.21 Mt CO_{2eq}. This is 0.7 % lower (or 0.42 Mt CO_{2eq}) than emissions in 2013 (58.22 Mt CO2 eq).

Agriculture remains the single largest contributor to the overall emissions at 33.3% of the total. *Transport and Energy* are the second and third largest contributors at 19.5% and 19.1% respectively. The remainder is made up by the *Industry and Commercial* at 15.5%, *Residential* sector at 9.8% and *Waste* at 2.7%.

Wastewater treatment falls under the Waste sector and this sector also includes landfill, waste incineration, open burning of waste and mechanical & biological treatment. The waste sector accounted for 2.7% of Ireland's GHG emissions in 2014.

Agriculture emissions are 1.1% lower (0.21 Mt CO_{2eq}) in 2014 compared with the 2013 levels. The most significant drivers for lower emissions in 2014 are reduced CO_2 emissions from liming on soils (25.9% reduction) and a reduction in nitrogenous fertiliser use (6.1% reduction) which is the main contributor to reduction of N_2O emitted from agricultural soils.

Indirect emissions associated with the collection and transport of sludge can also contribute to GHG emissions. It should be noted that the transport sector was the second largest contributor to overall GHG emissions at 19.5%. However, this transport sector encompasses all transport in Ireland and the transportation of wastewater sludge is not specifically defined.

The EU Commission's proposal following the end of the Kyoto reporting phase in 2012, requires Ireland to deliver a 20% reduction in emissions of GHGs relative to the 1990 levels by 2020. In order

[10] Air Quality in Ireland 2014 – Key Indicators of Ambient Air Quality. EPA (2015).

to determine the distance to target in achieving compliance with this reduction the EPA have carried out sector based projections for GHGs as published in "Ireland's Greenhouse Gas Emissions Projections 2012-2030", (EPA, 2014).

The EPA has published its Greenhouse Gas Emission Projections for 2014 – 2035. It is estimated that non-ETS sector emissions are projected to be 9% - 14% below 2005 levels by 2020. The EPA has projected for the waste sector, GHG emissions are projected to decrease by 20% by 2020 on current levels.

Transport emissions are projected to show strong growth over the period to 2020 with a 13%-19% increase on current levels depending on the level of policy implementation. Agriculture emissions are projected to increase 2% by 2020 on current levels. This reflects the impact of Food Harvest 2020 and removal of the milk quota regime in 2015. Relative to 2005, agriculture emissions are projected to decrease by 5% by 2020.

The European Council, in the context of necessary reductions according to the IPCC by developed countries as a group, reconfirmed in February 2011 the EU objective of reducing GHG emissions by 80-95% by 2050 compared to 1990 levels. To ensure that Ireland can effectively and equitably contribute to the EU objective of reducing GHGs by 80-95% and for the purposes of compliance with EU law, it is necessary to develop a low-carbon development strategy for the period to 2050.

The National Policy Position on climate action sets a fundamental national objective to achieve the transition to a competitive, low-carbon, climate-resilient and environmentally sustainable economy by 2050. The policy states that GHG mitigation and adaptation to the impacts of climate change are to be addressed in parallel national strategies, through a series of National Mitigation Plans and a series of National Climate Change Adaptation Frameworks respectively. Further to the National Policy Position, the Climate Action and Low Carbon Development Bill 2015 sets out the proposed national objective to transition to a low carbon, climate resilient and environmentally sustainable economy by the end of 2050. The Bill sets out provisions which, when enacted, will require the Minister for the DECLG to prepare and submit to Government the first statutory National Mitigation Plan and to renew it every five years thereafter. The provisions contained in the bill will, when enacted, also permit the Government to request the appropriate Government Ministers to submit the sectoral mitigation measures that they propose to adopt within the plan to the Minister for the DECLG. The National Mitigation Plan is currently being prepared and will represent a national plan setting out Ireland's first statutory low carbon development strategy for the period to 2050.

6.2.7.3 Transboundary Gases

Under Article 4 of the National Emissions Ceiling Directive [2001/81/EC], Ireland is required to limit the annual national emissions of SO_2, nitrogen oxides (NO_x), volatile organic compounds (VOC) and ammonia (NH_3) to amounts not greater than the emissions ceilings laid down in Annex 1 of the Directive, by the year 2010 at the latest, and each year after 2010.

Of relevance to this plan are ammonia which is released in low levels directly from wastewater treatment process and NO_x and VOCs which are released indirectly from the transport of wastewater sludge.

Ammonia emissions are associated with acid deposition and the formation of secondary particulate matter. The agriculture sector accounts for virtually all (99%) of ammonia emissions in Ireland. The

emissions in 2013 were 107.8kt which is 0.4% less than emissions in 1990 and below Ireland's national emission ceiling under the NEC Directive of 116kt. Animal manures produce about 87% of ammonia emissions in agriculture and chemical fertilisers and road transport account for the remainder. It is estimated that approximately 17% of the nitrogen in animal wastes and 2% of nitrogen contained in chemical fertilisers is lost to the atmosphere as ammonia.

Emissions of NO_x contribute to acidification of soils and surface waters, tropospheric ozone formation and nitrogen saturation in terrestrial ecosystems. The latest national emissions estimates reported by the EPA are 76.5kt in 2013 compared to Ireland's national emission ceiling under the NEC Directive of 65kt. NO_x emissions have been consistently above the national emission ceiling.

NO_x emissions in Ireland have decreased by 45% between 1990 and 2013 and emissions have decreased by 35.4kt (32%) since 2008. This reduction was achieved due to improved abatement in Moneypoint power plant, reduced demand for clinker/cement and a reduction in fuel used in road transportation. The transport sector, which mainly consists of road transport, is the principal source of NO_x emissions, contributing approximately 53% of the total in 2013. The industrial and power generation sectors are the other main source of NO_x emissions, with contributions of 16% and 11%, respectively in 2013. The remainder of NO_x emissions emanate from combustion in the residential/commercial and the agriculture sectors, which together produced around 20% of the total in 2013.

Volatile organic compounds (VOC) are emitted as gases by a wide array of products including paints, paint strippers, glues, cleaning agents and adhesives and they also arise as a product of incomplete combustion of fuels and, as such, are a component of vehicle exhaust emissions. VOC emissions from manure management in the agriculture sector are included as a new source in the 1990-2013 emissions inventory. Emissions in 2013 were 90kt which are above the EU National Emissions Ceilings (NEC) Directive target of 55kt.

The main sources of VOC emissions in Ireland are from manure management in agriculture and solvent use. These sources combined produce 74% of the annual total in 2013. Coal burning in the residential sector is another important but declining source as coal consumption decreases. Emissions from stationary combustion of fossil fuels across all sectors; power stations, residential, commercial and agriculture account for 17% of national total VOC emissions. Transport emissions account for almost 8% of national total emissions of VOC, mainly from exhaust and fugitive releases from gasoline vehicles.

6.2.7.4 Indirect Emissions

Ammonia emissions that may be affected indirectly as a result of the plan are those emitted directly as a result of the waste water treatment process. Ammonia emissions in waste water derive mainly from the decomposition of urea and uric acid. Excreted urea is hydrolysed to ammonia through the action of microbial urea. Wastewater sludge management under the NWSMP is not anticipated to significantly alter the national emissions of ammonia from the waste water treatment process in Ireland.

Collection and transport of wastewater sludge is a significant part of wastewater sludge management and is mainly by large heavy goods vehicles (HGVs). The extent of the emissions depends on the distance travelled and the fuel used for transport. These road movements generate emissions of air pollutants (NO_x and VOCs) and GHGs (CO_2) which impact on air quality and climate.

Transport in general accounts for 19.5% of total GHG emissions and is of principal concern requiring action to meet 2020 GHG emissions obligations. This mainly consists of road transport but there is no detail available on the contribution of waste transport to this sector. Traffic GHG emissions are projected to show strong growth over the period to 2020 with a 13 – 19% increase on current levels depending on the level of policy implementation. This is attributed to forecasted increases in petrol and diesel use for road transport.

The principal air pollutants of concern from road transport are oxides of nitrogen, particulate matter, carbon monoxide and volatile organic compounds. The transport sector in Ireland (again mainly consisting of road transport) is the principal source of NO_x emissions in 2013, contributing approximately 53% of annual emissions. As above, there is no detail available on the contribution of wastewater sludge transport to this emission total.

6.2.7.5 Energy Recovery

The national renewable energy target for 2020 is for renewable sources to account for 40% of electricity consumption. There is also an EU target under the EU Renewable Energy Directive for renewable energy to account of 16% of final energy use across electricity, transport and thermal energy by 2020; this stood at 7.1% in 2012.

To meet future targets, strong action is needed across all sectors to help reduce GHG emissions. A transition to a lower carbon economy with changes to the fuel mix and improved energy efficiency is necessary as emissions in Ireland will not remain depressed as the global economy starts to uplift and activity levels rise.

The energy requirements for wastewater sludge treatment processes vary with high energy costs associated with thermal drying compared to other treatment options. Effective and safe management of wastewater sludge, utilising its potential for energy generation or reuse where feasible, is identified as a key challenge in Irish Water's Water Services Strategic Plan (WSSP).

6.2.7.6 Existing Environmental Pressures / Problems: Air Quality and Climatic Factors

In general ambient air quality in Ireland is good due largely to the prevailing clean westerly air-flow from the Atlantic and the relative absence of large cities and heavy industry.

Increasing population and the demand for electricity, space heating fuels, construction materials and vehicle ownership are some of the national drivers for air emissions in Ireland. Ireland also has a large agricultural and food export industry, a key driver for ammonia emissions. Expected growth in the agricultural sector as outlined in the Food Harvest 2020 strategy (DAFM, 2010), along with the removal of milk production quotas within the European Union (CEU, 2009) will increase pressure on future emissions to air from this sector (EPA, 2012).

The EU Commission's proposal requires Ireland to deliver a 20% reduction in emissions of greenhouse gases relative to the 1990 levels by 2020. Despite the current economic downturn leading to a marked reduction in Ireland's GHG emissions this 20% reduction on 1990 levels will be difficult to achieve. An integrated approach across a range of sectors, including waste, is required to meet Ireland's EU and International obligations to reduce GHG emissions and to improve air quality.

The latest data from the EPA indicate that emissions of GHGs in Ireland in 2013 were 58.21Mt CO_2 equivalent which represents a decrease of 0.7% on emissions in 2012. The waste sector is the smallest contributor to the overall emissions and presently contributes 2.7% of GHGs and has seen a 10.4% increase in emissions from 2013.

Under the CAFE Directive, Ireland is required to reduce levels of $PM_{2.5}$ by 10% between 2012 and 2020. $PM_{2.5}$ is fine particulate matter and can be emitted directly into the atmosphere or can be formed secondarily. This reduction will be challenging as it will require an integrated approach across a number of sectors including industrial, transport and residential emissions.

The test in meeting Ireland's obligations under the National Emissions Ceiling Directive is greater, in particular for oxides of nitrogen and volatile organic compounds which are currently out of compliance. Transport emissions are the greatest source of oxides of nitrogen and the measures proposed in the National Programme on Transboundary Pollutants will seek to reduce these emissions to below the ceiling limit by 2010 and each year thereafter.

6.2.8 Material Assets

The term 'Material Assets' is not clearly defined in the SEA Directive or indeed the EIA Directive, and this has led to a wide range of interpretations by environmental practitioners and environmental regulators alike. Material assets primarily relate to the infrastructural assets that enable a settlement to function as a place to live and work and can be taken to be infrastructure including settlements (towns and villages etc.), transport and utilities (including wastewater facilities).

For the purposes of this SEA, consideration of material assets has focussed on the following principle areas:

- Existing wastewater sludge management infrastructure;
- Existing transport networks for collecting and transporting wastewater sludge; and
- Wastewater sludge as a resource.

6.2.8.1 Existing Wastewater Sludge Management Infrastructure

Approximately 106,000[11] tonnes of wastewater sludge were reported as being produced at urban waste water treatment plants in 2009. There has been a drop in the quantity of wastewater sludge produced over the last number of years with 53,546[12] tonnes reported by Irish Water in 2014. It is noted however that reporting by Local Authorities in some cases has referred to total 'wet' tonnes of wastewater sludge rather than "tonnes dry solids".

The CSO predicts that the average annual population growth rate during the period 2016-2026 will be between 0.4 and 1% as outlined in their report *Population and Labour Projections 2016-2046* (CSO, 2013). As such the quantity of wastewater sludge produced at WWTPs is likely to increase in line with increased population which presents a challenge to ensure wastewater networks and treatment plants have adequate capacity and are sustainable for wastewater sludge management (**Table 6.5**).

[11] 2009-2014 Sludge Register as reported on by Local Authorities and outlined in National Wastewater Sludge Management Plan
[12] Table 2.1 of National Wastewater Sludge Management Plan

The infrastructure to manage and dispose of wastewater sludge includes:

- Over a 1,000 separate Wastewater Treatment Plants (WWTPs) and collection networks currently process wastewater in Ireland.
- Wastewater sludge satellites and hubs as outlined in **Figure 6.9** and **Table 6.12**.
- Twenty-four[13] existing WWTPs where full wastewater sludge treatment to produce biosolids is provided;
    - 20 of these plants currently act as wastewater sludge hub centres including 5 sites (Carlow, Galway, Kilkenny, Longford and Meath) where lime stabilisation equipment has been installed to produce biosolids.

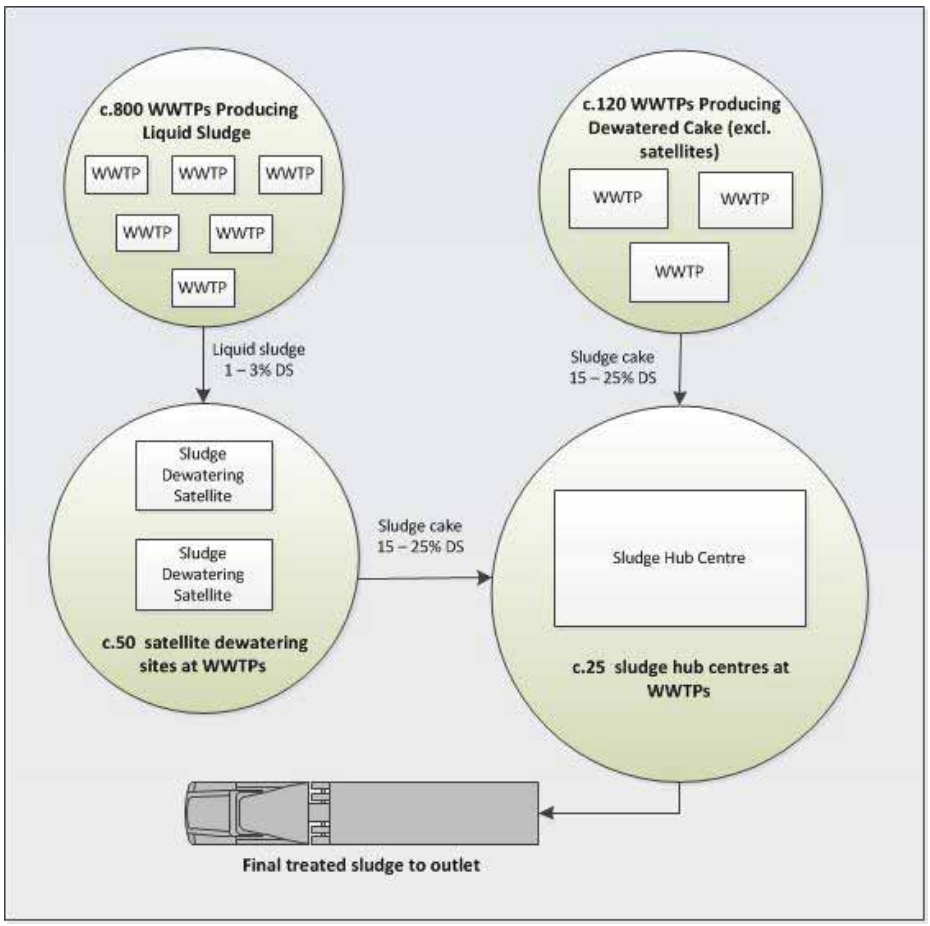


Figure 6.9 [14] – Schematic of Satellite and Hubs

[13] Chapter 7 of National Wastewater Sludge Management Plan
[14] Figure 7.1 of National Wastewater Sludge Management Plan

A summary of the current status of the existing satellites and hubs is outlined in **Table 6.12.**

Table 6.12 – Existing Wastewater Sludge Satellites and Hubs

Local Authority	Wastewater Sludge Hub Centres and Satellites
Carlow	Sludge import facilities at Carlow (Mortarstown WWTP), Tullow and Muinebheag. Temporary sludge treatment (lime stabilisation) at Carlow (Mortarstown WWTP)
Cavan	Sludge import facilities with screening at Cavan; off site treatment and disposal
Clare	Off site treatment and disposal. Sludge import facilities at Scariff
Cork City Council	Sludge treatment at Carrigrennan with no import facilities.
Cork County Council	Separate sludge contracts for four regions with off site treatment. Liquid sludge import facilities at Blarney and Buttevant.
Donegal County Council	Sludge hubs centres with thermal drying complete at Letterkenny and Donegal Town. Hubs include liquid and cake import facilities.
Dublin City Council	Sludge hub centre at Ringsend complete. Liquid sludge import facilities at Ringsend.
Dun Laoghaire Rathdown CC	Sludge treatment at Bray-Shanganagh with no import facilities.
Fingal County Council	Sludge hub centre planned as part of GDD WWTP.
Galway City Council	Sludge treatment with no sludge import facilities.
Galway County Council	Temporary sludge treatment (lime stabilisation) facilities at Tuam.
Kerry County Council	Off site treatment and disposal
Kildare County Council	Sludge hub centre at Osberstown not currently operational. Upgrade of sludge hub centre including liquid and cake sludge import facilities ongoing.
Kilkenny County Council	Kilkenny City operating as sludge hub centre with temporary lime stabilisation.
Laois County Council	Portlaoise sludge hub centre complete. Liquid and cake sludge import facilities at hub.
Leitrim County Council	Liquid sludge import facilities at Carrick-on-Shannon. Off site treatment and disposal
Limerick City Council	Limerick SHC complete. Liquid and cake sludge import facilities at hub.
Limerick County Council	Limerick SHC complete. Liquid and cake sludge import facilities at hub.
Longford County Council	Temporary sludge treatment (lime stabilisation) provided at Longford.
Louth County Council	Sludge hub centres complete in Dundalk and Drogheda. Liquid and cake sludge import facilities at Dundalk hub.
Mayo County Council	Off site treatment and disposal
Meath County Council	Temporary sludge treatment (lime stabilisation) provided at Navan.
Monaghan County Council	Off site treatment and disposal
Offaly County Council	Sludge hub centre complete at Tullamore. Liquid and cake sludge import facilities at hub.
Roscommon County Council	Off site treatment and disposal
Sligo County Council	Sludge hub centre complete. No satellites proposed.
Tipperary CC	Thermal dryer at Clonmel for sludge from South Tipperary. Liquid and cake sludge import facilities at hub, liquid sludge acceptance facilities at Cahir, Carrick-on-Suir, Cashel, Fethard and Tipperary Town. North Tipperary sludge treated off-site
Waterford City Council	Sludge hub centre complete at Waterford City WWTO; no import

Local Authority	Wastewater Sludge Hub Centres and Satellites
	facilities
Waterford County Council	Sludge hub centre complete at Dungarvan with import facilities
Westmeath County Council	Sludge hub centre complete at Mullingar. Liquid and cake sludge import facilities at hub.
Wexford County Council	Sludge hub centre complete at Wexford. Liquid and cake sludge import facilities at hub.
Wicklow County Council	Sludge hub complete at Wicklow with import facilities for sludge cake only. Liquid sludge imports discharged to WWTP.

Source: Table 3.4 of National Wastewater Sludge Management Plan

There are a number of privately-owned wastewater sludge treatment facilities, the majority of which use lime stabilisation. A number of composting and anaerobic digestion facilities also accommodate wastewater sludge imported under service contracts from municipal WWTPs; there are sixteen of these facilities licenced by the EPA under a waste licence. Twenty-two facilities are also registered with the EPA for wastewater sludge treatment and storage under the Waste Facility Permit and Certification of Registration system. Off-site wastewater sludge storage, not licenced under a waste licence or Waste Facility Permit must be registered with the Local Authority under the Certification of Registration system for wastewater sludge storage.

6.2.8.2 Existing Transport Network for Wastewater Sludge

Transportation is a significant part of wastewater sludge management as sludge is transported from WWTP to satellites sites and sludge hub centres for further treatment and onward to outlets for disposal and reuse. Transportation distances can vary due to local factors such as the plant location, type of treatment, recovery location etc. All movements of wastewater sludge and biosolids must be conducted by a holder of a waste collection permit and as such the transportation of wastewater sludge is by registered contractors.

Currently there is no transportation strategy relating to wastewater sludge management and as such this is leading to wastewater sludge being transported by contractors over long distances for further treatment and onward to outlets for disposal and reuse. A more coordinated approach is required to manage and reduce transportation distances as transport related emissions have an impact on air quality and climate.

6.2.8.3 Wastewater Sludge as a Resource

The European Commission has adopted a circular economy model. This approach focuses on reducing waste and resource loss by re-manufacturing, reusing and recycling materials such that one industry's waste becomes another's raw material. This is particularly relevant in the context of reuse of wastewater sludge in agriculture as it reduces the requirement for manufacture and import of chemical fertilizers and provides a sustainable outlet for wastewater sludge.

The management of wastewater sludge presents a challenge to Irish Water in terms of identifying an appropriate management strategy and identifying options that can potentially generate revenue and reduce management costs. Particular challenges include maximising energy recovery in the short term and the development of sustainable products and channels for reuse of by-products in the medium term. The following sections provide an overview of:

- Reuse in Agriculture and Non-Agricultural Land; and
- Energy Usage

Reuse in Agriculture and Non-Agricultural Land

In certain circumstances it is permissible to apply untreated wastewater sludge from waste water treatment facilities to land but in general a number of treatment processes are applied which are outlined below.

Article 3 (3) of S.I. No. 148/1998 - Waste Management (Use of Sewage Sludge in Agriculture) Regulations, 1998 allows that "*untreated sludge may be used in agriculture provided that it is previously injected or otherwise worked into land*". In addition, certain waste activities are exempt from waste licensing by Section 51 of the Waste Management Act 1996 as amended. This exemption applies in certain cases to, *inter alia*, the recovery of wastewater sludge from a facility operated by a local authority for the treatment of water or wastewater; and wastewater sludge for use in agriculture. 'Recovery', for the purpose of Section 51, includes the injection of waste into land for the purpose of benefiting the carrying on of any agricultural or silvicultural activity or an ecological system. Lastly the runoff from uncovered reception areas at alkaline stabilisation facilities accepting untreated wastewater sludge also offers a route for untreated materials to be routinely landspread.

Overview of Available Treatment Processes

Prior to the wastewater sludge being reused on lands there are a number of treatment processes enabling pathogen reduction and ensuring that wastewater sludge is suitable for use in agriculture, they are as follows:

Thermal Drying is undertaken to evaporate water from the wastewater sludge. Thermal drying produces an expensive but stable 'treated' fully pasteurised granular product with a dry solids content greater than 90%. Pathogen die-off is achieved at high temperatures during the drying process. Drying produces a biosolid which can be beneficially recycled to land as a fertiliser. The main advantages of this process are the significant volume reduction of wastewater sludge and the potential for alternative outlets to land-spreading. However there are some disadvantages such as high capital maintenance and operating costs; high energy costs and there is also a relatively high risk of fire associated with thermal drying. There are currently thirteen[15] thermal dryers treating municipal wastewater sludge in Ireland.

Alkaline Stabilisation has been described as *"the addition of lime to dewatered municipal sludge in order to raise the pH and temperature of the mixture. In order to achieve the required level of pasteurisation, the "Code of Good Practice for the Use of Biosolids in Agriculture" requires that the quantity of lime added must; increase the pH above 12 for 72 hours and maintain a temperature of ≥ 52˚C for 12 hours or greater (a higher dose of lime or external heating is required to reach the higher temperatures); or increase the pH to >12 and the temperature to 70˚C for 30 minutes*"[16]. The process of raising the pH and temperate prevents biological action which then inactivates pathogen in the biosolid. While lime is the material most commonly used in Ireland there are other alkaline materials used such as cement kiln dust.

[15] Management Options for the Collection, Treatment and Disposal of Sludge Derived from Domestic Wastewater Treatment Systems, EPA Strive Report Series No. 23 [2007-2013]

[16] Management Options for the Collection, Treatment and Disposal of Sludge Derived from Domestic Wastewater Treatment Systems, EPA Strive Report Series No. 23 [2007-2013]

The main advantages of this process are that is has relatively low capital and operating costs. However there are a number of disadvantages such as higher volume of wastewater sludge for disposal giving rise to additional transport and recycling costs of the lime stabilised wastewater sludge cake to land; potential for inadequate treatment if not properly controlled and monitored; and low nitrogen content and odours due to ammonia release.

The NWSMP outlines that there are a large number of lime stabilisation facilities currently being used for treatment of wastewater sludge. The majority are operated at off-site private facilities taking wastewater sludge and four are located at WWTPs.

Mesophilic Anaerobic Digestion (MAD) has been described as a multistage bacterial process carried out in the absence of free oxygen. It reduces the organic content and the number of pathogens in the wastewater sludge and generates biogas containing methane, carbon dioxide and other trace gases. A positive outcome of this process is that it reduces the volume of the total wastewater sludge mass, therefore reducing costs associated with transport and recycling/ disposal of the digestate. In addition, the methane produced can be utilised as an energy source. However, high capital and operational costs are associated with digestion of wastewater sludge, as well as lengthy retention times. In many cases the operation of these digestion processes has ceased in favour of other treatment options, e.g. alkaline stabilisation, to lower costs. There are fourteen MAD plants currently in use on WWTPs for the treatment of municipal wastewater sludge.

Thermophilic Digestion can occur as aerobic or anaerobic digestion. In the case of anaerobic digestion there is a mean *retention period of at least 48-72 hours in temperature range 50-55^{o}C. It must include a retention period of at least 1 hour at a temperature greater than 70^{o}C followed by a minimum retention period of at least 2 hours at a temperature ≥55^{o}C or of at least 4 hours at a temperature ≥50^{o}C*". In the case of aerobic digestion a *mean retention period of at least 7 days is required and all sludge must be subject to a temperature of ≥55^{o}C for at least 4 hours. It must achieve a reduction of volatile solids of ≥38%*[17]. This digestion process is expensive to operate as it requires additional energy to maintain the higher operating temperatures and has a greater sensitivity to operational and environmental conditions. There are no thermophillic anaerobic digestion facilities in operation by Irish Water but there is one aerobic digestion facility at the Killarney WWTPs.

Composting is a process involving biological degradation and stabilisation of organic compounds under thermophilic conditions. It is undertaken by mixing dewatered wastewater sludge with a bulking agent to provide carbon and increase porosity. The resulting mixture is placed in windrows, static piles or a vessel where microbial activity causes the temperature of the mixture to rise. "*Windrow composting involves retaining the material at 55˚C for at least 15 days and a temperature of ≥ 55˚C must be maintained over five turnings of the material. Static pile composting requires a temperature of ≥ 55˚C to be maintained for at least three days*[15].

Successful composting is dependent on maintaining a number of factors including moisture content of between 50-60%; the addition of bulking agents, a carbon nitrogen ratio of 25-35 and an optimum pH of between 6.5 and 7.2. Composting produces a stable end product which can be beneficially recycled to land as a soil conditioner. There are a number of advantages to this process including relatively low operating costs and an easily handled product, however there are a number of disadvantages such as higher capital cost than alkaline stabilisation; potential for inadequate treatment if not properly controlled and potential for odours.

[17] Table 5.1 of the National Wastewater Sludge Management Plan

Irish Water has does not directly own any composting facilities. There are a number of private sector companies composting municipal wastewater sludge in Ireland, however the relatively lower current cost of the lime stabilisation process is limiting the potential for further expansion of composting facilities for wastewater sludge.

Thermal Hydrolysis is a technology for advanced digestion of wastewater sludge and it provides disintegration and cell lysis upstream of anaerobic digestion. It is a well-known technology for a number of years and a large number of plants have been developed internationally in recent years. There is currently one site in Ireland with thermal hydrolysis of wastewater sludge.

Summary of Quantities of Dry Solids from Wastewater Sludge Treatment

Article 14 of the Urban Waste Water Treatment Directive states that "*sludge arising from waste water treatment shall be reused whenever appropriate and recovery routes shall minimise the adverse effects on the environment*". Accordingly, the primary outlet for wastewater sludge and biosolids from Irish waste water treatment facilities is land application for agricultural benefit. The wastewater sludge and biosolids are typically landspread after treatments as outlined above. **Table 6.13** provides a summary of the quantities of dry solids produced from the various processes.

Table 6.13 – Types of Wastewater Sludge Treatment

Treatment applied	Tonnes Dry Solids/Annum 2014	% Total Dry Solids
Autothermal Thermophillic Aerobic Digestion (ATAD)	226	0.4%
Anaerobic Digestion & Thermal Drying	2,124	4.0%
Anaerobic Digestion & Lime Stabilisation	4,529	8.5%
Anaerobic Digestion & Pasteurisation	4,239	7.9%
Composting	6,206	11.6%
Lime stabilisation	14,815	27.7%
Thermal drying	4,904	9.2%
Thermal Hydrolysis, Anaerobic Digestion, Thermal Drying	14,220	26.6%
Thermal Hydrolysis, Anaerobic Digestion	1,543	2.9%
No treatment	737	1.4%
Total	**53,543**	**100.0%**

Source: National Wastewater Sludge Waste Management Plan.

Once treated there are a number of options for the dry biosolid as outlined in **Table 6.14**. As identified the primary method for wastewater sludge recycling in Ireland is land spreading on agricultural land followed by other uses and then landfill.

Table 6.14 – Summary of End Use of Wastewater Sludge

	2009	2010	2011	2012	2013	2014
Agriculture	66,194	82,670	57,699	68,329	66,022	51,749
Landfill	63	188	304	4	2,866	381
Other Uses (e.g. reedbeds, land remediation, forestry, anaerobic digestion, energy crops, fuel)	40,521	7,133	27,645	4,096	959	1,433
Total	106,778	89,991	85,648	72,429	69,847	53,543

Source: National Wastewater Sludge Waste Management Plan.

As previously discussed in **Section 6.2.4**, treated biosolids are a rich source of nutrients which promote plant growth, thereby providing a low-cost alternative to conventional fertilisers. The organic matter present in the treated biosolids acts as a soil conditioner, which improves the quality of the soil properties. When treated in accordance with the COGP and recycled in accordance with a Nutrient Management Plan, the recycling of biosolids to agricultural land is a beneficial pathway for reuse, in accordance with the Article 14 of the Urban Wastewater Treatment Directive (91/271/EEC).

There are a number of other outlets that can utilise wastewater sludge and biosolids, including cement production, waste-to-energy and land reclamation. These outlets are currently not in use in Ireland and have been further discussed in **Chapter 8, 'Alternatives'**.

Energy Recovery

Wastewater sludge offers the opportunity for recovery of energy through processes such as anaerobic digestion which produces a methane rich bio-gas which can be harvested as fuel. Energy costs for operating WWTPs can be significantly reduced through anaerobic digestion of the wastewater sludge and energy recovery can be further increased when thermal hydrolysis is provided. Anaerobic digestion is currently undertaken at fourteen WWTPs in Ireland. Processes such as incineration and pyrolysis also offer potential for energy recovery. However these technologies have limited availability in Ireland and there is very limited if any potential for this outlet at this time.

6.2.8.4 Existing Environmental Pressures/ Problems: Material Assets

The CSO predicts that the average annual population growth rate during the period 2016-2026 will be between 0.4 and 1%. As such the quantity of wastewater sludge produced at WWTPs will increase in line with increased populations which presents a challenge to ensure wastewater networks and treatment plants have adequate capacity and are sustainable for wastewater sludge management.

Transportation is a significant part of wastewater sludge management and currently there is no transportation strategy which is currently resulting in wastewater sludge being transported over long distances, which has an associated impact on air quality and climate. A more coordinated approach is required to reduce transportation distances and associated transportation costs, which will have positive impacts on reducing carbon footprint, air quality and climate, traffic, odour and noise emissions.

The current outlet for wastewater sludge is almost exclusively agriculture, however this is coming under increasing pressure and the existing landbank available to Irish Water for landspreading of wastewater sludge is likely to reduce. While alternatives do exist for reuse and recovery of wastewater sludge, the majority are not advanced in Ireland to the point where they can offer credible or complete solutions to land spreading.

6.2.9 Cultural Heritage

The main issue for archaeological, architectural and cultural heritage associated with the implementation of the NWSMP is the resulting potential for both direct and indirect impacts on archaeological and architectural features and their settings as a result of siting of wastewater sludge management infrastructure. The key issues associated with sludge management and Cultural Heritage relates to:

- Impacts on archaeological features and setting;
- Potential impacts for unknown archaeological features during construction of new facilities and/or infrastructure upgrades;
- Potential impacts for underwater archaeological features during construction of new facilities and/or infrastructure upgrades.

The sites and features considered as part of the cultural heritage baseline for the NWSMP include those listed on the:

- Record of Monuments and Places (RMP), which is the statutory list of all known archaeological monuments in Ireland as compiled by the Archaeological Survey of Ireland, part of the Department of Arts, Heritage and the Gaeltacht;
- National Inventory of Architectural Heritage (NIAH), which identifies, records and evaluates the post-1700 architectural heritage of Ireland, uniformly and consistently as an aid in the protection and conservation of the built heritage. NIAH surveys provide the basis for the recommendations of the Minister for the Environment, Heritage and Local Government to the planning authorities for the inclusion of particular structures in their Record of Protected Structures; and
- United Nations Educational, Scientific and Cultural Organisation (UNESCO) World Heritage List, which includes cultural and natural heritage sites around the world considered to be of outstanding value to humanity.

Table 6.15 presents the number of features listed on each of these within the counties of Ireland. There are two UNESCO sites within Ireland, Brú na Bóinne in County Meath and Skellig Michael in County Kerry. There are an additional 7 sites which have been submitted on the tentative list; the Burren, Céide Fields and NW Mayo Boglands, the Monastic City of Clonmacnoise and its Cultural Landscape, Early Medieval Monastic Sites (Clonmacnoise, Durrow, Glendalough, Kells and Monasterboice), the Royal Sites of Ireland (Dún Ailinne, Hill of Uisneach, Rathcroghan Complex and Tara Complex) and the Western Stone Forts.

Table 6.15 – Number of Listed/Designated Cultural Heritage Resources in Each County

County	RMP	NIAH	County	RMP	NIAH
Carlow	1,615	291	Louth	2,157	1,347
Cavan	2,350	770	Mayo	8,088	1,470
Clare	7,679	450	Meath	3,543	1,132
Cork	17,357	8,466	Monaghan	1,519	1,257
Donegal	3,397	1,669	North Tipperary	3,472	780
Dublin	2,917	3,475	Offaly	3,296	1,196
Galway	11,198	1,961	Roscommon	5,918	402
Kerry	12,647	859	Sligo	6,153	803
Kildare	2,494	1,582	South Tipperary	4,744	1,251
Kilkenny	3,885	1,920	Waterford	2,787	2,700
Laois	1,603	507	Westmeath	3,674	1,617
Leitrim	2,120	392	Wexford	3,250	2,842
Limerick	7,463	2,050	Wicklow	2,540	1,293
Longford	2,350	841			

Source: National Monuments Service and Buildings of Ireland (retrieved 16/12/2015).

It is recognised that impacts to specific monuments and subsurface unknown archaeology are more appropriately assessed at a project level e.g. proposals for new wastewater infrastructure. At the strategic level of the NWSMP, focus will be on appropriate siting guidance that can alleviate conflict at later stages in the planning hierarchy and contribute to avoidance of risk as far as possible.

6.2.9.1 Existing Environmental Pressures/ Problems: Cultural Heritage

Wastewater sludge management infrastructure resulting from economic growth and increasing population has the potential to place pressure on sites or features of architectural, archaeological or cultural heritage interest. The infrastructure can put direct pressure on this resource, where it is in proximity, or where it increases the potential to interact with known or previously unknown sites and features. Together with the existing pressures on landscape and visual resources, this can result in an impact on the overall cultural heritage resource.

6.2.10 Landscape

Broadly speaking, landscapes are areas that are perceived by people which are made up of a number of layers:

- Landform, which results from geological and geomorphological history;
- Land cover, which includes vegetation, water and human settlements; and
- Human values, which are a result of historical, cultural, religious and other understandings and interactions with landform and land cover.

Ireland is a signatory to the European Landscape Convention, which aims to promote landscape protection, management and planning and to organise European co-operation on landscape issue.

Ireland ratified the Convention in 2002 and it came into effect in 2004. Ireland, as a party to the treaty, is required to undertake general measures to recognise landscapes in law, establish landscape policies with public participation and to integrate landscape into its existing policies, such as regional and town planning.

6.2.10.1 National Landscape Character Assessment

The Department of Arts, Heritage and the Gaeltacht launched the National Landscape Strategy (NLS) for Ireland 2015-2025, in line with Ireland's obligations under the European Landscape Convention. The strategy has been launched following the publication and public consultation of a Strategy Issues Paper in September 2011 and *A Draft Landscape Strategy for Ireland 2014-2024* in July 2014 as required under the screening process for Strategic Environmental Assessment and Appropriate Assessment.

The overall vision of the strategy is stated as:

> "*Our landscape reflects and embodies our cultural values and our shared natural heritage and contributes to the well-being of our society, environment and economy. We have an obligation to ourselves and to future generations to promote its sustainable protection, management and planning*".

The NLS is the means by which the State, working in co-operation with public authorities, stakeholders, communities and individuals, will provide a framework for the protection of the many cultural, social, economic and environmental values embedded in the landscape. The NLS will ensure compliance with the European Landscape Convention (ELC) and it will provide a high level policy framework to achieve balance between the management, planning and protection of our landscape.

Currently Local Authorities conserve and protect scenic value as areas of high amenity, high sensitivity, areas of outstanding natural beauty, protected views and similar designations but the approach is uncoordinated and can lead to different prioritisations in neighbouring counties. Each local authority is responsible for the designation of these within their individual jurisdictions, with each development plan providing objectives to protect such scenic values.

The strategy outlines six key objectives and actions, one of which is to develop a National Landscape Character Assessment. It is proposed that Landscape Character Assessments will be prepared at local and intra-local authority level. These regional and local landscape character assessments will inform and guide landscape policy, action plans and local authority development plans.

6.2.10.2 Land Cover

The main source of national scale information on land cover in Ireland is the EEA/EPA Corine land cover data series, which is an EU-wide inventory of land cover in 44 classes categorised from satellite photography. In 1990 a Corine database of land cover for Ireland was produced. This was updated in 2000 and again in 2006 with the latest update, Corine 2012, published in 2014. The smallest area of land classified under Corine is 25ha, which is quite broad on the scale of Ireland's land mass. The main land cover type in Ireland is agricultural land, which accounts for approximately two-thirds (66%) of the national landmass. Most of this is permanent grassland pastures. Peatlands and

wetlands are the second most widespread land cover type, covering almost one-fifth (20%) of the country, while forested areas covers 11% of the country (EPA, 2012).

Figure 6.10 shows land cover across Ireland in 2012. In 2010, according to the Census of Agriculture, there were almost 140,000 farms in Ireland averaging around 32.7ha in size and covering over 4.5 million ha in total (65% of total land area). Agriculture in Ireland is a resource-rich and primarily grass-based industry with 80% (3.6 million ha) dedicated to pasture, hay and silage. As a result beef and dairy production constitute almost 58% of total agricultural output.

According to Teagasc[18], approximately 80% (3.36 million ha) of agricultural area is devoted to grass (silage, hay and pasture), 11% (0.46 million ha) to rough grazing and the remainder (circa 9% or 0.38 million ha) is allocated to crop production. A recent audit of wastewater sludge management activities was undertaken by RPS[19] on behalf of Irish Water. This outlined that based on the estimated dry solids of wastewater sludge material produced in 2014 a number of assumptions were made which established that 17,739 ha of land is required to accommodate the material. CSO 2014 current landuses identified approximately 280,000ha of cereal growing lands (excluding malting barley) and therefore 6.3% of these lands would be required to accommodate biosolids for land application.

According to the National Forest Inventory, the area of forest is estimated to be 731,650ha or 10.5% of the total land area of Ireland. Since 2006, forest area has increased by 33,810 ha as a result of afforestation. Over half (53.2%) of forests are in public ownership and 46.8% (342,296 ha) are in private ownership. In terms of forest cover as a proportion of the total county land area, County Wicklow has the highest forest cover at 17.7%, followed by Leitrim and Clare at 16.7% and 16.4% respectively.

The DAFM operates a Bioenergy Scheme which has been in place since 2007 to provide grant incentives to farmers to grow miscanthus and willow for the production of biomass suitable for use as a renewable source of energy. From 2007 to 2014, in the region of 3,400 ha of energy crops were established under the Bioenergy Scheme. In the early years of the scheme there was a strong preference for planting miscanthus and in recent years the preference has switched to willow.

6.2.10.3 Existing Environmental Pressures / Problems: Landscape

Existing pressures on landscape and visual resources are primarily related to impacts to sensitive views and landscapes resulting from the secondary impacts from the siting of development. Issues of spatial planning, land use and soil quality are intertwined and interdependent, and this should be reflected in integrated policies and plans at national, regional and local levels.

The main drivers of land use change over the coming decade will be the agricultural policies of afforestation and Food Harvest 2020. The sustainable management of both land use and soils requires an integrated approach from the key statutory bodies. The recently published "National Landscape Strategy for Ireland 2015-2025" will be the means by which the State will provide a framework for the protection of the many cultural, social, economic and environmental values embedded in the landscape with a key action to develop a National Landscape Character

[18] https://www.teagasc.ie/rural-economy/rural-economy/agri-food-business/
[19] Wastewater Sludge Management Audit, 2015 by RPS on behalf of Irish Water

Assessment.

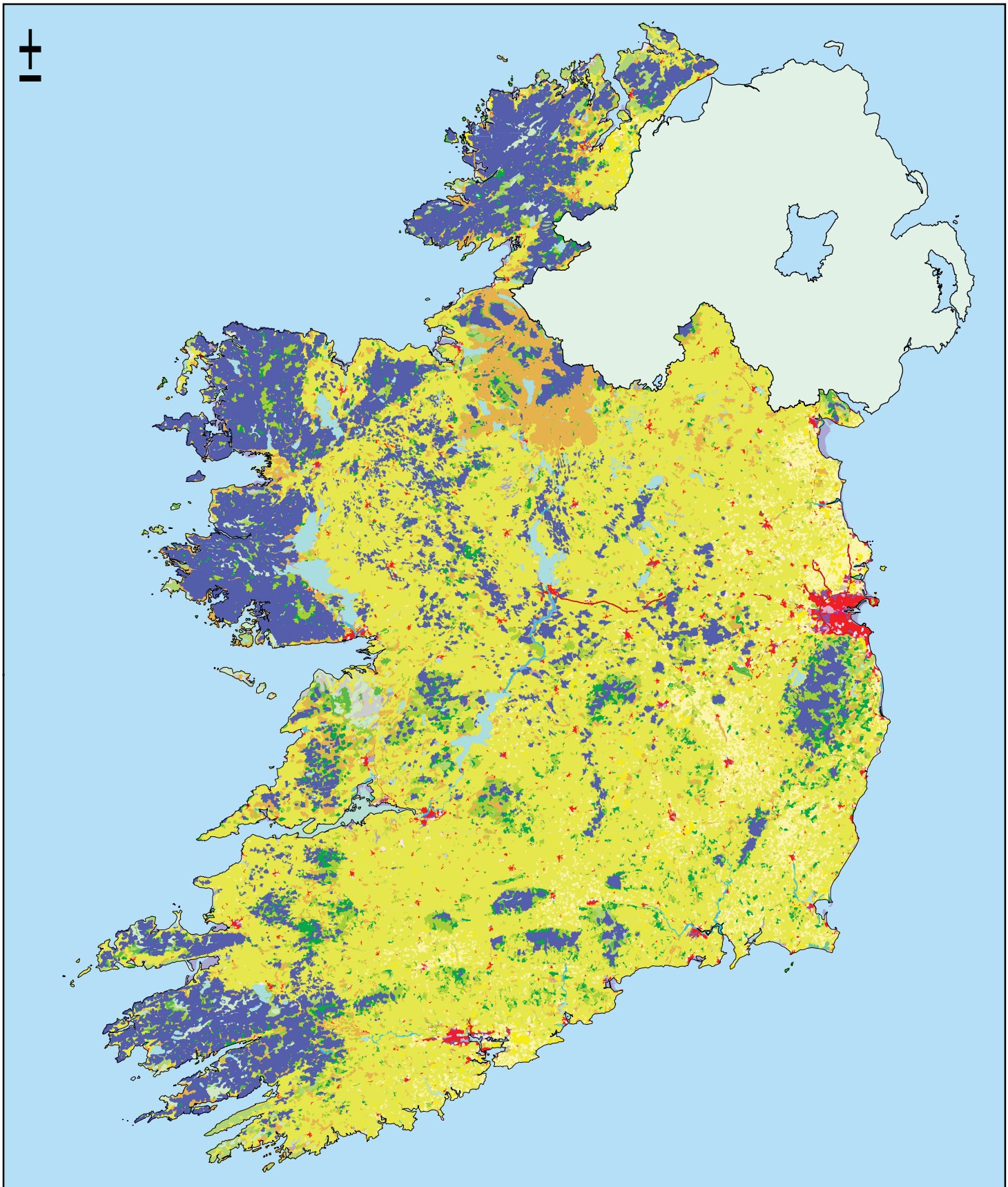
The main issue for Landscape associated with the implementation of the NWSMP is the resulting potential for both direct and indirect impacts on landscape character, areas of outstanding natural beauty, protected views and similar designations. The key issues associated with wastewater sludge management and landscape relates to:

- Impacts on designed landscape;
- Impacts on landscape character as a result of siting new wastewater sludge management infrastructure
- Impacts on cultural heritage resources; and
- Impacts on natural heritage resources and tourism assets which are dependent on the adjoining landscape setting.

The main drivers of land use change over the coming decade will be the agricultural policies of afforestation and Food Harvest 2020. The sustainable management of both land use and soils requires an integrated approach from the key statutory bodies. The recently published "National Landscape Strategy for Ireland 2015-2025" will be the means by which the State will provide a framework for the protection of the many cultural, social, economic and environmental values embedded in the landscape with a key action to develop a National Landscape Character Assessment.

The main issue for Landscape associated with the implementation of the NWSMP is the resulting potential for both direct and indirect impacts on landscape character, areas of outstanding natural beauty, protected views and similar designations. The key issues associated with sludge management and landscape relates to:

- Impacts on designed landscape;
- Impacts on landscape character as a result of siting new wastewater sludge management infrastructure;
- Impacts on cultural heritage resources; and
- Impacts on natural heritage resources and tourism assets which are dependent on the adjoining landscape setting.



Corine Land Cover Type

- 111 Continuous urban fabric
- 112 Discontinuous urban fabric
- 121 Industrial or commercial units
- 122 Road and rail networks
- 123 Sea ports
- 124 Airports
- 131 Mineral extraction sites
- 132 Dump
- 133 Construction sites
- 141 Green urban sites
- 142 Sport and leisure facilities
- 211 Non-irrigated land
- 231 Pastures
- 242 Complex cultivation patterns
- 243 Land principally occupied by agriculture with areas of natural vegetation
- 311 Broad-leaved forest
- 312 Coniferous forest
- 313 Mixed forest
- 321 Natural grassland
- 322 Moors and heaths
- 324 Transitional woodland scrub
- 331 Beaches dunes sand
- 332 Bare rocks
- 333 Sparsely vegetated areas
- 334 Burnt areas
- 411 Inland marshes
- 412 Peat bogs
- 421 Salt Marshes
- 423 Intertidal flats
- 511 Stream courses
- 512 Water bodies
- 521 Coastal lagoons
- 522 Estuaries

Data source: EPA and the European Environment Agency (EEA).

Title

Figure 6.10 - Corine 2012 Land Cover

Project
SEA and AA of the National Wastewater Sludge Management Plan

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ervia

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Issue Details

Drawn By:	NON	**Project No.**	MDE1189
Checked By:	EO	**File Ref:**	MDE1189Arc0007F01
Approved By:	AG		
Scale:	1:2,000,000 @ A4	**Projection:**	ITM (IRENET95)
Date:	15/03/2016		

NOTE:

6.3 INTER-RELATIONSHIP

The interrelationship between the SEA environmental topics is an important consideration for environmental assessment. **Figure 6.11** highlights the key interrelationships identified in this SEA. These potential interrelationships have been taken into account in the assessment of the different alternatives. A key interrelationship is between water and population/human health. The landspreading of wastewater sludge on agricultural land has the potential to generate runoff which can enter receiving waters, impacting on the ecological status of water bodies, invertebrates, plant life and all stages of fish cycles. This has the potential to impact on human health where commercial fisheries may become contaminated.

	Biodiversity Flora, Fauna	Population & Human Health	Food Production & Safety	Soil/ Geology	Water	Air & Climate	Material Assets	Cultural Heritage
Biodiversity, Flora, Fauna								
Population/ Human Health	√							
Food Production & Safety	√	√						
Soil/Geology	√	√	√					
Water	√	√	√	√				
Air & Climate	√	√	X	X	√			
Material Assets	√	√	√	√	√	√		
Cultural Heritage	X	√	X	√	√	√	√	
Landscape	√	√	X	√	√	√	√	√

Figure 6.11 – Inter-relationship between the SEA Topics

6.4 LIKELY EVOLUTION OF THE BASELINE WITHOUT IMPLEMENTATION OF THE NWSMP

The SEA legislation requires that consideration is given to the likely evolution of the current baseline where implementation of the NWSMP does not take place. The NWSMP is a Tier II Implementation Plan which sits below the Irish Water WSSP and as such, where appropriate, the links between these plans will be recognised throughout the SEA and AA of the NWSMP. The NWSMP will set out the short, medium and long-term strategy for management of wastewater sludge produced at WWTPs under the control of Irish Water and will set out a strategy for future capital works, operating procedures, quality control and risk management systems to ensure a sustainable strategy for wastewater sludge management. In the absence of the NWSMP, the pressures identified would continue to impact on existing wastewater infrastructure and investment to drive operational efficiencies and establish long term, secure and sustainable recovery routes and outlets would not occur which in turn could lead to deterioration of existing assets.

Table 6.16 – Likely Evolution of the Baseline without Implementation of the NWSMP

Key Issue	Likely evolution without the NWSMP
Biodiversity, flora and fauna	Without the implementation of the NWSMP the biodiversity, flora and fauna of the region, including protected sites, habitats and species, would continue to exist in much the same pattern, abundance and density as today however there would be continued pressure on biodiversity as a result of issues in relation to the appropriateness of lands suitable for landspreading and the rates and methods of application which result in runoff entering groundwater and surface water, resulting in impact to dependant ecosystems; disturbance to Annexed species (including birds) etc. The implementation of the NWSMP should provide for greater co-ordination between Irish Water and its contractors for the landspreading of wastewater sludge on agricultural land, ensuring that Nutrient Management Plans are carried out, that lands used for spreading are appropriate and avoid designated sites.
Population and human health	The population of Ireland has been predicted to grow to between 4.7 and 5.3 million over the period 2016-2026, an annual average population growth rate of between 0.4 and 1%. The quantity of wastewater sludge produced at WWTPs under the ownership of Irish Water will also increase in line with these predictions, which will result in pressures on the existing wastewater network and treatment plants. Without the NWSMP, it could reasonably be expected that infrastructure needs would not be clear resulting in continued export of wastewater sludge for treatment over considerable distances as the specific infrastructure requirements to address geographic imbalance would not be addressed.
Food Production and Safety	The agri-food sector is one of Ireland's most important indigenous industries. The main outlet for wastewater sludge in Ireland is agriculture with over 98% of wastewater sludge being currently recovered to agriculture. However the available landbank suitable for landspreading of wastewater sludge is expected to come under increasing pressure due to the growing negative sentiment among processors and customers, the number of farms certified under Quality Assurance Schemes where wastewater sludge is prohibited in addition to increasing agricultural outputs to meet the Food Wise 2025 Strategy which is expected to increase the number of farms committing to quality assurance schemes. Food Wise 2025 predicts that over the next decade Ireland can increase the value of agri-food exports by 85% to €19 billion. In the absence of the plan, it is likely that tighter controls would still be put in place in relation to Irish Water contractor management with requirements in relation to improved nutrient management planning, improved levels of monitoring of wastewater sludge and databses and mapping of lands used for landspreading of wastewater sludge however alternative strategies to land spreading would not be advanced.
Soil, Geology and Hydrogeology	In the absence of the NWSMP, the soils, geology and hydrogeology would continue to exist in much the same pattern. There is currently little or no legislation relating directly to soils and soil protection. The COGP would continue to be used. Wastewater sludge and landbanks would continue to be tested in accordance with the requirements of the Sewage Sludge in Agriculture Amendment Regulations (S.I. No. 267 of 2001).
Water	In the absence of the NWSMP, the water quality in Ireland is likely to continue to improve in line with efforts being made by the RBMP and Programme of Measures (PoM) throughout Ireland. The rate of this improvement in surface waters will remain insufficient to meet the requirement of achieving good status in all waters by 2015 as required by the Water Framework Directive and the main challenges: eliminating serious pollution associated with point sources; tackling diffuse pollution; and using the full range of legislative measures in an integrated way to achieve better water quality would remain. The second cycle of the RBMP and PoM would be initiated with continued gains expected regardless of the NWSMP.

Key Issue	Likely evolution without the NWSMP
Air and climatic factors	Air quality in Ireland is of a high standard across the country, meeting all EU air quality standards, according to the EPA. The absence of the NWSMP is not expected to affect this trend. As a result of manmade greenhouse gas emissions, climate change is predicted to occur in the future regardless of action. The UN Intergovernmental Panel on Climate Change (IPCC) in their *Climate Change 2007: Climate Change Impacts, Adaptation and Vulnerability Report* predict sea level rise, changes in rainfall patterns and temperatures as well as changes in the frequency of droughts and extreme weather events. The potential impacts from sea level increases, increased flooding, summer droughts, etc., may impact on wastewater sludge management. In the absence of the NWSMP the uncoordinated approach to provision of wastewater sludge management infrastructure and a wastewater sludge transport strategy to meet demands could result in unnecessary impacts on existing air quality as wastewater sludge may continue to be transported over long distances resulting in emissions to air from transport.
Material assets	The NWSMP incorporates the requirements of existing directives, regulations and measures to reduce pollution. It provides for the coordination of these controls to reduce impacts to the environment and examines how wastewater sludge management activities are impacting the wider environment and the measures needed to address these negative effects. In the absence of the NWSMP, wastewater sludge management on a national level would continue to be managed in a less coordinated manner, thus the cumulative and synergistic impacts on the environment of increasing population figures would continue. Critically the NWSMP will allow for a more coordinated approach to assessing future capital works to manage wastewater sludge nationally and regionally and avoid the unnecessary development of wastewater sludge infrastructure and subsequently ensures a sustainable strategy for wastwater sludge managment.
Cultural Heritage	In the absence of the NWSMP the uncoordinated approach to provision of wastewater sludge management infrastructure to meet demands could result in unnecessary impacts on existing cultural heritage resource. The new framework will enable a greater concentration of resources, while still addressing geographical and other relevant differences.
Landscape	In the absence of the NWSMP the uncoordinated approach to provision of wastewater sludge management infrastructure to meet demands could result in unnecessary impacts on existing designated landscapes. The new framework will enable a greater concentration of resources, while still addressing geographical, land use and other relevant differences.

7 ENVIRONMENTAL PROTECTION OBJECTIVES AND SEA FRAMEWORK

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

In order to streamline the assessment process, this report has used broad themes, based on the environmental topics listed in the SEA Directive, to group large environmental data sets, e.g., human health, cultural heritage and climate. Assigned to each of these themes is at least one high-level Strategic Environmental Objective (SEO) that specifies a desired direction for change, e.g. reduce CO_2 emissions, against which the future impacts of the plans can be measured. These high-level Strategic Environmental Objectives are then paired with specific targets. The progress towards achieving these specific targets is monitored using Indicators, which are measures of identified variables over time.

7.1 DEVELOPMENT OF STRATEGIC ENVIRONMENTAL OBJECTIVES, TARGETS AND INDICATORS

There are essentially three types of objectives considered as part of this SEA. The first relates to the objectives of the plan. The second relates to wider Environmental Objectives, i.e. environmental protection objectives at a national, European and international level (see **Chapter 4**), and finally there are the Strategic Environmental Objectives (SEOs), which were devised to test the effects of the NWSMP on the wider environment.

The assessment is an objectives-led assessment which involves comparing the proposed alternatives against defined SEA Environmental Objectives for each of the identified issue areas. For the purposes of consistency, the draft objectives, targets and indicators proposed for the NWSMP have been based on the objectives, targets and indicators already used for the WSSP. As a Tier II Plan, the NWSMP sits below the WSSP and would have similar context. Only those relevant to wastewater sludge management have been included.

The selected SEOs for this SEA are set out in **Table 7.1**. These environmental objectives are based on the current understanding of the key environmental issues having regard to the environmental protection objectives outlined in **Chapter 4** (and **Appendix B**). A draft set of objectives was included in the SEA Scoping Report prepared for the NWSMP which underwent public consultation in Q2 of 2015. The objectives have been updated prior to the assessment based on feedback from statutory consultees and the public on the draft objectives.

7.1.1 Strategic Environmental Indicators and Targets

The overall purpose of environmental indicators in the SEA is to provide a way of measuring the environmental effect of implementing the Plan. Environmental indicators are also used to track the progress in achieving the targets set in the SEA as well as the Plan itself. Targets were considered over the duration of the baseline data collection and assessment, and throughout the consultation process, in order to meet the SEOs as well as the objectives of the Plan.

The proposed targets and indicators have been selected bearing in mind the availability of data and the feasibility of making direct links between any changes in the environment and the implementation of the Plan. For this reason, where possible targets and indicators have been based on existing published targets such as Ireland's Action Plan for Biodiversity 2011-2016, which set national objectives, targets and indicators to measure Ireland's progress in protecting biodiversity, in line with our commitments under the Convention on Biological Diversity (CBD).

The objectives, targets and indicators associated with each topic area are presented in **Table 7.1**. It is noted that some targets and indicators relate to more than one objective. It is further noted that in certain cases, targets and indicators are not relevant or realistic at this strategic level and where this is the case, this has been noted in the table.

Table 7.1 – SEA Objectives, Targets and Indicators

Environmental Component	Strategic Environmental Objectives (SEOs)	SEA Indicators	SEO Targets	Data Source
Biodiversity and flora and fauna	Prevent damage to terrestrial, aquatic and soil biodiversity, particularly EU designated sites and protected species resulting from Irish Water's activities.	The Status of EU Protected Habitats and Species (Article 17 Conservation Status Assessment Reports due every 6 years, current reports published in 2013) (Ire and NI).	Maintenance / achievement of favourable conservation status for all habitats and species protected under national and international legislation to be unaffected by implementation of the NWSMP[20].	NPWS/ NIEA (6 yearly reporting)
		Provision of appropriate and effective wastewater treatment.	Achievement of WSSP indicators in relation to "operating water services infrastructure in a manner that facilities the achievement of the water body objectives under the Birds and Habitats Directives" *(pg. 48 of the final WSSP).*	Irish Water (yearly reporting)
Population and Human Health (PHH)	Protect and reduce risk to human health in undertaking water services.	Indicators as listed in Chapter 4 and Chapter 5 of the WSSP* *Strategic Objective to Ensure a Safe and Reliable Water Supply (pg. 39-40 of the final WSSP); and* *Strategic Objective to Provide Effective Wastewater Management (pg. 42-43 of the*	In line with WSSP, contribute to the achievement of: • All drinking water areas (including groundwater), as identified on the register of protected areas, to achieve good status, or maintain high status. • All bathing waters, as identified on the register of	Irish Water and EPA

[20] Except as provided for in Section 6(4) of the Habitats directive viz. There must be (a) no alternative solution available; (b) imperative reasons of overriding public interest for the plan to proceed; and (c) adequate compensatory measures in place.

Environmental Component	Strategic Environmental Objectives (SEOs)	SEA Indicators	SEO Targets	Data Source
		final WSSP).	protected areas, to achieve good status, or maintain high status. • All economic shellfish waters, as identified on the register of protected areas, to achieve good status, or maintain high status. • All water bodies designated for salmonids, as identified on the register of protected areas, to achieve good status, or maintain high status. • Long term reduction in drinking water restriction notices.	
Food Production and Safety (FPS)	To contribute to protection of food safety by ensuring the quality of the wastewater sludge product for land spreading on agricultural land.	Audit of contractor compliance with the COGP and the legislation, as a minimum, prior to development of a quality assurance scheme.	To develop a quality assurance scheme for all Irish Water wastewater sludge to ensure that only treated and tested wastewater sludge of suitable quality is used for land spreading on agricultural lands.	Irish Water
Water (W)	Prevent deterioration of the status of water bodies with regard to quality and quantity due to Irish Water activities and contribute towards the improvement of water body status for rivers, lakes, transitional and coastal waters and groundwaters to at least good status, as appropriate to the Water Framework Directive.	Indicators as listed in Chapter 4 and Chapter 5 of the WSSP* *Strategic Objective to Ensure a Safe and Reliable Water Supply (pg. 39-40 of the final WSSP); and* *Strategic Objective to Provide Effective Wastewater Management (pg. 42-43 of the*	In line with WSSP, contribute to the achievement of: • No deterioration in status of waters currently with high or good status (WFD Objective). • Restoration to good status of waters currently at moderate, poor or bad status (WFD Objective). • Progressively reduce chemical	Irish Water and EPA

Environmental Component	Strategic Environmental Objectives (SEOs)	SEA Indicators	SEO Targets	Data Source
		final WSSP).	pollution in waters (WFD). • Limit pollution inputs to groundwaters and prevent deterioration (WFD Objective).	
Air and Climatic Factors (AQ)	Minimise contributions to climate change and emissions to air (including greenhouse gas emissions) as a result of Irish Water activities and ensure the resilience of water supply and treatment infrastructure to the effects of climate change.	*EN1b on pg. 59 of the final WSSP* - Preparation and implementation of the Sustainable Energy Strategy. % increase in overall energy efficiency at Irish Water facilities.	Improve energy efficiency by 33% by 2020 (from the 2009 baseline).	Irish Water
		Number of complaints received related to odour.	Compliance with odour criteria to prevent deterioration in amenity beyond the site boundary for wastewater infrastructure and minimise emissions to air from wastewater sludge spreading.	Irish Water
		EN1c on pg. 59 of the final WSSP - Preparation and implementation of the Climate Change Adaptation and Mitigation Strategy)	Ensure resilience of infrastructure to the effects of climate change.	Irish Water
Material Assets (MA)	Provide new, and upgrade existing, wastewater management infrastructure to protect human health and ecological status of water bodies.	Wastewater services investment expenditure per annum.	Increase investment in wastewater management infrastructure.	Irish Water

Environmental Component	Strategic Environmental Objectives (SEOs)	SEA Indicators	SEO Targets	Data Source
Soil and Geology (SG)	Avoid conflicts with, and contribute towards, the appropriate management of soil quality and quantity.	Audit of contractors compliance with the COGP and the legislation, as a minimum, prior to landspreading.	Accurate Nutrient Management Plan (NMP) for all lands proposed for spreading of Irish Water wastewater sludge.	Irish Water [through annual audit and quality control / assurance system). Also input from Relevant Local Authorities
Cultural Heritage (CH)	Avoid damage to cultural heritage resources resulting from Irish Water's activities.	Implementation of Strategy EN1e [Adherence to environmental and planning legislation]. Any change in the condition of monuments on the Record of Monuments and Places due to Irish Water activities.	No unauthorised physical damage or alteration of the context of cultural heritage features due to Irish Water activities.	Irish Water Archaeological Survey of Ireland Sites and Monuments Record
Landscape (L)	Avoid damage to designated landscapes resulting from Irish Water's activities.	Compliance with WSSP Strategy EN1e [Adherence to environmental and planning legislation]	Avoid damage to designated landscapes as a result of NWSMP implementation.	Irish Water

***See Appendix C**

8 ALTERNATIVES

8.1 INTRODUCTION

The consideration of alternatives is a requirement of the SEA Directive (2001/42/EC). It states under Article 5(1) that;

Where an environmental assessment is required under Article 3(1), an environmental report shall be prepared in which the likely significant effects on the environment of implementing the plan or programme, and reasonable alternatives taking into account the objectives and the geographical scope of the plan or programme, are identified, described and evaluated. The information to be given for this purpose is referred to in Annex I.

The term 'reasonable' is not defined in the legislation. Good practice points to the analysis of 'alternatives' as being a constructive and informative exercise for the policy makers, and that only 'possible' options for policy are examined.

Alternatives are required to take into account the objectives of the plan. The alternatives study therefore must operate within the strategic objectives, set out for the plan, and provide an examination of alternative means of implementing the plan. Section 3.14 of the DEHLG Guidelines[21] notes that the higher the level of the plan, the more strategic the options which are likely to be available.

The Directive does not prescribe at what stage consideration of alternatives should be undertaken, however, to present a useful input into the plan making process, all guidance points to considering alternatives as early as possible. Guidance also recognises that multiple layers of alternatives may exist, particularly for plans of this nature.

8.2 APPROACH TO ALTERNATIVES FOR THE NWSMP

Early discussion of possible alternatives was undertaken as part of the scoping for the NWSMP, which was the subject of public consultation. This chapter of the Environmental Report considers alternatives in greater detail and outlines the reasonable alternatives which have been developed through the evolution of the draft NWSMP. Both the NWSMP Team and the SEA/ AA Team have been conscious of the need for iteration in this regard and consideration of alternatives therefore started early in the process by considering strategic needs initially before considering policy alternatives. The draft NWSMP is not prescriptive about location of future outlets or specific technologies to be used in wastewater sludge management therefore these types of alternatives have not been addressed.

8.3 ASSESSMENT PARAMETERS

The approach used for assessing alternatives for the draft NWSMP was an objectives-led assessment. Each alternative has been assessed against a set of strategic environmental assessment

[21] Implementation of SEA Directive (2001/42/EC): Assessment of the Effects of Certain Plans and Programmes on the Environment, DEHLG 2004

objectives (See **Chapter 7, 'Environmental Protection Objectives and SEA Framework'** for details of the objectives). The assessment compares the likely impacts in terms of the Strategic Environmental Objectives to see how alternatives perform in relation to the stated environmental objectives.

For the purposes of the alternatives assessment:

- Plus (+) indicates a potential positive environmental impact;
- Minus (-) indicates a potential negative environmental impact;
- Plus/minus (+/-) indicates that both positive and negative environmental impacts are likely or that in the absence of further detail the impact is unclear; and
- Zero (0) indicates neutral or no environmental impact.

The following notation is used in the assessment tables: BFF (biodiversity, flora and fauna); PHH (population and human health); FPS (food production & safety); SG (soils & geology); W (water); AQ (air quality); CF (climatic factors); MA (material assets); CH (cultural heritage) and L (landscape).

Under each alternative a discussion is presented to support the assessment parameters shown and the reason for choosing the preferred alternative. Assessments include qualitative and where possible quantitative information.

8.4 STRATEGIC ALTERNATIVE

At the strategic level, it is noted that the NWSMP is a Tier 2 Plan within the Irish Water Planning and Environmental Assessment Hierarchy for Waste Services as outlined in **Figure 4.1**. These Tier 2 Plans derive from the Water Services Strategic Plan, a Tier 1 Plan required under Section 33 of the Water Services No. 2 Act of 2013. This represents the highest tier of asset management plans for Irish Water. The Tier 2 Plans are not statutorily required but rather detail Irish Waters implementation strategies for the WSSP. Given that there is no statutory requirement for the NWSMP, consideration has been given to the "do nothing" as an alternative under strategic considerations in the SEA.

8.4.1 No Plan versus NWSMP

The basic framework for wastewater sludge management has significantly altered since the establishment of Irish Water in 2013. Prior to that, wastewater sludge management was the remit of the various Local Authorities, acting as Water Service Authorities (WSA). These authorities were responsible for the treatment and recovery of wastewater sludge in accordance with the requirement of the relevant EU legislation including the Urban Waste Water Treatment Directive [91/271/EEC] and the Nitrates Directive [91/676/EEC] and their national implementing regulations.

Local Authorities formulated and adopted individual wastewater sludge management plans which addressed the management and control of wastewater sludge, quality and quantities, suitable lands for reuse, reuse options, storage and transportation. This was done at the county level.

With the setting up of Irish Water, the focus has shifted to national level planning for wastewater sludge and an overall national wastewater sludge management response.

Significant Impacts

Overall the development of a national plan is anticipated to be positive across all environmental receptors as the auditing and monitoring of facilities and activities will reduce the incidence of poor practice and increase consistency within the system. Possible avenues of poor practice have been identified to include incorrect liming in the treatment process of wastewater sludge, Nutrient Management Plans that did not necessarily reflect the requirements of the legislation and spreading in inappropriate conditions. The development of a national management plan with appropriate monitoring will improve practices across the sector which will lead to indirect positive impacts for the receiving environment.

One of the potential negative impacts associated with a national approach is the potential for greater separation distances between the source of the treated wastewater sludge and suitable spread lands. This could potentially lead to wastewater sludge being hauled over long distances with little or no benefit. Transport related emissions are also likely to increase with indirect impacts on air quality and climate. There is some indication of this significant transport of wastewater sludge from recent auditing by Irish Water.

The draft NWSMP will also look at capacity of existing infrastructure for treatment of wastewater sludge and identify gaps on a national top down level. Initial audits of infrastructure including wastewater sludge treatment plants, sludge hub centres and sludge satellites indicate fewer treatment facilities along the west and southwest areas. This is leading to increased transport from provincial wastewater treatment facilities. The draft NWSMP will address this geographic imbalance leading to better servicing of the west and southwest areas and ultimately less transport related emissions, although it is acknowledged that availability of spread lands in the west are limited by geology and as such may pose a significant environmental risk. The provision of infrastructure must therefore be in the context that the least environmentally damaging option may be to haul material further in some cases.

Without the NWSMP, it could reasonably be expected that infrastructure needs would not be clear resulting in continued export of wastewater sludge for treatment from facilities along the west coast. Monitoring of contractors and facilities would likely be more local with no opportunity to identify cumulative impacts or realise cumulative benefits from existing practices.

	BFF	PHH	FPS	SG	W	AQ	CF	MA	CH	L
No Plan	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-
NWSMP	+	+	+	+	+	+/-	+/-	+	+	+

Preferred Alternative and Reasons for Choosing the Preferred Alternative: The preferred alternative is the development of a NWSMP. This plan will provide a clear and transparent approach to the management of wastewater sludge at a national level. Importantly it will also standardise the requirements and expectations for contractors charged with collecting and spreading treated wastewater sludge, including the ensuring that the lands chosen are appropriate and that the contractor is adhering to best practice in use of the sludge.

Mitigation: Contracts should ensure that wastewater sludge is transported and spread on the nearest suitable spread lands to the source of the sludge to reduce impacts to air quality and climate.

8.5 WASTE WATER SLUDGE MANAGEMENT ALTERNATIVES

The options in relation to wastewater sludge management relate mainly to treatment, transport and reuse or disposal. Transport permeates both treatment and reuse / disposal as the level of treatment applied at the point of generation (i.e. the WWTP) has significant implications in terms of volume of material to be transported and similarly the geographic spread of treatment facilities can dictate the distance to be travelled for treatment. Similarly transport is also a consideration for reuse or disposal in terms of the location of the available outlets.

The following sections consider the reasonable alternatives in terms of transport, treatment and disposal with a view to informing the overall preferred strategy for the NWSMP.

8.5.1 Transport Alternatives – Wastewater Sludge Volumes

The wastewater treatment process generates sludge which require further treatment prior to reuse or disposal. Wastewater sludge is primarily the organic by-product of the biological treatment of wastewater, and comprises organic and inorganic solids removed during the treatment processes and may contain microbiological and chemical contaminants. In Ireland there are 1,232 WWTPs under the remit of Irish Water[22]. This includes large scale plants serving a P.E of over 100,000 including sites at Ringsend, Cork, Waterford, Shanganagh, Dundalk, Limerick, Kilkenny and Drogheda, as well as much smaller plants in rural locations serving P.E of less than 50. The number of smaller WWTPs in particular has posed a challenge for the management of wastewater sludge. Many of these WWTPs are too small to warrant full or partial on-site treatment facilities and the liquid wastewater sludge must therefore be transported off-site to other treatment facilities before reuse or disposal.

Transportation is a significant part of wastewater sludge management in terms environmental impacts including generation of GHG emissions, odour, noise and indeed traffic movements. The need to undertake transportation in a sustainable manner is identified in the WSSP which states that "*Transport and reuse/disposal of all wastewater sludge will be managed by Irish Water to ensure compliance with our standards for treatment and disposal by registered contractors with full traceability*." However, reduced transport must be seen in the context of environmental and social impacts of additional wastewater sludge infrastructure at a greater number of dispersed sites. Possibly the first consideration must be in relation to reducing the overall volume of wastewater sludge requiring transport. The options considered in this regard relate to: transport of unthickened wastewater sludge versus further on-site thickening, dewatering and/or treatment prior to final disposal. The second consideration is in relation to the optimum distance to treatment facilities. The options considered in this regard relate to: provision of satellite centres versus transport directly to a wastewater sludge hub centre.

To inform the optimum transport strategy for wastewater sludge generated in Irish Water WWTPs, the lifecycle cost for transport versus further on-site thickening, dewatering and/or treatment prior to final disposal was reviewed by Irish Water to establish economically viable transport distances. The Irish Water review and assessment of the recommended maximum transport distances considered size of plant, distance to satellite centre and type of treatment process. In addition to this life cycle analysis, an independent audit of wastewater sludge management was undertaken in 2015 by Irish Water in order to assess the current levels of compliance, identify any issues and make

[22] Received from Irish Water January 2016

recommendations for improvements. The audit included an assessment of wastewater sludge treatment facilities, both on Irish Water WWTP's and off-site treatment facilities, an audit of off-site wastewater sludge storage facilities and an audit of wastewater sludge reuse activities. The results of this audit have informed the considerations below.

The main alternatives in relation to transport are transport of un-thickened wastewater sludge versus wastewater sludge volume reduction and provision of a network of regionally focussed treatment options versus the existing dispersed model.

8.5.1.1 Transport of Unthickened Wastewater Sludge versus Wastewater Sludge Volume Reduction Prior to Transport

Wastewater sludge volume reduction is provided at WWTPs to reduce the cost of transport of wastewater sludge from the treatment process. The reduction of wastewater sludge volumes is provided mainly by thickening and dewatering processes, however storage and use of reed beds can also provide volume reduction.

Un-thickened Wastewater Sludge: There are two outputs from the wastewater treatment process: treated effluent; and liquid sludge with a dry solid (d.s.) content of 0.7-3%. The treated effluent is typically released, to receiving waters while the liquid sludge is then either treated further on-site through a process of thickening (d.s. content of 2-6%) and dewatering (d.s. content of 14-30%) or it is shipped off-site for similar treatment at facilities operated by Irish Water or other third parties. For smaller treatment plants, (< 500 p.e), storage may be facilitated within the process if there is room. Alternatively storage may require the provision of separate dedicated storage tanks. The removal of wastewater sludge from these tanks is then a function of the level of treatment and the volume of available storage space.

Thickened Wastewater Sludge: Wastewater sludge thickening can take place at different point in the process depending on the level of treatment involved. Generally where secondary treatment occurs, wastewater sludge is normally removed from the process stream at <1% d.s. while with primary wastewater sludge it is removed at approximately 2-3% d.s. The main technologies used in Ireland for wastewater sludge thickening include: picket fence thickeners consolidation tanks; drum thickeners and gravity belts. The preferred technology is a function of the size of the population being served and the distance to the nearest satellite. Dewatering as the name implies, seeks to remove water (which adds both significant volume and mass in terms of transportation) from the sludge remaining after wastewater treatment. The main processes currently in use in Ireland are: belt presses; centrifuges; and sludge drying beds. There are 177 No. WWTPs reported as having sludge dewatering installed. In general, existing WWTPs with a current PE over 3,000 have dewatering in place, however there are a number of WWTPs with a PE of less than 2,000 which also have dewatering. On-site wastewater sludge reed beds are another version of dewatering and have been provided in Ireland in recent years and are operating successfully. Wastewater sludge reed beds are considered beneficial in smaller remote WWTPs where the cost of transport of wastewater sludge to a satellite dewatering site is unsustainable.

Significant Impacts:

In overall terms the reduced volume of wastewater sludge achieved by thickening and dewatering prior to transport will bring positive environmental benefits by reducing the number of tanker movements required thereby reducing transport related emissions including GHG.

The total volume of wastewater sludge from treatment plants is estimated to be in the order of 900,000m^3/annum with the majority of this from local authority operated WWTP. Analysis undertaken in preparation of the NWSMP indicates that there is potential to reduce the volume of wastewater sludge for transport by 20 to 25% by optimising thickening at smaller WWTPs. Alongside this there are a large number of sites with existing wastewater sludge storage tanks where sludge thickening could be optimised by automating the decant process.

Reducing the volume of wastewater sludge for transport would represent a significant saving in terms of emissions to air, climate, energy usage in transport and reduced pressure on the road infrastructure. This in turn would have a long-term positive impact on air quality and climatic factors associated with wastewater sludge management. GHG emissions have a direct impact in terms of climate change with indirect impacts on population, human health, biodiversity and material assets as a result of increased flooding. NOx, SOx and particulate matter have short, medium and long-term effects on human health in particular but also on biodiversity as a result of deposition and acidification.

An example is provided in **Table 8.1** to demonstrate that the extent of the impact of transporting wastewater sludge (thickened and unthickened) is largely dependent on the volume of material to be transported. The average GHG emissions per mass of material transported by road have been devised by Department for the Environment, Food and Rural Affairs, UK (Defra)[23] and were used to calculate the kg of CO_2 for each of four scenarios. It is clear that with increased thickening of liquid wastewater sludge there is a decrease in the number of vehicles required to remove the sludge offsite and a direct relative reduction in the kg of CO_2 having a positive contribution toward the reduction of GHG emissions. The energy required to treat the wastewater sludge has not been accounted for in these calculations.

Table 8.1 – Scenario on Transport of (thickened and unthickened) Sludge

Scenario	Description	No. Truck Movements*	Transport GHG Emissions (kg CO_2)
Transport of Liquid Wastewater Sludge 3000m^3 (1% d.s)	Transport of liquid wastewater sludge from a WWTP for further treatment within 100km.	150	13,264
Partial On-site Treatment to thickened Liquid – 1000m^3 (3% d.s.)	Transport of thickened liquid wastewater sludge from a WWTP for further treatment within 100km.	50	4,421
On-site Treatment to Wastewater Sludge Cake - 150m^3 (20% d.s.)	Transport of wastewater sludge cake from a WWTP for further treatment within 100km.	7.5	663
On-site Treatment to thermally dried 31.5m^3 (95% d.s.)	Disposal of treated wastewater sludge to an outlet within 100km	1.6	141

*It has been assumed that a tanker has 20m^3 capacity

As demonstrated by the sample scenario, the GHG transport emissions are inversely proportional to the level of on-site treatment. The relative differences would change depending on the location of the WWTP and off-site treatment facility.

[23] DEFRA 2012 GHG Conversion Factors, 0.88433kg CO_2 per vehicle per km (Assumption 7.5-17 tonne vehicle weight, 39% weight laden)

Transport related emissions have the potential for negative impacts on the terrestrial and aquatic environment and on biodiversity, flora and fauna from deterioration in air and water quality and from disturbance of habitats. The contribution of transport to GHG emissions also has consequences for climate change and in particular flooding which in turn has negative impacts for population, human health, biodiversity and material assets.

It is important to note that the full or partial on-site options have, themselves, potential for negative effects which would be felt locally as new infrastructure would need to be built resulting in land use changes, emissions to air and water (albeit controlled), disturbance of biodiversity, flora and fauna and populations. Any additional infrastructure locally will have the potential for some emissions, locally compared to the scenario where liquid wastewater sludge is transported to off-site facilities (see previous example for comparison). However, these impacts should not be significant as they will be controlled by the licensing / planning systems. Any emissions would be within licensed emission levels and / or planning conditions that are based on standards intended to protect human health and the environment.

Full or partial onsite options may also require energy for treatment with indirect negative impacts on air and climate as a result and this needs to be weighed against savings in GHG emission from transport. Simple partial treatment using settlement possibly offers the greatest balance as it would not require significant energy to dry materials but the number of truck movements would decrease significantly compared transport of liquid wastewater sludge. The balance becomes more challenging as energy costs (financial and environmental) for drying are considered against emissions savings from the reduced transport. However, any facility with the potential for energy recovery will have environmental benefits by offsetting the use of other fossil fuels, which may in some cases be regarded as renewable energy.

However, it is important to note that the provision of new or upgraded infrastructure, itself, may have potential for negative effects which would be felt locally resulting in land use changes, emissions to air and water (albeit controlled), disturbance of biodiversity, flora and fauna and populations. Reed beds for example may result in increased odour in the local area. The option of wastewater sludge reed beds as an alternative technology to transportation of liquid wastewater sludge may provide a sustainable solution, for smaller plants, particularly where there are long transport distances to a satellite dewatering centre.

	BFF	PHH	FPS	SG	W	AQ	CF	MA	CH	L
Transport of Liquid Wastewater Sludge	+/-	+/-	0	+/-	+/-	+	+	+	+/-	+/-
Transport of Thickened / Dewatered Wastewater Sludge	+/-	+/-	0	+/-	+/-	+	+	+	+/-	+/-

Preferred Alternative and Reasons for Choosing the Preferred Alternative: The preferred alternative is thickening and dewatering to reduce the wastewater sludge volumes requiring transport.

Mitigation: It is recognised that economic analysis must be a feature of decision making in relation to the operation of WWTPs and wastewater sludge reuse. However, in considering the level of treatment at a given site, a balance needs to be achieved between the capital and operating costs of

partial or full treatment and the cost of wastewater sludge transport. In some cases technologies such as containerised dewatering units or mobile dewatering are suitable for reducing wastewater sludge volumes where a permanent dewatering installation is not economically justified. These partial options must be considered as part of a thorough cost benefit analysis on a site by site basis to ensure that the greatest reduction possible in terms of transport related impacts is achieved. In considering the suitability of sites for the provision of thickening/ dewatering account should be taken of environmental considerations relating to odour, traffic, emissions to water and land use change prior to a final decision at site level.

8.5.2 Wastewater Sludge Infrastructure Alternatives

The principal alternatives in terms of treatment infrastructure relate to maintaining the status quo whereby each local authority area is considered on an individual basis versus consolidation of infrastructure into a network of satellites and hubs.

The use of a 'Hub-centre and Satellite-site' system for the management of wastewater sludge has been implemented in a number of counties in Ireland. The approach has been used to allow for economies of scale and greater flexibility in the selection of treatment processes, particularly energy recovery and also assists in the maintenance of quality control over the outputs from any selected treatment processes. This system of satellite and hubs is also commonly used internationally and the current status of hub and satellite-site systems in Ireland is summarised in **Table 6.12** within **Section 6.2.8.**

Significant Impacts:

The DELG document, *Sludge Management Plans: A Guide to their Preparation and Implementation (DELG 1998)* recommended the adoption of a 'hub-centre and satellite-site' system for the treatment of wastewater sludge. The system, which is used internationally, provides for wastewater sludge from outlying rural works to be directed via intermediate WWTP (satellite dewatering sites) where sludge is dewatered prior to transfer to a centralised treatment facility (the sludge hub-centre). The dewatering of wastewater sludge at the satellite-sites reduces onward transport costs and traffic movements, thereby having the potential to contribute to overall reduction in GHG emissions. There are a total of 24 wastewater sludge hub and treatment centres in Ireland where full treatment to produce biosolids is provided. The majority of these are being operated by DBO contractors.

The principle benefit of providing an improved network of satellite sites and hub centres with a more regional focus is the reduction in volume of wastewater sludge material achieved thereby reducing the number of truck movements required to transport unthickened wastewater sludge. This is particularly important for rural areas where provision of thickening and dewatering processes may be unviable given the P.E. being served or the location of the WWTP. Given the highly dispersed nature of the population in Ireland and the large volume of WWTPs of varying size, the provision of an intermediate step offers many advantages.

The negative effect relates to the requirement for an improved network of satellite and hubs which may mean new infrastructure or upgrades to existing infrastructure leading to localised traffic, odour, and noise nuisance if in proximity to population centres and / or clusters. There could also be negative impacts on landscape due to land use change but the level of impact will depend on the chosen location and the size of the facility that is being constructed.

There will be positive effects in relation to material assets as through improved access to a 'Hub-centre and Satellite-site' system there will be more options for de-watering of the wastewater sludge. This will have knock on positive impacts on air quality and climate change as it is hoped that there will be less vehicle movements required to transport the wastewater sludge.

	BFF	PHH	FPS	SG	W	AQ	CF	MA	CH	L
Maintain status quo	+/-	+/-	0	+/-	+/-	+/-	+/-	+/-	+/-	+/-
Improve regional access to treatment infrastructure	+/-	+/-	0	+/-	+/-	+/-	+/-	+/-	+/-	+/-

Preferred Alternative and Reasons for Choosing the Preferred Alternative: The preferred alternative is to provide improved regional access to a network of satellites and hubs.

Mitigation: The selection of new locations for 'Hub-centre and Satellite-site' systems will require detailed assessments on a site by site basis to establish suitability. This assessment must take into account the environmental, social and financial impacts of any proposal. A review of other constraints such as existing operational contracts must also be taken into account.

8.5.3 Reuse and Disposal Alternatives

Currently the majority of wastewater sludge in Ireland is reused on agricultural land, however, as noted earlier, Irish Water is looking at a range of outlet options for wastewater sludge in the medium to long term. Alternative outlets has to be viewed in the context of current and future outlet options as currently a number of reasonable options are not established in Ireland to any significant degree and as such only hold future potential.

There are two primary outlets for wastewater sludge in Ireland. These are:

- Reuse on land; and
- Waste to Energy – incineration, pyrolysis and gasification

Historically a number of other outlets did exist for wastewater sludge including both dumping at sea and landfill. Up to 1999 some wastewater sludge was disposed of to sea mainly from the Ringsend Treatment Plant. Disposal of wastewater sludge at sea has however been terminated. This disposal route for municipal wastewater sludge is not a sustainable or permissible option and is not considered further. The 1999 EU Landfill Directive sets mandatory targets for the reduction of biodegradable waste to landfill. EPA landfill licenses reflect these requirements and attach conditions that limit or preclude the disposal of wastewater sludge to landfill. Therefore, as disposal to landfill is being phased out, this disposal route for municipal wastewater sludge is not a sustainable option for the future and is not considered further. The following sections consider reuse options in greater detail.

Currently the principle outlet is reuse on agricultural lands as can be seen in **Table 8.2**, which also shows the other outlets currently used for wastewater sludge and the proportional share of the overall wastewater sludge load going to these outlets. **Figure 8.1** provides European context and it

can be seen that agriculture and incineration are the two main destinations for the majority of wastewater sludge in Europe (data from 2012 as 2013 returns reported on EuroStat are incomplete).

Table 8.2 – Summary of Wastewater Sludge Register Data

	Quantity (tonnes dry solids)			
Year	Agriculture	Landfill	Other (e.g. forestry etc.)[1]	Total
2009	66,194	63	40,521	106,778
2010	82,670	188	7,133	89,991
2011	57,699	304	27,645	85,648
2012	68,329	4	4,096	72,429
2013	66,022	2,866	959	69,847
2014	51,749	381	1,433	53,543

Notes: 1. Sludge reported as "other" in 2014 is all sludge in storage.

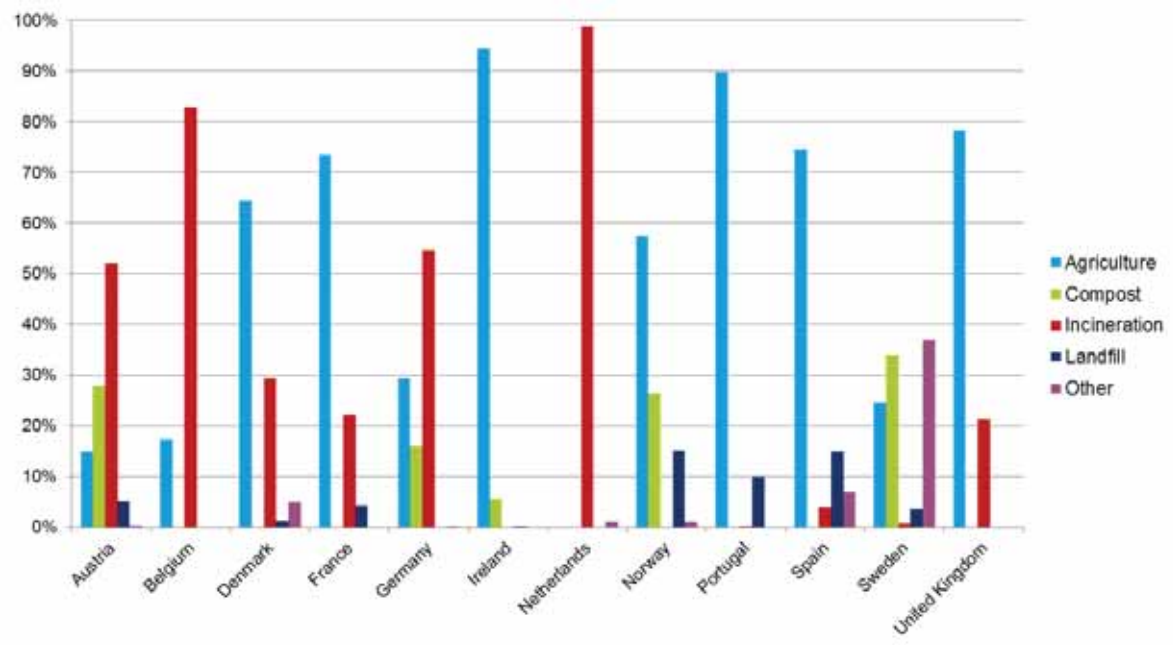


Figure 8.1 – Wastewater Sludge Outlets in Europe (2012)

8.5.3.1 Reuse on Land

Reuse on Agricultural Land

Under Article 14 of the Urban Wastewater Treatment Directive, it is stated that *"sludge arising from wastewater treatment shall be reused whenever appropriate. Disposal routes shall minimise the impacts on the environment."* Reuse on agricultural land has been a significant outlet for wastewater sludge, particularly following the ban on disposal at sea in the late 1990s and the

constraints placed on landfill in the early 2000s. In fact, over 98% of wastewater sludge produced at Irish WWTPs is currently reused on agricultural lands.

There are recognized advantages to the use of treated wastewater sludge in agriculture. The principle one relates to the nutrient cycle in soils. Plants take up nutrients from the soil as they grow. When plants are harvested many of the nutrients associated with their growth are removed also. The plants, or products derived from them, are consumed directly and indirectly by humans and animals and many of the plant nutrients are assimilated in animal or human growth. However, not all nutrients are used in these processes and as a result some are released in waste and enter the wastewater stream and ultimately are found in wastewater sludge. If these nutrients can be returned to the soil, it completes the natural cycle, replenishing those lost when plants are harvested or removed by feeding livestock. Of particular interest from an agricultural perspective is the presence of quantities of both phosphorus and nitrogen in the wastewater sludge, two nutrients which are regularly applied to land as inorganic fertiliser to aid plant growth. An available organic source of these nutrients offers significant cost and soil fertility advantage to famers. Other important nutrients are also present e.g. potassium.

Conversely there are concerns surrounding the application of wastewater sludge on agricultural lands. A 2008 report[24] from the Food Safety Authority noted that in the absence of strict control measures, the land-spreading of organic agricultural and organic municipal and industrial materials on agricultural land used for food production may pose risks associated with microbiological and chemical hazards, to food safety. Specifically the report references "*mismanaged, untreated, inadequately treated, or recontaminated organic agricultural and organic municipal and industrial materials*" as risks to food safety with possible subsequent contamination of foods either directly or indirectly.

The DELG produced a Code of Good Practice for the Use of Biosolids in Agriculture (COGP)[25] in an effort to set guidelines for the treatment and use of wastewater sludge in agriculture. The COGP applies nationally although research by Cre in 2013[26] reported that while the vast majority of Local Authorities were making it a requirement in contracts a minority were not doing so. The same report highlighted exemptions and provisions in the regulations which were not completely in line with the COGP. It is Irish Water policy to comply with the COGP and compliance is a requirement on all contracts awarded by Irish Water.

Not all sludge derived from wastewater treatment facilities are equal in agricultural reuse terms and this is reflected in various regulations and codes of practice in operation. If wastewater sludge is intended for use as a fertiliser on agricultural land, it must undergo some form of treatment to stabilize the material and ensure it does not pose a risk to human health or the environment. This is most often achieved for sludge from WWTPs through a form of drying or lime stabilisation, although there are a number of methods as described in **Section 6.2.8**. The resulting material is termed a biosolid and can be spread in line with the regulations and COGP. It is noted that the COGP states in Part 2, Section 1.5 that untreated wastewater sludge should not be landspread or injected into soil. This is at odds with the Waste Management (Use of Sewage Sludge in Agriculture) Regulations, 1998 and the Waste Management (Use of Sewage Sludge in Agriculture) Regulations, 2001 which state

[24] Food Safety Implications of Land-spreading Agricultural, Municipal and Industrial Organic Materials on Agricultural Land used for Food Production in Ireland, Food Safety Authority of Ireland, 2008
[25] Code of Good Practice for the Use of Biosolids in Agriculture, Guidelines for Farmers, Department of the Environment and Local Government, Fehily Timoney Consultants (COGP)
[26] The Management of Sewage Sludge in Ireland. Cre, 2013.

that untreated wastewater can be used in agriculture provided that it is previously injected or otherwise worked into land.

In terms of heavy metals and nutrients, the main restrictions for reuse of wastewater sludge in agriculture are set out in **Tables 8.3 and 8.4**. Other factors impacting suitability of land for agricultural use include potential for run-off, pH values and levels of heavy metals.

Table 8.3 – Maximum Annual Rates of Application of Parameters in Wastewater Sludge

Parameter	Limit Value (kg/ha/yr)	Legislation
Cadmium	0.05	SI 267 of 2001
Copper	7.50	SI 267 of 2001
Nickel	3.00	SI 267 of 2001
Lead	4.00	SI 267 of 2001
Zinc	7.50	SI 267 of 2001
Mercury	0.10	SI 267 of 2001
Chromium	3.5	SI 267 of 2001
Nitrogen[1]	0-225	SI 31 of 2014
Phosphorus[1]	0-125	SI 31 of 2014

Notes: 1. Nutrient application rates are dependent on land use and nitrogen and phosphorus indices as detailed in S.I. 34 of 2014

Table 8.4 – Maximum Levels of Parameters in Soils

Parameter	Mg/kg of dry matter in a representative sample[1]	Legislation
Cadmium	1	SI 148 of 1998
Copper	50	SI 148 of 1998
Nickel	30	SI 148 of 1998
Lead	50	SI 148 of 1998
Zinc	150	SI 148 of 1998
Mercury	1	SI 148 of 1998

Notes: 1. Values applicable to soil with a pH from 5 to 7. Where the pH of the soil is consistently higher than 7, the values set may be exceeded by not more than 50%, provided that there is no resulting hazard to human health, the environment or, in particular, ground water.

The type of agricultural land typically used for land spreading of wastewater sludge is tillage land used for animal feeds. Approximately two-thirds of cereals produced in Ireland are used for animal feed and are thus considered suitable for wastewater sludge. Pasture land is subject to restrictions and as such considered less suitable for use. The use of treated wastewater sludge on horticultural lands is not allowed under the COGP. Some, limited use, is allowed under legislation (SI 148 of 1998, Article 5).

Overall the use of agricultural land is broadly considered a sustainable option for management of the treated wastewater sludge for which this draft NWSMP is concerned. For the avoidance of doubt this does not relate to untreated sludge or agricultural sludge. Treated wastewater sludge presents a reasonable source of nutrients and presents an alternative to commercial fertiliser. Furthermore it can improve soil condition and contribute to improved plant growth and biomass generation. The

benefits of treated wastewater sludge are however linked to their application in line with the existing COGP and legislation which require appropriate nutrient management planning.

Impacts on water quality could also have a negative effect on drinking water supplies and ultimately human health. There could be impacts from leaching of heavy metals, nutrients and pathogens to soil and water following landspreading if the requirements of the COGP are not complied with.

It is noted that there is considerable and growing opposition from sectors of the food industry to the use of wastewater sludge on agricultural lands. The concerns relate to the use of wastewater sludge on agricultural lands and the lack of statutory basis for the COGP. Therefore, there is the potential for negative impacts on food safety and population in the absence of tightening controls on current practices.

	BFF	PHH	FPS	SG	W	AQ	CF	MA	CH	L
Reuse on Agricultural Land	+/-	-/0	-/0	+/-	0/-	0	0	+	0	0

Reuse on Energy Crops

Reuse on lands growing energy crops is currently not a significant outlet for wastewater sludge. It is applied for similar reasons as agricultural land spreading, to provide fertiliser to increase yields of energy crops[27],[28]. Energy crops are typically low cost, low maintenance and and high-yielding crops which are grown to use their biomass as a source of energy. These include high yielding perennial members of the grass family of plants (such as miscanthus) or trees, such as willow and poplar that will re-grow after they have been cut to the ground. Such crops are harvested, dried and burnt as fuel source for electricity or heat production. The nutrient requirements are similar to any other crops producing large amounts of biomass. Wastewater sludge can provide these nutrients, which would otherwise be supplied by artificial fertiliser or animal manure, and in doing so may offer increased profitability.

Government has supported the development of energy crops. The Department of Agriculture, Food and the Marine operates a Bioenergy Scheme to provide grant incentives to farmers to grow miscanthus and willow for the production of biomass suitable for use as a renewable source of energy. The department has had the scheme in place since 2007 however there has been very low uptake and the scheme is currently being reviewed by the department. For 2015 the scheme focused exclusively on the growing of willow.

In 2014, there were approximately 1,500 acres of willow plantation and 2,500 ha committed to miscanthus production[29]. Willow plantations (known as short rotation coppice, abbreviated as SRC) have higher nutrient requirements and require three times more water uptake than miscanthus, therefore indicating their potential suitability of SRC for bioremediation of wastewater sludge. The application of wastewater sludge to SRC offers an alternative sustainable sludge recycling route, while also providing low cost fertiliser to facilitate biomass production. Studies indicate that, when

[27] Energy Crops Manual 2010

[28] Management Options for the Collection, Treatment and Disposal of Sludge Derived from Domestic Wastewater Treatment Systems STRIVE 2012-W-DS-9 Prepared for the Environmental Protection Agency By Ryan Hanley Consulting Engineers

[29] DAFM Annual Review & Outlook for Agriculture, Food and the Marine 2013/2014

managed correctly, willow plantations successfully take up nutrients with no liquid discharge following wastewater sludge recycling to land. It is noted however that cultivation of energy crops themselves can alter the hydrological regime causing indirect negative impacts on water quality and biodiversity sensitive to water levels. This factor must be borne in mind in terms of possible in combination effects arising from use of wastewater sludge on energy crops. As with all other outlets, the suitability of the site and the application methods and rates must be established in the first instance before land spreading can be safely undertaken.

Current regulatory procedures relating to the use of land for energy crop production, serve as a disincentive to the development of energy crops for wastewater sludge. Energy crops are not included in the definition of agriculture in the Waste Management (Use of Sewage Sludge in Agriculture) Regulations, 1998 (S.I. 148/1998) - these regulations were published before the more recent growth in interest in energy crop production. The Waste Management (Facility Permit and Registration) (Amendment) Regulations 2008 (S.I. No. 86 of 2008) includes wastewater sludge spreading to energy crops as potentially availing of the relief (exemption) for beneficial recycling. However, the EPA requires that a "certificate of registration" is required from the local authority to recycle wastewater sludge to willow coppice. This places additional costs upon energy crop operations. In line with the mitigation measures included in the Regional Waste Management Plans, on foot of requirements in the associated SEA and AA, these certificate of registration must now undergo screening for Appropriate Assessment. This is positive as it reduces the risk to European Sites which may be connected to the proposed site.

The regulations and COGP therefore cover the recycling of wastewater sludge to mainstream agricultural land and crops but do not cover recycling of wastewater sludge to non-food crops such as willow. Energy crops are included in the definition of agriculture in a number of European documents, such as Ireland's National Nitrates Action Programme. The recognition of energy crop production in the Waste Management (Use of Sewage Sludge in Agriculture) Regulations would rationalise and simplify the procedures around the recycling of wastewater sludge to energy crops.

The Tillage Sectoral Energy Crop Development Group indicates that the priority for energy crops is to unlock the potential market for up to 67,000 ha of all energy crops to meet Ireland's 2020 renewable energy targets. However, the energy crop recycling route is likely to only cater for a small percentage of future municipal wastewater sludge volumes, unless, among other things the regulatory barriers to using this route are addressed.

Inappropriate application of wastewater sludge for use on energy crops could give rise to run-off and potential negative impacts to surface and/ or groundwater leading to deterioration in water quality and consequently negative impacts to water dependant ecosystems. Impacts to water quality could also have negative effect on drinking water supplies and ultimately human health having a negative impact on population and human health. There could also be impacts from leaching of heavy metals, nutrients and pathogens to soil and water following the application of wastewater sludge.

The application of wastewater sludge on soils to grow energy crops would be positive for material assets as the provision of wastewater sludge would facilitate the growth of energy crops and negate the need to acquire other forms of fertiliser. However due to the process, requiring compliance with the EPA 'certificate of registration' there is very limited interest.

There is the potential for secondary positive impacts on population from increased bioenergy usage and the provision of more renewable sources of energy. Whilst the use of wastewater sludge on

energy crops would alleviate food safety concerns there is the potential for negative impacts in the absence of a nutrient management system being in place for wastewater sludge spread on energy crops.

	BFF	PHH	FPS	SG	W	AQ	CF	MA	CH	L
Reuse on Energy Crops	+/-	+/-	+	+/-	+/-	+	+	+	0	0

Reuse on Forestry Lands

Reuse on lands containing forestry is not an outlet that is currently used in Ireland for wastewater sludge. The Irish Water Wastewater Sludge Register for 2014 confirms very limited forestry applications were recorded. The COGP states that biosolids can be applied to soils prior to planting forestry and also that it can be used as a fertiliser on growing crops, including forestry, however the COGP also states that biosolids should not be applied to forestry in upland areas due to artificially drained, thin, poor acidic soils. It does however outline that lowland forestry areas can be utilised for spreading.

There is differing guidance and regulations across Europe[30] in relation to the application of wastewater sludge for forestry lands. In Germany the use of forestry land is prohibited, while in Denmark wastewater sludge is permitted in cultivated forests based on a need for fertilisation. In the United Kingdom it has been applied to forestry to increase the fertility of soils and improve foliar nutrition and forest productivity with the most recent 'Information Note' being produced by the Forestry Commission in 2006.

The impacts presented are similar to those outlined for reuse on energy crops. Inappropriate application of wastewater sludge could give rise to run-off and potential negative impacts to surface and/ or groundwater leading to deterioration in water quality and consequently negative impacts to water dependant ecosystems. Impacts to water quality could also have negative effect on drinking water supplies and ultimately human health having an indirect negative impact on population and human health. There could also be impacts to water quality from leaching of heavy metals, nutrients and pathogens to soil and water following the application of wastewater sludge.

Site suitability is key to establishing forestry as a feasible outlet. As with energy crops, forestry can have its own impacts on the receiving environment and in particular the hydrological regime as a result of the significant drainage works which are often required in commercial forestry. Acidification of the receiving waters and release of suspended solids are also a concern in relation to forestry operations and these impacts could give rise to in combination effects with application of wastewater sludge. The underlying geology, tree species and site characteristics determine much of the suitability of a site for forestry and this information is included in forestry applications to the DAFM. Such applications do undergo screening for Appropriate Assessment however it is not clear if application of wastewater sludge as a fertilizer would require any further consent. The Forestry and Water Quality Guidelines published by the Forest Service, DAFM do contain specific measures regarding fertiliser application including measures to protect permanent or seasonal streams, rivers and lakes (aquatic zones) from fertiliser discharge.

[30] EC Disposal and Recycling Routes for Sewage Sludge 2001

There would be positive impacts on material assets as the provision of wastewater sludge would facilitate improved forest production and follicular health and negate the need to acquire other forms of fertiliser. There is the potential for positive impacts on air quality and climate also where there is reduced need for artificial fertiliser production, and increased biomass production contributing to reduced CO2 levels and medium to long term benefits for climate.

	BFF	PHH	FPS	SG	W	AQ	CF	MA	CH	L
Reuse in Forestry	+/-	+/-	+	+/-	+/-	+	+	+	0	0

Reuse for Land Reclamation

Land reclamation through wastewater sludge provides the possibility of restoring derelict or degraded land, whilst stabilising soil and promoting the growth of vegetation. It therefore has the potential to prevent soil erosion. Wastewater sludge contain organic matter and nutrients, which encourage vegetation growth and therefore aid soils that lack nutrients.

There are stringent measures required prior to land reclamation including site suitability and risk assessments. Even though there are limited quantities of land suitable for land reclamation, it still provides the benefits of allowing non-food e.g. energy crops, to be grown. An example of land reclamation which has occurred in Ireland is Galmoy Mine in Kilkenny. This underground zinc and lead mine has tailings cells with a combined surface area of 33 ha. Rehabilitation started in 2007 using 127,000 tonnes of organic substrate including 2,600 tonnes of limed biosolid. The rehabilitated land now supports good vegetative cover.

The use of wastewater sludge for land reclamation is positive for biodiversity, population, soils and material assets as it provides a natural fertiliser that can be used to generate new growth on the lands. However as with reuse on energy crops or forestry there is the potential for direct negative impacts on biodiversity, water and soils and indirect negative effects on drinking water supplies and ultimately human health from run-off if applied inappropriately. There is also the possibility of impacts from leaching of heavy metals, nutrients and pathogens to soil and water following the application of wastewater sludge.

	BFF	PHH	FPS	SG	W	AQ	CF	MA	CH	L
Reuse on Agricultural Land	+/-	-/0	-/0	+/-	+/-	0	0	+	0	0
Reuse on Energy Crops	+/-	-/0	+	+/-	+/-	+	+	+	0	0
Reuse in Forestry	+/-	-/0	+	+/-	+/-	+	+	+	0	0
Land Reclamation	+/-	-/0	+	+/-	+/-	0	0	+	-/0	+

8.5.3.2 Thermal Recovery

It is acknowledged that thermal recovery can cover incineration (waste to energy), co-incineration (cement kilns), pyrolysis, gasification and others technologies.

Incineration is a combustion process in which waste, including wastewater sludge (at a minimum of 25 to 30% dry solids for the process to be self-sustaining) are burned in the presence of excess oxygen to form carbon dioxide, water and ash. Fuel is always required during start-up and is normally required intermittently as the solids content and calorific value of the feed varies. The heat generated from the process can be removed and used for heat or to generate electricity. There is one incinerator currently operational in Ireland, the facility in Carranstown, County Meath. Further facilities are in development at Poolbeg, Dublin and Ringaskiddy, Cork. These facilities may provide outlets for disposal of wastewater sludge. Once more capacity comes on-stream, incineration of wastewater sludge presents a viable alternative to reuse on land.

Both pyrolysis and gasification turn wastes into energy rich fuels by heating the waste under controlled conditions. Whereas incineration fully converts the input waste into energy and ash, pyrolysis and gasification deliberately limit the process so that combustion does not take place directly. This converts the waste into valuable intermediates that can be further processed for materials recycling or energy recovery. No pyrolysis and gasification facilities have yet been developed in Ireland. According to the 2014 Irish Water Sludge Register, no wastewater sludge was disposed of in waste to energy facilities in Ireland. As outlined in **Figure 8.1**, the use of incineration is a common approach to the disposal of wastewater sludge and the majority of European counties use it as a form of disposal for a proportion of their wastewater sludge.

Cement Production can use wastewater sludge as an alternative fuel source. The production of cement involves combusting fuel with calcium oxide, silicon dioxide, aluminium oxide, and iron oxide in a high temperature environment to form a clinker which is milled to form cement. Wastewater sludge can displace some of the fuels normally used and provides an alternative fuel to clinker production. However, the wastewater sludge must be dried to be used in the process and therefore a high amount of energy is required to dry the wastewater sludge. Sludge have been trialled[31] as feedstocks to cement production facilities at Lagan Cement, Kinnegad and are a permitted feedstock (EWC 19 08 05) at that facility by the EPA IPC licence P0487-06.

The use of wastewater sludge in thermal recovery facilities has both positive and negative impacts on the environment. The energy output from the combustion of the wastewater sludge has long term positive impacts on material assets, population and human health from the production of heat and electricity and the displacement of fossil fuels. In addition, the ash generated can be utilised by the cement industry displacing mined materials. However, there are negative impacts on material assets as there are high costs involved in drying the wastewater sludge for cement production which would contribute to the increase of emissions to the atmosphere. There are negative impacts on biodiversity and soils as the nutrient content of the wastewater sludge is not captured and released back into the soil but instead is converted to energy.

It is noted that certain recovery processes can give rise to by-product such as fly ash and bottom ash (from Waste to Energy). In the case of fly ash, this is considered hazardous material and is exported for disposal in appropriate facilities. The export of fly-ash for disposal has the potential to impact negatively on AQ and CF as a result of transport related emissions. The disposal of this material also

[31] Presentation by Lagan Cement at CIWM open day at Lagan cement Ireland, 22 April 2010.

has potential for negative environmental impacts, particularly in relation to AQ, water, soils, BFF and PHH. It is acknowledged that risks related to these impacts would currently be borne by the country accepting this waste as Ireland does not have facilities to deal with this material. It is noted that such facilities would be subject to licensing and permitting regimes in the host country therefore significant impacts are not anticipated.

Bottom ash is not considered hazardous and can be landfilled in non-hazardous landfills in Ireland, a practice which is ongoing. In addition bottom ash may be reused in the production of construction blocks as is the practice in the Netherlands. This reuse of materials would give rise to positive environmental impacts.

	BFF	PHH	FPS	SG	W	AQ	CF	MA	CH	L
Thermal Recovery	+/-	+/-	+	+/-	+/-	+/-	+/-	+	0	0

Preferred Alternative and Reasons for Choosing the Preferred Alternative: Following review and assessment of the various reuse and thermal recovery options, no one specific alternative is considered to be superior to the others. All reuse options are considered feasible, subject to a review of site suitability on a case by case basis and specifically consideration of impacts to human health, water and soil quality and biodiversity, flora and fauna relevant to the quality of the wastewater sludge product being reused. Thermal recovery also offers a feasible alternative in the medium to long-term.

Of note is the lack of resilience in terms of alternatives in the short-term, with little or no alternative to land spreading on agricultural land. Until such time as thermal recovery options and other reuse outlets are more fully developed, reuse on agricultural lands is the only viable alternative available to Irish Water.

Mitigation

- Inconsistencies between the COGP and the Regulations should be addressed by Irish Water through their Standard Operating Procedures.
- Further research into alternative reuse outlets should include consideration of wider environmental impacts including biodiversity, water, soils, human health and food safety as a minimum with a view to developing Specific Standard Operating Procedures for reuse.
- It is recommended that Irish Water formally liaise with the Regional Waste Authorities and suppliers in relation to thermal recovery capacity.

8.6 OVERALL PREFERRED STRATEGY

The NWSMP proposes to develop the network of hub treatment sites and satellite dewatering plants, with hubs optimised on a regional rather than county basis. The preferred option is reuse with primary focus in agriculture on tillage lands used for animal feed crops. Alternative options, such as energy crops, forestry etc. will be developed where possible.

9 ASSESSMENT OF PREFERRED STRATEGY

The purpose of this section of the Environmental Report is to evaluate as far as possible the likely significant effects on the environment and to set out measures envisaged to prevent, reduce and as far as possible offset any significant adverse effects on the environment of implementing the NWSMP.

9.1 ASSESSMENT APPROACH

The preferred strategy identified at the end of Chapter 8, 'Alternatives' has been progressed and actions have been developed for the following areas:

a) Policy;

b) Administration

c) Review and Research;

d) Infrastructure Planning; and

e) Protection.

The approach used for assessing the actions for the draft NWSMP was objectives led assessment. Each of the actions have been assessed against a set of strategic environmental assessment objectives (See **Chapter 7, 'Environmental Protection Objectives and SEA Framework'** for details of the objectives). The assessment compares the likely impacts in terms of the strategic environmental objectives to see which actions meet the strategic environmental objectives and which, if any, contradict them.

For the purposes of this assessment:

- Plus (+) indicates a potential positive environmental impact;
- Minus (-) indicates a potential negative environmental impact;
- Plus/minus (+/-) indicates that both positive and negative environmental impacts are likely or that in the absence of further detail the impact is unclear; and
- Zero (0) indicates neutral or no impact.

A discussion is presented in the next section of this report to support the assessment parameters shown. Not all of the actions are suitable for detailed assessment as they may relate to administration issues or additional monitoring etc. In these cases a qualitative statement has been made to describe how the action might support the overall strategy approach.

9.2 ASSESSMENT PARAMETERS

Within the current scope of this SEA, temporary impacts have not been assessed. *Temporary impacts* arising from the NWSMP and actions contained therein would be associated with the construction phase, however, no specific location or design parameters are addressed at this strategic level. It is therefore considered that the scope of the NWSMP does not lend itself to an

assessment of such impacts but such impacts will be addressed at the EIA level in relation to project specific details. *Permanent effects* are addressed in the assessment which follows.

The NWSMP will cover the period from 2016 up to 2040 with review on 5 yearly basis. In line with the SEA Directive, *short, medium and long-term impacts* must be considered during the assessment. As such, assessments have been made for 2016 (as a short term horizon), 2022 (as a medium term horizon) and post 2022 (as a long term horizon) extending beyond the timeframe of this first cycle of the NWSMP. The long-term horizon would represent possible effects beyond the end of this planning cycle for the NWSMP. Short, medium and long-term impacts are addressed in the assessment which follows.

Cumulative effects arise for instance where several developments may each have an insignificant effect but together have a significant effect or where several individual effects of the NWSMP have a combined effect. *Synergistic effects* interact to produce a total effect greater than the sum of the individual effects so that the nature of the final impact is different to the nature of the individual impact. Cumulative / synergistic assessment is addressed in the assessment which follows.

The primary objective of the NWSMP is to manage wastewater sludge sustainably. Many of the actions under consideration will have *direct* impacts on material assets as a result. However, a number of actions also have the potential to directly and indirectly impact on other environmental receptors. These *secondary and indirect* effects have been taken into account in the assessment which follows**.**

9.2.1 Integration of SEA and AA with the draft NWSMP

To assist the NWSMP Team in developing actions which had due regard for the environment, the SEA/ AA Team have worked with the NWSMP Team to ensure feedback on proposed wording and actions has been included in the NWSMP. Specifically both the SEA/AA Team have:

- Provided input on alternatives as part of a workshop (See Chapter 8);
- Undertaken a preliminary review of emerging policies and policy actions;
- Provided feedback to address issues in particular in relation to European Sites and Appropriate Assessment;
- Advised on appropriate siting criteria for the protection of the environment and human health for inclusion in the plan;
- Developed mitigation measures for inclusion in the plan.

Chapter 10, 'Mitigation and Monitoring' provides details on the mitigation measures that are proposed as a result of the assessment process.

9.3 KEY ISSUES IN RELATION TO WASTEWATER SLUDGE MANAGEMENT

The management of wastewater sludge poses economic, planning and environmental challenges. As noted earlier the total volume of wastewater sludge from WWTPs is estimated to be approximately 900,000m^3/annum, based on estimated volumes of sludge removed from all WWTPs, all of which requires treatment and onward reuse / disposal. This volume must be seen in the context of a source which equates to over 1000 separate WWTP and collection networks in Irish Water control

ranging from large scale urban plants right down to septic tanks serving isolated housing clusters. As such, economies of scale must be considered alongside environmental and social issues in terms of the long term sustainable treatment options, particularly for smaller, isolated facilities. One of the stated objectives of Irish Water's Water Services Strategic Plan (2015) is to provide water services in an efficient and economic manner. This is further underpinned by the requirement of Irish Water to discharge its role as the national water services utility under regulation by both:

- The Commission for Energy Regulation (CER) which is charged with protecting the interests of the customer while approving an appropriate funding requirement sufficient to enable the utility to deliver the required service to specified standards in an efficient manner; and

- The Environmental Protection Agency (EPA) which sets standards and enforces compliance with EU and national regulations for drinking water supply, wastewater discharge to water and in matters of public health (in liaison with the HSE).

As outlined in **Chapter 8** 'Alternatives' the development of NWSMP is anticipated to have an overall positive effect as it will standardise and regularise wastewater sludge management in the WWTPs operated by Irish Water and apply overarching procedures, along with auditing and monitoring of facilities and associated treatment and reuse/disposal activities to reduce the incidence of poor practice. This section identifies the key opportunities and challenges associated with wastewater sludge management with a view to signposting the actions required to address poor practices and promote good practices.

9.3.1 Opportunities

Nutrient Recovery and Cycling

The wastewater treatment process generates sludge which undergoes further treatment prior to reuse or disposal. If wastewater sludge is intended for use as a fertilizer on agricultural land, it must undergo some form of treatment to stabilize the material and ensure it does not pose a risk to human health or the environment. The resulting material is termed a biosolid - *"the organic by-product of urban wastewater treatment, which, by being treated to an approved standard can be used beneficially as a fertiliser/ soil conditioner in agriculture"*[32]. Whilst there are numerous challenges posed by wastewater sludge there is the potential for a positive output of biosolid, which facilitates nutrient recycling in soils.

As noted earlier in **Chapter 8**, 'Alternatives', there are recognized advantages to the use of treated wastewater sludge in agriculture. The principle one relates to nutrient cycling in soils. Plants take up nutrients from the soil as they grow. When plants are harvested many of the nutrients associated with their growth are removed also. The plants, or products derived from them, are consumed directly and indirectly by humans and animals and many of the plant nutrients are assimilated in animal or human growth. However, not all nutrients are used in these processes and as a result some are released in waste and enter the wastewater stream and ultimately are found in wastewater sludge. If these nutrients can be returned to the soil, it completes the natural cycle, replenishing those lost when plants are harvested or removed by feeding livestock. Of particular interest from an agricultural perspective is the presence of quantities of both phosphorus and nitrogen in the wastewater sludge, two nutrients which are regularly applied to land as inorganic

[32] Code of Good Practice for the Use of Biosolids in Agriculture, Guidelines for Farmers, Department of the Environment and Local Government, Fehily Timoney Consultants (COGP)

fertiliser to aid plant growth. An available organic source of these nutrients offers significant cost and soil fertility advantage to famers. Other important nutrients are also present e.g. potassium, sulphur, magnesium and micronutrients which are present in the wastewater sludge. In addition, the organic content of the wastewater sludge can improve soil quality.

Energy Recovery

Wastewater sludge can be considered to be a valuable resource due to its energy content. Anaerobic digestion of wastewater sludge for example, produces methane gas which, by conversion to electricity can significantly reduce energy costs for operating WWTPs with energy recovery is increased where thermal hydrolysis is provided in addition to conventional anaerobic digestion.

There are also a number of thermal conversion technologies for the treatment of wastewater sludge. Advanced thermal treatment processes for wastewater sludge, leading to destruction of the sludge, normally with energy recovery and an ash product have been under development for a number of years. These processes include the following:-Wet oxidation; Pyrolysis; Gasification; Melting furnace; and Incineration. To date, incineration is the only thermal treatment process which has been generally commercially available for wastewater sludge (although this is not currently used in Ireland). However, recent developments are likely to make more advanced technologies such as pyrolysis and gasification available on a commercial basis.

Energy recovery strategies offer a route to offset some of the energy requirements in the wastewater treatment sector and contribute positively to Irish Waters sustainability policy and stated aim in the WSSP to become more efficient in energy usage.

9.3.2 Challenges

The majority of wastewater sludge is well treated, managed and reported. That said there are some challenges which may be contributing to poor practice within the overall management process.

Consistency in Requirements of Legislation and Guidance

Three key documents relating to agricultural use of wastewater sludge in Ireland are:

- S.I. No. 31 of 2014 - European Union (Good Agriculture Practice for Protection of Waters) Regulations 2014, as amended by S.I. 134 of 2014 and S.I. 436 of 2014;
- S.I. No. 148 of 1998 — Waste Management (Use of Sewage Sludge in Agriculture) Regulations, 1998, as amended by the S.I. No. 267 of 2001; and
- Code of Good Practice for the Use of Biosolids in Agriculture (COGP).

Statutory Instrument No. 31 of 2014 is the principal regulation to ensure that all land spreading activities on agricultural lands in Ireland are carried out in a manner that best offers protection of waters. These regulations define, amongst other things, crop nutrient requirements and availability vis a vis prescribed soil and crop indices. The nutrient availabilities, particularly phosphorus, in organic materials prescribed in these regulations differ somewhat from the COGP.

In explanation, the relevant legislation, SI 31 of 2014, Article 15 (4) states "*The amount of nitrogen or phosphorus available to a crop from an organic fertiliser of a type which is not specified in Table 9 of Schedule 2 shall be deemed to be the amount specified in the Table in relation to cattle manure or, where supported by the necessary analysis, the amount of nitrogen estimated on the basis of the C:N ratio of the compost in accordance with Table 9A unless a different amount has been determined in relation to that fertiliser by, or with the agreement of, the relevant local authority or the Agency, as the case may be".* It would appear from the aforementioned statement that for available phosphorus in biosolids the amount specified for cattle manure in Table 9 of Schedule 2 must be used i.e. 50% available P on P1 and P2 soils and 100% availability on P3 and P4 soils. However, many operators [identified through the Irish Water 2015 audit] have used the % of available P stated in A*vailability and Fate of Phosphorus in Biosolids when Applied to Agricultur*e, Fehily Timoney, 2007 report (this report appears to have been the basis of the COGP). This report assumed 30% available P across all soil P indices for thermally dried biosolids and 50% available P across all soil P indices for lime stabilised material. There is therefore a possibility that operators have been over applying P with thermally dried wastewater sludge on all soils and over applying P with lime stabilised wastewater sludge on all P3 soils.

S.I. No. 148 and S.I. No. 267 are the regulations that transpose the main European legislation in relation to use of wastewater sludge Council Directive 86/278/EEC on the protection of the environment, and in particular of the soil, when wastewater sludge is used in agriculture (Sewage Sludge Directive). The main restrictions for reuse of wastewater sludge in agriculture are set out in terms of heavy metals and nutrients.

The COGP sets guidelines for the treatment and use of wastewater sludge and provides detailed information on good practice for both treatment and reuse. This is the main guidance document referred to in current contracts for Irish Water in relation to wastewater sludge treatment and reuse. The COGP applies nationally although research by Cre in 2013[33] reported that while the vast majority of Local Authorities were making it a requirement in contracts, a minority were not doing so. The same report highlighted the exemptions and provisions in the regulations and how they are inconsistent with the COGP. One of the most critical differences between the COGP and the regulations, relates to the fact that regulations state that untreated wastewater sludge can be used in agriculture provided that it is previously injected or otherwise worked into land while the COGP requires that all wastewater destined for use on agricultural land must be treated. These irregularities have introduced confusion and a lack of clarity into land spreading and this has fuelled health concerns in relation to food safety.

Furthermore, the COGP refers to a document developed by the Departments of Environment and Agriculture called *Code of Good Agricultural Practice to Protect Waters from Pollution of Nitrates, 1996*. This document is superseded and so therefore, this element of the COPG is also superseded by regulation S.I. No. 31 of 2014 and the requirements thereof.

A key point to address in the NWSMP is therefore clarity on the standards to be applied to wastewater sludge destined for agricultural land spreading to ensure that all interested stakeholders are clear on the minimum standards acceptable to Irish Water wastewater sludge.

[33] The Management of Sewage Sludge in Ireland. Cré, 2013.

Compliance of Contractors with Irish Water Contract Requirements

One of the key challenges for wastewater management is that there are no national standard operating procedures (SOPs) in place for the collection, treatment and recovery / disposal of wastewater sludge. In the absence of SOPs, a range of practices have developed which introduce risk into the management process.

RPS on behalf of Irish Water undertook a review in 2015 of current contracts for Wastewater Sludge Management Services. As part of this review, audits on a select number of sites were used to assess compliance with Irish Water contract requirements, current legislation and the COGP. A number of key issues were identified through the audit process for particular aspects of wastewater sludge treatment, storage and recovery.

It was found in the 2015 audit that, while anaerobic digestion, thermal drying, dewatering and composting treatment methods were conducted generally in compliance with COGP, there were issues with the monitoring of alkaline stabilisation and the frequency of monitoring of pathogens (faecal coliforms and salmonella). Alkaline (lime) stabilisation is one method used in the production of a wastewater sludge biosolid and represented 36.1% of the treatment processes undertaken in 2014. The audit found that many facilities conducting this were not able to demonstrate compliance with the COGP as the pH and temperature of the wastewater sludge was not being recorded during alkaline stabilisation. The COGP states that minimum frequency for testing of pH is every 12 months but it does not state a frequency for temperature. The COGP also states the minimum frequency of analysis for faecal coliforms and salmonella. The COGP state that the analysis should be weekly regardless of the PE of the plant. However, out of the 15 sites audited in the 2015 Wastewater Sludge Management Audit only two conducted weekly pathogen testing, with the remainder carried out fortnightly, which raises questions as to the level of treatment and if the wastewater sludge product is guaranteed to be free of harmful pathogens, a requirement for biosolids.

The audit also identified a number of issues in relation to wastewater sludge/ biosolid treatment and storage including:

- Not all alkaline (lime) stabilisation facilities could demonstrate effectiveness of the process in terms of achieving the required temperature and pH, which could lead to inadequately treated wastewater sludge which are then consigned to lands, posing a potential risk to human health;
- Inconsistent quality in record keeping and technical controls at storage facilities;
- Alkaline stabilisation facilities unable to accurately account for loss of water via evaporation or water gains via infiltration. Not all of these facilities have access to weighing capabilities and therefore rely on volumetric measurements of the outgoing biosolids;
- Some facilities were found to not comply with the requirement for a certificate of registration in relation to storage of wastewater sludge at the farmstead. In these cases the wastewater sludge had been stored in excess of the maximum 1 week period advised by the local authority;
- Variability in oversight by regulatory authorities at storage facilities;
- Untreated runoff from uncovered reception areas is being collected and spread directly to lands at some sites;
- Composting and anaerobic digestion facilities are not all reporting the land outlets used for biosolids. The compost is considered by the contractors to be a product and outside of the

waste legislation requirements and therefore the requirement to record outlets does not apply;

- The COGP has not been complied with at all facilities, specifically:
    - Non-maintenance of shipments log at facilities;
    - Poor or no recording of pH and temperate at alkaline stabilisation facilities and clarity on analysis of pathogens;
    - Not clear if there is sufficient capacity to store between October and February;
    - Facilities readily accessible by the public (inadequate fencing, gating, security and signage).

The audit also identified a number of issues in relation to wastewater sludge **recovery (land spreading)** locations including:

- Concern regarding flooding on some of the lands identified as suitable for land spreading of biosolids;
- Many of the Local Authorities have protocols regarding the spreading of biosolids in their jurisdictions. These protocols encompass by and large the requirements of SI 31 of 2014 with some additional conditions. These protocols are not an issue, per se. However, there appears to be some variation in the protocols adapted by different Local Authorities and in some instances no protocols at all;
- Biosolids for land spreading are being transported considerable distances from source facility to receptor site, often by-passing suitable lands in closer proximity to treatment facilities. This is arising due to competitor issues; and
- Concerns that food quality assurance schemes may affect the availability of lands available for land spreading of treated wastewater sludge.

All spread lands for biosolids are required to have a **Nutrient Management Plan** (NMP) under S.I. 267/ 2001. Furthermore, all farms are required to have prepared by the 31st March "an estimation of the annual fertiliser requirement for the holding and a copy of any NMP prepared in relation to the holding". The wastewater sludge audit identified a number of issues with this process:

- NMPs are not always reflective of real time land use at a given site and this can be further compounded by a lack of updates / revisions to the NMP;
- Operators are in some cases following the *Availability and Fate of Phosphorus in Biosolids when Applied to Agriculture* Guidance (2007) as opposed to relevant legislation S.I. 31/2014 which has superseded this guidance and the COGP and it appears from the audit that there is an over application of phosphorus to soils with certain P indices;
- NMPs are assuming that organics generated on the farm are spread evenly on the lands, which is unlikely to be the case and therefore certain fields are receiving a greater volume of nutrients than anticipated;
- NMPs are in general not making reference to potassium (K) requirements. While K is not a limiting nutrient and is not normally a nutrient associated with pollution it is a necessary macro nutrient for crop growth. This would suggest the NMPs presented are not complete and require the landowner to seek the advice of an agronomist to complete the NMP; and
- The NMP is dependent on the accuracy of the material applied and the audit found that there was only crude estimation in the weight of material land spread in particular for lime stabilised biosolids.

Food Safety Concerns

The key issues associated with wastewater sludge management and food production and safety relate to:

- Food safety concerns related to introduction and transfer of pathogens through the food chain;
- Increased levels of toxic metals and environmentally persistent chemicals;
- Negative perceptions in relation to the spreading of wastewater sludge; and
- The prohibited use of raw or treated wastewater sludge under particular Quality Assurance Schemes.

A 2008 report from the Food Safety Authority[34] noted that in the absence of strict control measures, the land-spreading of organic agricultural, organic municipal and industrial materials on agricultural land used for food production may pose risks associated with microbiological and chemical hazards, to food safety. Specifically the report references mismanaged, untreated, inadequately treated, or re-contaminated organic agricultural and organic municipal and industrial materials as risks to food safety with possible subsequent contamination of foods either directly or indirectly. However, it also noted that appropriately managed land-spreading provides a sustainable option for the utilisation of organic agricultural materials and some treated organic municipal and industrial materials, conditional on the implementation of effective controls and the consistent application of good practice at every level. The report outlined recommendations relating to the minimum safe standards required when land-spreading organic agricultural and organic municipal and industrial materials on agricultural land used for food production.

Availability of Outlets

The main outlet for wastewater sludge in Ireland is land spreading (98%) to agricultural lands and while this is also a significant outlet in many European countries, there are more alternatives available in other Member States, including incineration. In Europe up to 25% of wastewater sludge was incinerated in 2012 (see also **Figure 8.1** in **Chapter 8**, 'Alternatives'). Historically, landfilling was also used but this is no longer considered to be economically or environmentally sustainable and is generally in decline. Other options include composting, anaerobic digestion, use on energy crops or for forestry and land remediation. These have been discussed in detail in Chapter 8, 'Alternatives'. In the majority of cases, the alternative outlet options are not developed sufficiently at this point to provide a credible option in the short-term, although it is acknowledged that this situation is likely to change in some cases at least over the medium to long-term.

In the case of options involving thermal treatment for example, the issue is one of lack of capacity in the State but it is anticipated that this will improve over the short to medium term. The SEA for the Regional Waste Management Plans 2015, estimated that the total active authorised thermal treatment capacity in the State is in the order of 435,000 tonnes nationally. This is set to rise to over 727,000 tonnes through planned additions which have received planning and are licensed but are yet to come on stream. It was further noted in that SEA that the existing and planned capacity showed a distinct regional imbalance, leaning toward the Eastern Midlands Region. Similarly the Regional Waste Management Plans included actions to increase the capacity for biological treatment

[34] Food Safety Implications of Land-spreading Agricultural, Municipal and Industrial Organic Materials on Agricultural Land used for Food Production in Ireland, Food Safety Authority of Ireland, 2008

and anaerobic digestion across the three waste regions. This will add to the current limited capacity in that arena and may provide other avenues for wastewater sludge disposal in the medium to longer term.

Other issues with outlet alternatives are more focussed on regulatory limitations. As noted in the EPA Strive Report Series No. 123, current regulations relating to the reuse of wastewater sludge on energy crops discourages the practice by excluding energy crops from the definition of agriculture in the 1998 Regulations. A Waste Facility Permit or similar would be required to carry out land spreading on energy crops, the same degree of regulatory compliance is not required if spread on food and animal food crops. These kinds of challenges continue to push the focus to agricultural lands in the short-term but that is not without its own challenges.

A number of restrictions in agricultural use of wastewater sludge are in place, specifically in relation to levels of heavy metals in soil e.g. cadmium and nickel levels and in relation to groundwater vulnerability. This reduces the overall area of suitable agricultural lands available to take treated wastewater sludge. Much of the central part of Ireland for example is limited by existing heavy metal content, mainly cadmium and nickel. In accordance with the Sewage Sludge Directive, as implemented by S.I. 148 of 1998 and amended by S.I. 267 of 2001, the levels of cadmium and nickel in soil must be less than 1mg/kg and 30 mg/kg respectively for use of wastewater sludge to be allowable. There are also large areas in the west and north-west of Ireland which are unsuitable for disposal of wastewater sludge due to groundwater vulnerability and soil types. Groundwater is most at risk where the subsoils are absent or thin and, in areas of karstic limestone, where surface streams sink underground at swallow holes. Use of wastewater sludge is not normally permitted in areas of extreme groundwater vulnerability. These restrictions reduce the lands potentially available in the State, from approximately 4.45 million ha to 2.54 million ha, i.e. 54% of agricultural land[35]. However as stated in the draft NWSMP, the quantity of wastewater sludge produced in 2014 was 53,543 tonnes dry solids and therefore based on a phosphorus content of 1.7%, there would be a land requirement for agricultural reuse of 15,300 ha. It is expected that the quantity of wastewater sludge will increase and therefore there will be a requirement by 2020 for approximately 21,500 ha.

It is noted that these restrictions do not explicitly address other environmental limitations such as flooding risk, proximity to European Sites designated under the EU Habitats Directive, wetlands, buffer strips, karst geology, thin or poor acidic soils etc. which need to be factored into considerations on agricultural and indeed non-agricultural lands in determining their suitability for land spreading.

Further to this, the agricultural outlet is also under pressure due to perceptions of contamination risk. As reported in the EPA Strive Report Series No. 123 and evidenced in submissions received during SEA Scoping, Irelands status and image as an agricultural food producer, the increased focus on intensification of food production (e.g. Food Wise 2025) and the increasing prevalence of quality assurance schemes, there has been a reduction in the availability of agricultural outlets due to concern of some landowners to accept wastewater sludge as the produce from these lands may be rejected under quality assurance schemes. This includes the schemes operated by An Bord Bia and the Irish Grain Assurance Scheme and applies to both treated and untreated wastewater sludge with no distinction made.

[35] Draft NWSMP

9.4 ASSESSMENT OF NWSMP ACTIONS

In compiling the draft NWSMP, Irish Water has had regard to the key issues identified above and has developed specific actions to address many of the challenges noted. *Policy* actions have been designed to ensure that regulatory and legislative controls are met and there is transparency and clarity in the minimum requirements and standards that will be acceptable. *Administrative* actions have been included to establish a 'fit for purpose' register of all wastewater sludge management infrastructure. *Research* actions are included to address gaps in knowledge with regard to alternative technologies such as the use of reed beds in management of the wastewater sludge. *Infrastructure Planning* actions have been included to address shortfalls in capacity of certain treatment processes and furthermore to address geographic imbalance and access to a national network of treatment, storage and recovery / disposal in order to drive operational efficiencies. Finally, actions centred on *Protection* of human health and the environment have been included to ensure that management of wastewater sludge nationally is carried out in a safe and secure manner. **Table 9.1** to **Table 9.5** presents the assessment of the actions as established from Chapters 6 to 10 of the draft NWSMP.

9.4.1 Assessment of Policy Actions

Policy Action_1: An independently audited quality control / assurance system will be put in place for wastewater sludge management activities to ensure compliance with Irish Water policies and to address stakeholder concerns, particularly in relation to agricultural produce. [Section 10.1 of draft NWSMP].

Policy Action_2: An annual audit of wastewater sludge management activities will be undertaken on behalf of Irish Water, pending full development of a quality control / assurance scheme [Section 10.1 and 10.4 of draft NWSMP].

Policy Actions 1 and 2 will have broadly positive long term impacts on the receiving environment. The introduction of a quality control / assurance scheme under *Policy Action_1* will include a number of measures which will improve the overall operation of the plants. To complement the independently audited quality assurance system, separate SOPs and control procedures are being developed by Irish Water to ensure that the whole process from source control of pollutants to wastewater sludge treatment and reuse is controlled and monitored.

Policy Action_1 is linked to *Research and Review Action_6* which intends to deliver research into industrial discharges. *Source control* ensures that standardised conditions are applied to discharge licences based on the nature of the discharger's activity, the capacity of the receiving network and the capability of the WWTP to remove pollutants. This addresses the fact that end-of-pipe treatment is often not the appropriate location to remove specific pollutants (e.g., metals, persistent organic pollutants, pharmaceutical products, etc.). Ensuring that specific pollutants are managed at source also ensures the quality of wastewater sludge. In addition, it also addresses the concept of polluter pays. In keeping with this principle the real costs of managing the wastewater is passed to the producer. This includes licensed activities which are currently overburdening downstream WWTP's. This in turn can have negative impacts on the service provided to a much wider customer base and on the level of treatment that can be applied to wastewater with consequent negative short to long-term impacts for the receiving environment. Source control would therefore have overall short, medium and long term positive permanent impacts on water, biodiversity, flora and fauna, population, human health, food production, soils and geology and material assets as it would reduce the risk of harmful chemicals and substances entering the WWTP and the wastewater sludge

treatment process where they could be released to receiving waters in effluent or incorporated into wastewater sludge to be land spread. It is noted that effluent discharge licenses are often administered by other agencies e.g. EPA and as such the ongoing close cooperation between Irish Water and the EPA will be critical to the success of *Policy Action_1*.

The quality control /assurance scheme will further be informed by the development of an Asset Register [see also *Admin Action_1*]. Work has already commenced on this with a project currently underway to audit all Irish Water infrastructure at water and wastewater treatment facilities. This project includes site surveys of all wastewater assets, including wastewater sludge treatment with full details of all assets detailed in an Asset Register. It is anticipated that the project will take a period of 2-3 years and will be used to inform infrastructure needs. This will have direct positive impacts in terms of material assets as it will contribute to the asset knowledge base. Indirect positive medium to long term effects are also anticipated for biodiversity, flora and fauna, water, soils and human health in particular as the register will inform decisions on new infrastructure requirements.

Allied to this register is improved reporting of wastewater sludge data and monitoring as outlined in *Policy Action_2.* This will ensure consistency and follow up in reporting and monitoring of actions. By ensuring appropriate reporting and follow up, this action will have broadly long term positive indirect impacts on all environmental receptors by ensuring that the effectiveness of actions can be tracked and improvements made if necessary. Irish Water is currently developing systems to allow online reporting of all wastewater sludge data by contractors [see also *Admin Action_3*]. This will capture all data required by the local authority wastewater sludge registers. In parallel, a national database of data reported to Irish Water in Annual Environmental Reports, prepared by the Local Authorities for all licenced WWTPs has been developed. The development of online reporting systems including geographical data [see also *Admin Action_2*] in relation to wastewater sludge disposal sites and central recording of all wastewater sludge and soil analysis is considered an essential element of the quality assurance procedures for wastewater sludge management. It is proposed that the data from Annual Environmental Reports will be used to cross-check reporting submissions by contractors. This element of the quality control / assurance scheme will have medium to long term positive impacts on biodiversity, flora and fauna, soils, water, material assets, human health and food safety as it is creating a centralised platform for all relevant data on what, where and in what manner wastewater sludge is being disposed / reused on agricultural lands. This type of approach is key to ensuring that sludge is not reused or disposed of inappropriately.

It is proposed that future wastewater sludge treatment and reuse/disposal contracts for Irish Water will be required to comply with the quality assurance scheme to be developed by Irish Water as outlined in *Policy Action_1*. Given the issues identified earlier in this chapter in relation to requirements in the legislation and the COGP, this SEA recommends that at a minimum, a Standard Operating Procedure (SOP) for reuse of wastewater sludge in agriculture and non-agricultural outlets is developed as part of this quality assurance scheme and will become a compliance requirement for all Irish Water contractors. The SOP will address inconsistencies in the legislation and the COGP and specify clearly the best practice required for Irish Water contractors.

In order to ensure that all wastewater sludge treatment and disposal complies with this SOP, auditing of contractors activities will be required as identified in *Policy Action_1 and 2*. In order to ensure that there is consistency and traceability in reporting of wastewater sludge reuse, Irish Water has proposed that GIS systems will be used to record the destination of all wastewater sludge disposed of. Teagasc have recently developed an online nutrient management planning system which must be used by farmers participating in the Green, Low-Carbon, Agric-Environment Scheme

(GLAS). There is a potential synergy with Teagasc in nutrient management planning for wastewater sludge and reporting of the location and quantity of wastewater sludge on a field basis. Irish Water intends to work with Teagasc to avail of this synergy, subject to agreement with Teagasc and development of the existing systems.

Auditing, as proposed under *Policy Action_2* is both an interim step before the quality assurance scheme is established and also an essential ongoing process to ensure that SOP [see also *Protection Action_1*] are being implemented on the ground. An audit undertaken in 2015 identified a number of activities which did not conform to legislation and / or best practice guidance and which have the potential to directly and indirectly have short, medium and long term impacts on water, biodiversity, soils, human health and food production. This type of audit is essential on an annual basis to ensure progress is being made in eradicating any poor practices and to ensure an overall quality of the product. It is recommended by the SEA that audits of land spreading be undertaken during the timescale of application of the biosolids to the lands to fully assess if compliance is being achieved.

The introduction of a quality assurance / control scheme by Irish Water will be particularly beneficial in relation to providing greater certainty in terms of biosolid quality which is proposed for reuse on agricultural lands. This will have direct positive impacts for human health and food production safety as there will be greater transparency and certainty in the quality of the biosolid. Long term positive impacts can also be anticipated for soils and geology and water quality as a result of improved quality control of the biosolid.

The cumulative effect of implementing all these actions is considered to be long term positive.

Table 9.1 - Assessment of Actions within the Draft NWSMP – Policy Actions

Action Ref.	Proposed Actions	BFF	PHH	FPS	SG	W	AQ / CF	MA	CH	L
Policy Action_1	An independently audited quality control / assurance system will be put in place for wastewater sludge management activities to ensure compliance with Irish Water policies and to address stakeholder concerns, particularly in relation to agricultural produce. [Section 10.1 of draft NWSMP].	+	+	+	+	+	+	+	0	0
Policy Action_2	An annual audit of wastewater sludge management activities will be undertaken on behalf of Irish Water, pending full development of a quality control / assurance scheme [Section 10.1 and 10.4 of draft NWSMP].	+	+	+	+	+	+	+	0	0

***Key**: BFF – Biodiversity, Flora and Fauna; PHH – Population, Human Health; FPS – Food Production Safety; SG – Soils and Geology; W – Water; AQ /CF– Air Quality and Climatic Factors; MA – Material Assets; CH – Cultural Heritage; L – Landscape.*

9.4.2 Assessment of Administration Actions

Admin Action_1: An audit of WWTP's will be compiled into an asset register [Section 10.5 of draft NWSMP]. This data will then be kept on an asset register and used to inform future developments.

Admin Action_2: GIS systems will be used to record the destination of all wastewater sludge re-used or disposed of to ensure that there is consistency and traceability in reporting of wastewater sludge movements [Section 10.9 of draft NWSMP].

Admin Action_3: Irish Water is currently developing systems to allow online reporting of all wastewater sludge data by contractors [Section 10.7 of draft NWSMP].

As noted earlier in this chapter, the an audit in 2015 identified a number of shortfalls in the administration and tracking of wastewater sludge management activities both within Irish Water facilities and as part of third party activities where wastewater sludge undergoes treatment, storage, reuse and / or disposal off-site. A notable contributor to the current situation is the overall lack of a complete and accurate inventory / dataset of facilities, service providers and activities, a feature of wastewater sludge management arising from its previous fragmented nature focussed at the local authority level rather than nationally. Since its inception in 2014, Irish Water has begun the process of interrogating the disjointed data and compiling a national dataset of assets.

Broadly speaking the *Administration Actions* in the draft NWSMP are directed at data gathering, however, they provide the tools, methodologies and data required to inform future actions arising from the NWSMP and they have limited direct impact on environmental receptors. The three actions will improve Irish Waters knowledge base of the wastewater assets and that there can be further consistency and follow up in reporting and monitoring as the NWSMP is rolled out. By ensuring appropriate reporting and follow up, these *Administration Actions* will have broadly positive indirect short, medium and long term impacts on all environmental receptors by ensuring that the effectiveness of actions can be tracked and improvements made if necessary. *Admin Action_2* in particular has the potential to improve future actions in relation to reuse / disposal of wastewater sludge. Currently the final destination for wastewater sludge is not well reported to Irish Water and as such presents a potential risk to the protection of human health and the environment as there is potential for reuse on unsuitable lands or in unsuitable locations.

It is recommended that the national database (including online reporting system and GIS systems) be cross referenced to sites and lands considered sensitive for the purposes of land spreading, as outlined in **Figure 9.1**, to ensure that conflicts do not occur.

The cumulative effect of implementing all these actions is considered to be long term positive.

Table 9.2 - Assessment of Actions within the Draft NWSMP – Administration Actions

Action Ref.	Proposed Actions	BFF	PH H	FPS	SG	W	AQ/ CF	MA	CH	L
Admin Action_1	An audit of WWTP's will be compiled into an asset register [Section 10.5 of draft NWSMP]. This data will then be kept on an asset register and used to inform future developments.	+	+	+	+	+	+	+	+	+

Action Ref.	Proposed Actions	BFF	PHH	FPS	SG	W	AQ/CF	MA	CH	L
Admin Action_2	GIS systems will be used to record the destination of all wastewater sludge reused or disposed of to ensure that there is consistency and traceability in reporting of wastewater sludge movements [Section 10.9 of draft NWSMP].	+	+	+	+	+	+	+	+	+
Admin Action_3	Irish Water is currently developing systems to allow online reporting of all wastewater sludge data by contractors [Section 10.7 of draft NWSMP].	+	+	+	+	+	+	+	0	0

***Key**: BFF – Biodiversity, Flora and Fauna; PHH – Population, Human Health; FPS – Food Production Safety; SG – Soils and Geology; W – Water; AQ /CF– Air Quality and Climatic Factors; MA – Material Assets; CH – Cultural Heritage; L – Landscape.*

9.4.3 Assessment of Research and Review Actions

Research and Review Action_1: A review of existing technologies will be undertaken to identify the most suitable technologies to optimise liquid wastewater sludge thickening. The additional data being gathered in the asset register, as further detailed in Section 10.5 will be used to inform the site specific upgrade requirements [Section 6.4.3 of draft NWSMP]

Research and Review Action_2: A feasibility study of wastewater sludge reed beds at potentially suitable sites is recommended [Section 6.4.4 of draft NWSMP]

Research and Review Action_3: A review of options for re-use of wastewater sludge in non-agricultural land will be undertaken [Section 8.7 of draft NWSMP]

Research and Review Action_4: A review of new sludge hub centres and all sites with thermal drying will be undertaken to assess whether anaerobic digestion is feasible as a new sludge treatment process or to replace or supplement the existing thermal drying plant [Section 9.7 of draft NWSMP]

Research and Review Action_5: It is proposed that standards for monitoring of wastewater sludge in the EU and international research will be reviewed on an ongoing basis to determine if additional monitoring of wastewater sludge or soil samples is required [Section 10.8 of draft NWSMP]

Research and Review Action_6: Irish Water is currently reviewing all non-domestic discharges to municipal sewers and wastewater treatment plants. As part of this review, a risk assessment of significant industrial discharges will be undertaken. This will include an assessment of potential impact on the wastewater sludge and on its proposed disposal/recovery options [Section 10.3 of draft NWSMP].

Similar to the administration actions, the research and review actions proposed within the draft NWSMP are broadly positive in relation to potential impacts on the environment. They are primarily directed at data gathering, providing the tools, methodologies and data required to inform future actions arising from the draft NWSMP. The specific actions mentioned have limited direct impact on environmental receptors. It is acknowledged that the scope of the data gathering and research has the potential to impact on future decision making therefore while not strictly suitable for assessment, commentary is provided.

Research and Review Action_1 is focussed on improvements to liquid wastewater sludge thickening. It is acknowledged that reducing the volume of wastewater sludge requiring transport will have

direct positive impacts on air quality and climate from reduced transport emissions in particular and also direct and indirect positive impacts on material assets through upgraded infrastructure located closer to the source of the wastewater. However, it has to be remembered that improvements to existing infrastructure may lead to increased impact locally. There may be: more air quality impacts as liquid wastewater sludge is transported to a centralised location, increased odour from the processing and treatment of more wastewater sludge and a bigger facility footprint to accommodate upgrades and on-site treatment such as reed beds. These local impacts are best addressed by development of siting criteria to guide and advise on proper land use planning around existing facilities. It is also likely that upgrades would result in more effluent generation which would have to be considered based on the sensitivity of the receiving waters and may be subject to screening for Appropriate Assessment even if staying within an existing licensed limit.

Related to Action 1, this *Research and Review Action_2* is looking at wastewater sludge reed beds as an alternative to hard treatment infrastructure. The use of wastewater sludge reed beds has significant potential, particularly in areas where it is not commercially viable to provide the hard infrastructure. Wastewater sludge reed beds would have a broadly positive impact on the receiving environment, for example they have the potential to increase biodiversity and have reduced impacts on the wider landscape in comparison to hard treatment infrastructure. However negative impacts are also possible such as the change of landuse for the provision of the reedbeds. Of particular note is the need to harvest and dispose of the reeds on a cyclical basis to ensure the reed bed functions properly. Without ongoing maintenance and oversight there would be potential for impacts on water quality, soils, biodiversity flora and fauna, and also air quality and human health resulting from odour. The feasibility of reed beds must have regard to appropriate siting and in the first instance should have regard to the siting guidelines presented in **Chapter 10**, ' Mitigation and Monitoring'.

Research and Review Action_3 focusses on investigating options for reuse of wastewater sludge in non-agricultural land. **Chapter 8**, 'Alternatives' has discussed reasonable alternatives and identifies a number including reuse on energy crops, forestry and in land remediation. Reuse is a higher order recovery solution recognised as providing more benefits than recycling or other recovery options. The concept of *Reuse* is a positive one with positive impacts for the environment, particularly in relation to reduced resource consumption and waste prevention. These two aspects alone can have significant positive effects for the environment generally with less natural resource usage and less potential for pollution to air, water and soils. Increased reuse activities have long term environmental benefits by reducing the amount of waste requiring further management and reducing the use of new raw materials such as manufactured fertilizers. Increased reuse activities would also result in energy savings and therefore would decrease $C0_2$ emissions and global warming effects. However, there is also some potential for negative impacts that need to be fully understood as well as challenges that must be overcome if alternatives to reuse on agricultural land can be fully realised and this must also form part of the investigation of options. In many cases, the issues associated with landspreading on agricultural land are just as valid for non-agricultural outlets and as such the assessment below should be read in the context of all sustainable outlets.

The restrictions in agricultural use of wastewater sludge, due to groundwater vulnerability and heavy metal levels reduces the overall area of agricultural land, potentially available, from approximately 4.45 million ha to 2.54 million ha, i.e. 54% of agricultural land. This area could be further reduced to approximately 108,000 ha if only land used for cereals producing animal feeds was used. Given that the food and drinks industry have stated their opposition to the use of any wastewater sludge (treated or untreated) further restrictions may also arise.

The quantity of wastewater sludge produced in 2014 was 53,543 tonnes dry solids. Based on a phosphorus content of 1.7%, the application rate would be approximately 3.5 tonnes per hectare. Therefore the land requirement for agricultural reuse would be 15,300 ha. It is expected that the quantity of wastewater sludge may increase to 75,150 tds per annum by 2020 if full compliance with wastewater discharge licencing is achieved. This would increase the land requirement to 21,500 ha. Currently over 98% of wastewater sludge is reused on agricultural lands with few if any real non-agricultural alternatives.

The draft NWSMP currently outlines areas of land restricted in terms of application of wastewater sludge with the main focus on levels of heavy metals and the presence of vulnerable aquifers as per the 1998 Regulations and the COGP. The SEA focus is necessarily on the wider environment and the potential for direct and indirect impacts on water, soils and geology, biodiversity, flora and fauna, human health and material assets associated with land spreading. It is acknowledged that these issue issues are considered in the 1998 Regulations and the COGP. However to assist the spatial awareness of these conditions nationally a map (**Figure 9.1**) has been developed which includes the following environmental layers.

- Areas prone to flooding [1% AEP];
- Areas in European Sites;
- Areas in freshwater Pearl Mussel catchments designated under SI 291 of 2009;
- Areas in (proposed) Natural Heritage Areas;
- Wetlands including peatlands, turloughs etc. [represented by wetlands layer in Corine dataset[36]];
- Riverine buffer strips;
- Areas of karst geology; and
- Thin or poor acidic soils [represented by extreme vulnerability dataset].

Spreading in these areas has the potential to increase the risk base for negative impacts to water quality, soils, and biodiversity flora and fauna as a result of runoff or leaching of nutrients and associated material into receiving surface or ground waters. This in turn has the potential for indirect negative impacts on human health and population where drinking water sources and recreational waters are negatively impacted. This is in line with the restrictions imposed by the 1998 Waste Management (Use of Sewage Sludge in Agriculture) Regulations which prevent use of wastewater sludge on lands used for growing fruit or vegetable crops or lands intended for cultivation of fruit or vegetable crops (for a period before and during harvesting). These issues need to be factored into considerations on suitability of lands in determining if they are suitable for land spreading whether they are agricultural or non-agricultural in nature.

For the purposes of the SEA, preliminary mapping has been compiled to provide a high level interpretation of the geographic extent of the key sensitivities discussed above. This sensitivity map (**Figure 9.1**) presents the areas where environmental sensitivities are likely to be encountered. Note the heavy metals layer is not included on the map as the resolution available provides a distorted picture of conditions locally at the field level. It was therefore considered more appropriate not to include this on the sensitivity mapping and accept that field by field assessment would be required to comply with the legislation regardless. It does not identify third party restrictions such as those applied for quality assurance schemes as this is a commercial / administrative agreement entered into between a land owner and the relevant quality agency. The agreement to accept wastewater

[36] European Environment Agency Corine Landcover 2012

sludge remains with each individual land owner and this will not alter under Irish Water. The map is also not intended to be a blueprint for decision making but rather to inform future discussions on where the greater proportion of suitable lands might occur. The map should be reviewed in the context of Standard Operating Procedures being developed by Irish Water in relation to land spreading. While the map identifies areas considered to be of lower sensitivity to land spreading it neither confers consent to spread or excludes areas from spreading. Ground level investigation and assessment must be carried out before any lands agricultural or non-agricultural, are approved for land spreading. Strict control on where land spreading can take place should be the foundation for both agriculture and non-agricultural lands.

Focussing on possible alternatives to agricultural lands, it is noted that from 2007 to 2014, in the region of 3,400 ha of energy crops were established under the Bioenergy Scheme and the Department of Agriculture, Food and the Marine are currently reviewing options for the future.[37] Teagasc has reported that there is a potentially larger market for up to 67,000 ha of energy crops to meet Ireland's 2020 renewable energy targets. However, given the rate of uptake of the existing grant schemes, the actual area of land growing energy crops is not expected to increase substantially. While there are many advantages in the use of wastewater sludge in the fertilisation of energy crops, there are also some obstacles. First and foremost is the practical application of wastewater sludge which is likely to be restricted to post harvesting when access can be achieved e.g. approximately every three years for willow. However, other energy or non-food crops may offer a more viable outlet. A similar situation exists for forestry operations where the practical application of wastewater sludge may be restricted by the physical trees as well as their nutrient needs over their life cycle. Coupled with this, there has been poor uptake of grant schemes for planting of energy crops and this has limited it as a potential outlet. Energy crops do not currently fall under the definition of agriculture and therefore are subject to different permitting processes which may be acting as a barrier to growing of these crops and in turn this is limiting its potential as a viable alternative reuse outlet.

It is also noted that growth of energy crops can have negative effects on water and biodiversity and must in the first instance be sited in suitable locations before in-combination effects of land spreading can be fully understood at the field level. Similarly, the effects of forestry in catchments must be fully investigated at the local scale before additional nutrient inputs could be applied, particularly as forestry may already increase phosphorus and organic matter in a catchment. To prevent long term temporary and permanent negative impacts on biodiversity, flora and fauna, water quality and soils, SOP for reuse on agricultural and non-agricultural outlets should be developed. The SOP should promote a risk based approach to determine lands most at risk from land spreading activities.

It is likely that the final solution will involve a combination of agricultural and non-agricultural reuse options which recognise local and regional conditions.

Research and Review Action_4 focusses on the increased use of Anaerobic Digestion (AD) at new sludge hub centres and as a replacement for or supplementary to existing thermal drying. Anaerobic digestion produces a high energy containing gas, known as biogas, which can be used for green energy production. This can be used to offset some of the energy needed to operate the plant and as such would have direct positive impacts for material assets and climate in particular. Overall biological treatment is considered to have a positive impact as it reduces the amount of wastewater sludge requiring further treatment or reuse / disposal. In addition material recovery can result in a

[37] Reference: Dáil Debates, 24th June 2015, Written Answer No. 149

cleaner end product which can be used as a soil conditioner. This action should be seen in the context of the Regional Waste Management Plans, published in 2015. The three Regional Plans support the development of biological treatment capacity, in particular anaerobic digestion, to primarily treat suitable agri-wastes and other organic wastes.

While the action in the draft NWSMP is to undertake a review of sites, it is likely that the development of this kind of biological treatment by Irish Water may take place in the future. In the absence of location specific information for increased anaerobic digestion capacity or detail of project proposals, a risk based approach is recommended and any review should ensure that sites proposed comply with siting criteria outlined in **Section 10.2.1** of this Environmental Report as a minimum.

Research and Review Action_5 is focussed on ensuring best practice internationally is observed by Irish Water in the management of wastewater. This will have an overall positive effect on the receiving environment, particularly soil, water, biodiversity and human health as an emerging evidence base can be used to refine monitoring programmes with the effect of protecting human and health and the environment from risk through contamination. It is recommended that as a precursor to this action, Irish Water should record how the existing standards for monitoring of wastewater sludge and soil samples comply with EU and international practice. This will provide a benchmark which can be used to determine what changes need to be made going forward.

Research and Review Action_6 is linked to *Policy Action_1* which intends to deliver a quality control / assurance scheme. A lack of clarity for Irish Water on non-domestic discharges to municipal sewers and WWTPs introduces risk to operational efficiency and / or risk of contamination of the wastewater sludge product. Where non-domestic discharges are causing knock-on negative effects on the operation of a WWTP, this can in turn have direct negative impacts on the material asset as the plant may suffer shut-downs. This in turn has potential short to medium term indirect negative impacts on water quality, biodiversity and soils as effluent to surface waters may be compromised. While the industrial discharges to the municipal sewer or WWTP may not cause operational difficulties, they may compromise the quality of the wastewater sludge product for onward treatment and reuse / disposal. From the SEA scoping phase one of the most significant issues raised was the potential for negative impacts on the food sector resulting from the perception of contamination where wastewater sludge is spread on agricultural lands. In a number of instances, it was cited that other countries such as the Netherlands, do not land spread wastewater sludge. However, Ireland could not be seen in the same light as other more significantly industrialised European countries. Significant industrial discharges to the municipal system are limited as industries such as the pharmaceutical sector have typically dealt with wastewater on-site. In more recent times new industries have established in Ireland and there is an imperative to understand any issues with these industrial discharges. From a self-sufficiency perspective, land spreading to agricultural lands is the only large scale available strategy at this time but this does not remove the need to develop others in the short to medium term, and this is addressed through *Research and Review Action_3*.

The information gathered from this review is likely to have positive permanent impacts on water quality, soils, biodiversity and human health as the suitability of wastewater sludge for disposal / reuse options can be better understood. This will in turn provide the clarity and certainty required by the food sector that only wastewater sludge suitable for reuse on agricultural land are in fact being spread with indirect positive impacts for human health, soils, material assets and food production safety.

The cumulative effect of implementing all these actions is considered to be long term positive.

Table 9.3 - Assessment of Actions within the Draft NWSMP – Research & Review Actions

Action Ref.	Proposed Actions	BFF	PHH	FPS	SG	W	AQ / CF	MA	CH	L
Research and Review Action_1	A review of existing technologies will be undertaken to identify the most suitable technologies to optimise liquid wastewater sludge thickening. The additional data being gathered in the asset register, as further detailed in Section 10.5 will be used to inform the site specific upgrade requirements [Section 6.4.3 of draft NWSMP]	+/-	+/-	0	0	+/-	+/-	+	0	0
Research and Review Action_2	A feasibility study of wastewater sludge reed beds at potentially suitable sites is recommended [Section 6.4.4 of draft NWSMP]	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-
Research and Review Action_3	A review of options for reuse of wastewater sludge in non-agricultural land will be undertaken [Section 8.7 of draft NWSMP]	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-
Research and Review Action_4	A review of new wastewater sludge hub centres and all sites with thermal drying will be undertaken to assess whether anaerobic digestion is feasible as a new sludge treatment process or to replace or supplement the existing thermal drying plant [Section 9.7 of draft NWSMP]	+/-	+/-	+/-	+/-	+/-	+/-	+	+/-	+/-
Research and Review Action_5	It is proposed that standards for monitoring of wastewater sludge in the EU and international research will be reviewed on an ongoing basis to determine if additional monitoring of wastewater sludge or soil samples is required [Section 10.8 of draft NWSMP]	+	+	+	+	+	+	+	0	0
Research and Review Action_6	Irish Water is currently reviewing all non-domestic discharges to municipal sewers and WWTPs. As part of this review, a risk assessment of significant industrial discharges will be undertaken. This will include an assessment of potential impact on the wastewater sludge and on its proposed disposal/recovery options [Section 10.3 of draft NWSMP]	+	+	+	+	+	+	+	+	+

***Key**: BFF – Biodiversity, Flora and Fauna; PHH – Population, Human Health; FPS – Food Production Safety; SG – Soils and Geology; W – Water; AQ /CF– Air Quality and Climatic Factors; MA – Material Assets; CH – Cultural Heritage; L – Landscape.*

9.4.4 Assessment of Infrastructure Planning Actions

Infrastructure Action_1: Fifty existing WWTP sites have been identified as requiring infrastructure upgrades to act as satellite sites [Section 7.4 of draft NWSMP]

Infrastructure Action_2: Six new wastewater sludge hub centres have been identified as being (Cork, Waterford, Tuam, Longford, Navan and Fingal). Two of these hubs may be developed at existing WWTP sites with full wastewater sludge treatment to produce biosolids. Three of the remaining sites are proposed to be developed at existing wastewater treatment plants where new wastewater sludge treatment is proposed with anaerobic digestion and pasteurisation the preferred solution.

The Fingal wastewater sludge hub centre is proposed to be located on the site of the new North Dublin WWTP (Greater Dublin Drainage Scheme www.greaterdublindrainage.ie) [Section 7.4 of draft NWSMP]

Infrastructure Action_3: Detailed site assessment will be undertaken for all sites where wastewater sludge infrastructure proposed [Section 9.3 of draft NWSMP]

Transport and infrastructure analysis was undertaken in relation to existing capacity nationally with a focus on sustainable transport distances and cost benefit of new or upgraded infrastructure, particularly in isolated areas. A total of three infrastructure policy actions are included in the draft NWSMP. *Infrastructure Action_1 and 2* both deal with new and upgraded infrastructure which has been proposed to maximise the benefit of treatment of wastewater sludge against the cost of transport and provision of treatment closer to the source of the wastewater sludge.

The issue of treatment at source or closer to source has both positive and negative impacts. From a positive perspective, indirect positive impacts are anticipated as a result of reduced national transport of liquid wastewater sludge if a better network of satellite sites is achieved. The export of liquid wastewater sludge to locations, in some cases, outside the region, give rise to transport emissions such as CO_2, NOx, particulate matter etc. Transport emissions have the potential for direct negative impacts on air quality and climate as well as water quality. The transport also has the potential to indirectly impact on biodiversity, human health through deterioration of water quality and air quality, disturbance of habitats and species, generation of GHG which can in turn impact on flooding and landuse, etc.

Conversely, improving regional and national network of sites also has the potential for negative effects more locally, resulting in landuse changes, emissions to air and water (albeit controlled), disturbance of biodiversity, flora and fauna and populations. Any facility will have the potential for some emissions locally compared to those occurring elsewhere. However, these impacts should not be significant as they will be controlled by the planning and licensing systems. Any emissions would be within licensed emission levels that are based on standards intended to protect human health and the environment. In addition, there are material assets benefits associated with greater regional self-sufficiency such as jobs and economic benefits associated with the infrastructure and treatment of the wastewater. The value of wastewater sludge that is not reused or subject to thermal recovery is a loss in terms of the revenue generated from heat generation and revenue lost from the Irish economy as a result of purchase of manufactured chemical fertiliser.

Infrastructure Action_1 supports upgrade up to 50 existing plants to satellites. These upgrades have the potential for direct negative impacts to AQ, soils and water and indirectly to PHH as a result of additional process emissions. AQ and CF may also be negatively affected from transport of liquid wastewater sludge to the facility. Increased levels of effluent can be anticipated at these sites albeit

subject to license. A key consideration must therefore be the capacity of the receiving waters to receive any additional inputs. Prior to finalising the list for upgrade, a risk based assessment should be undertaken to determine the implications of the increased effluent on receiving waters and to ensure that Irish Water is addressing the implications and wider obligations under the Water Framework Directive (2000/60/EC) and the Habitats Directive (92/43/EEC).

The new facilities proposed under *Infrastructure Action_2* can be expected to require additional landtake, land use changes and new emissions to air, soils and water. As such they have the potential for direct and indirect negative impacts on water, soils and air quality from emissions with possible indirect impacts to human health. Negative impacts on biodiversity, flora and fauna, landscape and cultural heritage are also a possibility resulting from disturbance and land loss. It is acknowledged that any new facilities will be subject to Emission Limit Values (ELVs) which are set out in licences expressly to protect human health and the environment. Significant impacts to AQ, water, soils and PHH are therefore not anticipated however site selection is critical to avoid sensitive receptors as far as possible as early as possible in the planning process. It is noted that any such facility would be likely to require screening for EIA and planning.

Infrastructure Action_3 addresses much of the concern associated with the provision of new or upgraded infrastructure. It acknowledges that site suitability is paramount and requires a detailed assessment prior to decisions being taken. This detailed assessment must consider in the first instance potential to impact on the conservation objectives of any European Sites within the zone of influence of the proposed development and also impacts to more general biodiversity, flora and fauna, water quality, soils, cultural heritage population and human health. The first step in ensuring impacts are avoided is the application of the siting criteria as outlined below:

The location of new or upgraded wastewater sludge facilities must consider the following:

- Avoid, as far as possible, siting wastewater sludge infrastructure (including expansion to WWTP, sludge hub centre or sludge satellite) or related infrastructure in areas protected for landscape and visual amenity, geological heritage and/or cultural heritage value. Where this is unavoidable, an impact assessment should be carried out by a suitably qualified practitioner and appropriate mitigation and/or alternatives must be provided.
- Avoid siting wastewater sludge infrastructure or related infrastructure in proposed Natural Heritage Areas (pNHAs), Natural Heritage Areas (NHAs), Statutory Nature Reserves, Refuges for Fauna and Annex I Habitats occurring outside European designated sites.
- In order to protect habitats which, by virtue of their linear and continuous structure (e.g. rivers and their banks) or their contribution as stepping stones (e.g. ponds or small woods), are essential for the migration, dispersal and genetic exchange of wild species, these features will be protected as far as possible from loss or disruption through good site layout and design.
- To protect river habitats and water quality, ensure that no wastewater sludge facility, including clearance and storage of materials, takes place within a minimum distance of 25 m measured from each bank of any river, stream or watercourse.
- Ensure Sustainable Drainage System (SuDS) is applied to any wastewater sludge facility and that site-specific solutions to surface water drainage systems are developed, which meet the requirements of the Water Framework Directive and associated River Basin Management Plans.
- Avoid development of wastewater sludge infrastructure in flood risk areas. Reference should be made to the *Planning System and Flood Risk Management for Planning Authorities*

(DECLG/OPW 2009) and the National Flood Hazard Mapping (OPW) while referring to the relevant Flood Risk Management Plan (FRMP).

- Ensure riparian buffer zones (minimum of 25 m) are created between all watercourses and any wastewater sludge facilities to mitigate flood risk. The extent of these buffer zones shall be determined in consultation with a qualified ecologist and following a Flood Risk Assessment. Any hard landscaping proposals shall be located outside of these buffer zones.
- To protect river habitats and water quality (including physical habitat and hydrological processes/regimes), ensure that no wastewater sludge facilities, including clearance and storage of wastewater sludge materials, takes place within a minimum distance of 25 m measured from each bank of any river, stream or watercourse.
- Avoid geologically unsuitable areas including karst where practicable, and areas susceptible to subsidence or landslides. Due consideration should be given to the primary water source of the area and the degree of surface water/groundwater interaction.
- Impact from a transport perspective will be assessed including road access, network, safety and traffic patterns to and from the proposed wastewater sludge facility in accordance with road design guidelines and/or relevant LA guidelines in relation to roads.
- Existing WWTP sites and brownfield sites should be considered for any expansions for wastewater sludge facilities. Opportunities to integrate wastewater sludge treatment with sites that produce wastewater sludge needs to be considered ensuring maximum efficiency of wastewater sludge processing.
- Ensure strict protocols are applied to prevent the spread of Invasive Alien Species.

In addition and following iterative discussions between the NWSMP Team and the SEA/AA Team a commitment has been included in the draft NWSMP to ensure that any project and any associated works, individually or in combination with other plans or projects, are subject to screening for Appropriate Assessment to ensure there are no likely significant effects on the integrity (defined by the structure and function) of any Natura 2000 site(s) and that the requirements of Article 6(3) and 6(4) of the EU Habitats Directive are fully satisfied. The inclusion of this commitment is a positive example of how the SEA / AA processes have influenced the draft NWSMP.

Furthermore, in recognition of wider issues relevant to protection of biodiversity in Ireland, that do not strictly fall under the remit of the Habitats Directive, e.g. ecological networks, disturbance of nationally protected habitats and species etc. a further commitment has been included in the draft NWSMP stating that: in carrying out activities associated with management of wastewater sludge from Irish Water operated WWTP, Irish Water will ensure that they are in compliance with their obligations as a the public water authority under the Birds and Natural Habitats Regulations 2011-2015.

The cumulative effect of improving infrastructure will give rise to long term positive effects on the environment by improving the quality of the process. However the full extent of the cumulative effects on the receiving environment can only be fully assessed at a site level.

Table 9.4 - Assessment of Actions within the Draft NWSMP – Infrastructure Actions

Action Ref.	Proposed Actions	BFF	PHH	FPS	SG	W	AQ/CF	MA	CH	L
Infrastructure Action_1	Fifty existing WWTP sites have been identified as requiring infrastructure upgrades to act as satellite sites [Section 7.4 of draft NWSMP]	+/-	+/-	+/-	+/-	+/-	+/-	+	+/-	+/-
Infrastructure Action_2	6 new wastewater sludge hub centres have been identified as being (Cork, Waterford, Tuam, Longford, Navan and Fingal). Two of these hubs may be developed at existing WWTP sites with full wastewater sludge treatment to produce biosolids. Three of the remaining sites are proposed to be developed at existing WWTPs where new wastewater sludge treatment is proposed with anaerobic digestion and pasteurisation the preferred solution. The Fingal wastewater sludge hub centre is proposed to be located on the site of the new North Dublin WWTP (*Greater Dublin Drainage Scheme www.greaterdublindrainage.ie*) [Section 7.4 of draft NWSMP]	+/-	+/-	+/-	+/-	+/-	+/-	+	+/-	+/-
Infrastructure Action_3	Detailed site assessment will be undertaken for all sites where wastewater sludge infrastructure proposed [Section 9.3 of draft NWSMP]	+	+	+	+	+	+	+	+	+

***Key**: BFF – Biodiversity, Flora and Fauna; PHH – Population, Human Health; FPS – Food Production Safety; SG – Soils and Geology; W – Water; AQ /CF– Air Quality and Climatic Factors; MA – Material Assets; CH – Cultural Heritage; L – Landscape.*

9.4.5 Assessment of Protection Actions

Protection Action_1: Standard operating procedures (SOPs) will be developed by Irish Water, including procedures for on-site wastewater sludge management. These SOPs will address all areas of wastewater sludge management including potential environmental impacts and compliance with Wastewater Discharge Licences [Section 6.1 and 10.1 of draft NWSMP].

Protection Action_2: Future lime stabilisation will be restricted to Irish Water owned sites with the use of off-site lime eliminated as soon as possible [Section 10.4 of draft NWSMP].

Protection Action_3: Irish Water will develop and set more detailed minimum requirements for the use of lime stabilisation [Section 10.4 of draft NWSMP]

Protection Action_4: Research and recommendations in relation to emerging contaminants will be reviewed regularly to mitigate against any risk to soils or health due to the presence of organic pollutants [Section 9.11 of draft NWSMP]

Protection Action_5: Irish Water will develop a new template for Nutrient Management Plans which must be complied with by all contractors proposing to spread wastewater sludge on land. This will explicitly require contractors to consider environmental impacts and potential to impact on European Sites.

The consideration of the environment in the management of wastewater sludge is critical in relation to the potential long term impacts that can be mitigated. A consistent approach in management will be assisted by the new structure of wastewater management in Ireland taking the form of a national approach. *Protection Action_1* and *Action_5* will be vital to assisting with a consistent approach to the protection of key areas such as biodiversity, human health, soil, food production, water, air quality, material assets and landscape. It is noted that *Action_1* does not explicitly state that these SOPs must take a cradle to grave approach for wastewater management rather than focussing on WWTP only. As highlighted in the 2015 Irish Water Audit, much of the risk to the environment and human health is encountered off-site where third party contractors have accepted the wastewater sludge. An historic lack of monitoring / control of off-site activities has in turn contributed to some problematic practices. The development of SOPs for all stages of treatment and disposal, along with the development of a standardised template for nutrient management plans will have direct positive short, medium and long term positive impacts for *Biodiversity, Flora and Fauna; Population, Human Health; Food Production Safety; Soils Water Quality; Air Quality and Climate; Material Assets; Cultural Heritage ; and Landscape.*

A SOP specifically addressing outlets for reuse will be essential to addressing long-term negative impacts resulting from land spreading. Currently restrictions on particular lands relate to presence of heavy metals and vulnerable aquifers in particular, although it is acknowledged that the 1998 Regulations and the COGP include environmental protection. There remains a risk forshort medium and long term direct and indirect negative impacts to *Biodiversity, Flora and Fauna; Soils; and Water Quality* as a result of mobilisation of wastewater sludge during flood events on lands prone to flooding leading to nutrient enrichment in rivers, release of suspended solids to water bodies etc. and similarly short medium and long term direct and indirect negative impacts on protected habitats and species sensitive which may be to nutrient enrichment.

A key finding of the 2015 Irish Water Audit related to poor practices, particularly in relation to monitoring of alkaline stabilisation and the monitoring of pathogens (faecal coliforms and salmonella). The audit found that many facilities conducting this were not able to demonstrate compliance with the COGP as the pH and temperature of the wastewater sludge was not being recorded during alkaline stabilisation. In response to this Irish Water has, under *Protection Action_2*

and Protection Action_3, undertaken to restrict the specific activity to their own sites and to develop an evidence based response to develop and set more detailed minimum requirements for this aspect. These actions combined will have positive impacts in the short and medium term in relation to *Biodiversity, Flora and Fauna; Soils Water Quality and Material Assets* as the process of lime storage and stabilisation becomes standardised within Irish Water. In particular, Human Health and Food Production Safety will see direct positive impacts where pH and temperature can be properly controlled and monitored to ensure complete inactivation of pathogens in accordance with the requirements of the COGP.

As evidenced by submissions received during SEA Scoping and review of literature, there is a concern in relation to the presence of contaminants in wastewater sludge, particularly industrial contaminants including POPs and PAHs. It has been considered to date that the relatively low levels of industrial activity in Ireland compared to mainland Europe meant that contaminant levels were low. However, concerns persist, particularly in relation to national and international perceptions for the food sector. Ongoing research in relation to the composition of treated wastewater sludge has identified the presence of persistent organic pollutants, pharmaceuticals and personal care products which needs to be considered. In response to this, Irish Water has committed to undertake regular and ongoing research into emerging contaminants and to provide recommendations on approach. *Protection Action_4* will not result in any direct impacts but it is expected to result in indirect positive impacts to Human Health and Food Production Safety in particular over the medium to long term through awareness of issues and monitoring and potential for readjustment of the Irish Water response in the long term. Irish Water is aware of the requirement to protect the environment and is currently supporting a public awareness campaign 'Think Before You Flush' run by An Tasice. This awareness programme is addressing the problem that items such as sanitary products cause to our marine environment if they enter the wastewater system. On-site management of wastewater sludge activities has the potential to impact the final effluent discharges from the WWTP. This can be due to operational issues or inadequacies in infrastructure. It is proposed that Irish Water *Standard Operating Procedures* (SOP) will address the requirements for wastewater sludge management at individual WWTP's. This will have indirect positive impacts on water and biodiversity by improving operational efficiencies and reducing the potential for effluent discharges to breach relevant licence limits. This will also result in direct positive impacts for material assets as improvements to infrastructure will contribute to the long term sustainability of the facilities.

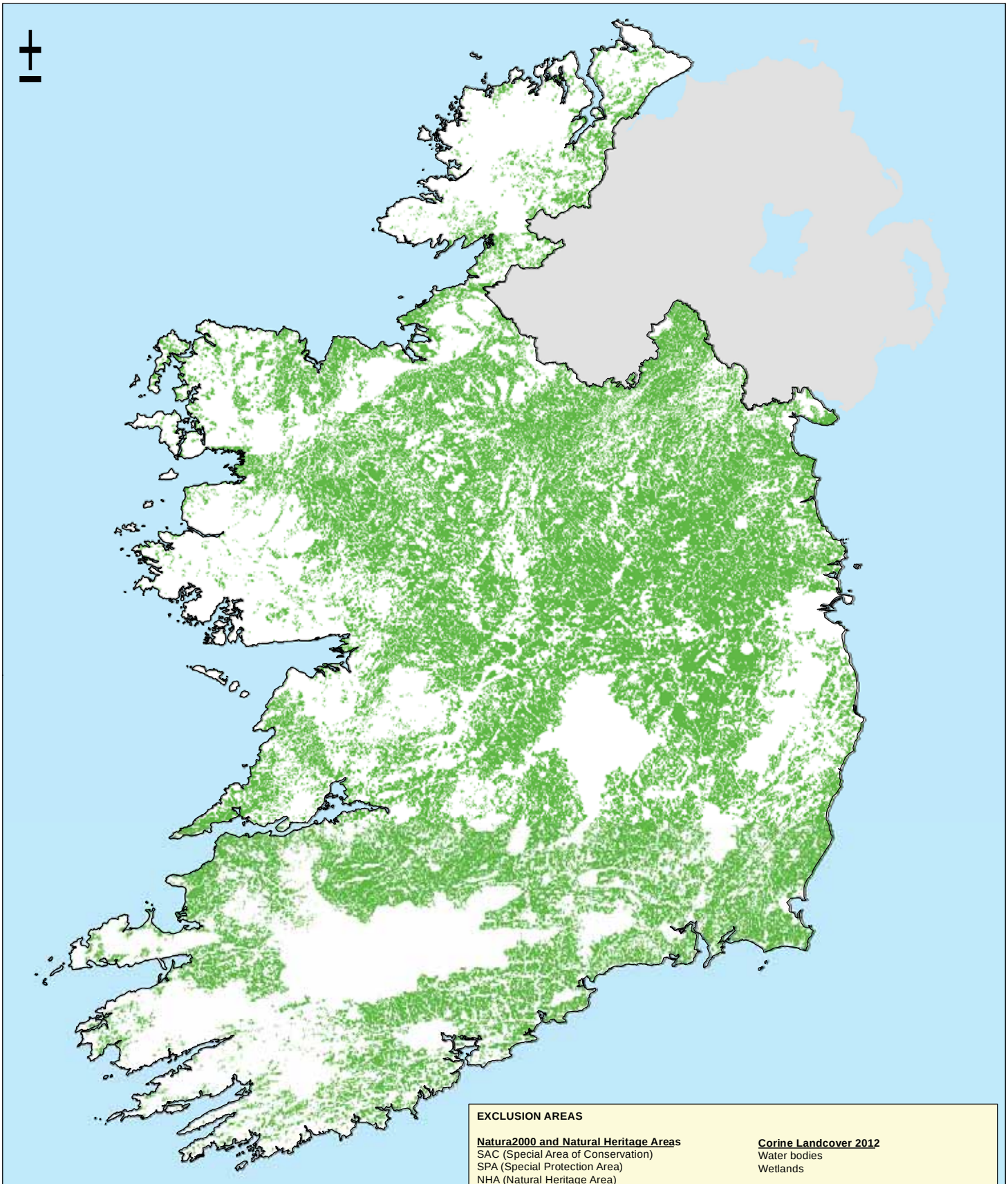
The cumulative effect of implementing all these actions is considered to be long term positive.

Table 9.5 - Assessment of Actions within the Draft NWSMP – Protection Actions

Action Ref.	Proposed Actions	BFF	PH H	FPS	SG	W	AQ / CF	MA	CH	L
Protection Action_1	Standard operating procedures (SOPs) will be developed by Irish Water, including procedures for on-site wastewater sludge management. These SOPs will address all areas of wastewater sludge management including potential environmental impacts and compliance with Wastewater Discharge Licences [Section 6.1 and 10.1 of draft NWSMP].	+	+	+	+	+	+	+	+	+
Protection	Future lime stabilisation will be	+	+	+	+	+	+	+	0	0

Action Ref.	Proposed Actions	BFF	PHH	FPS	SG	W	AQ / CF	MA	CH	L
Action_2	restricted to Irish Water owned sites with the use of off-site lime eliminated as soon as possible [Section 10.4 of draft NWSMP].									
Protection Action_3	Irish Water will develop and set more detailed minimum requirements for the use of lime stabilisation [Section 10.4 of draft NWSMP]	+	+	+	+	+	+	+	0	0
Protection Action_4	Research and recommendations in relation to emerging contaminants will be reviewed regularly to mitigate against any risk to soils or health due to the presence of organic pollutants [Section 9.11 of draft NWSMP]	+	+	+	+	+	+	+	0	0
Protection Action_5	Irish Water will develop a new template for Nutrient Management Plans which must be complied with by all contractors proposing to spread wastewater sludge on land. This will explicitly require contractors to consider environmental impacts and potential to impact on European Sites.	+	+	+	+	+	+	+	+	+

***Key**: BFF – Biodiversity, Flora and Fauna; PHH – Population, Human Health; FPS – Food Production Safety; SG – Soils and Geology; W – Water; AQ /CF– Air Quality and Climatic Factors; MA – Material Assets; CH – Cultural Heritage; L – Landscape.*



Legend

Areas of Lower Sensitivity to Landspreading

Data source:
Environmental Protection Agency (EPA)
Geological Survey of Ireland (GSI)
National Parks and Wildlife Services (NPWS)
Office of Public Works (OPW)

EXCLUSION AREAS

Natura2000 and Natural Heritage Areas
SAC (Special Area of Conservation)
SPA (Special Protection Area)
NHA (Natural Heritage Area)
pNHA (proposed Natural Heritage Area)

Flood Extent
100-yr (1% AEP) event indicative fluvial flood extents
Indicative groundwater flood extents (no specific event probability)

Aquifer Vulnerability
Excluded the follwoing two classes;
Rock at or near Surface or Karst (X)
Extreme (E)

Corine Landcover 2012
Water bodies
Wetlands

Rivers and Lakes
Rivers (25m buffer from all water courses)
All Lakes
Areas in freshwater Pearl Mussel catchments designated under SI 291 of 2009

Title

Figure 9.1 - Sensitivity Map

Project
SEA and AA of the National Wastewater Sludge Management Plan

Client
ervia

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Issue Details

Drawn By:	SK	**Project No.**	MDE1189
Checked By:	EO	**File Ref:**	MDE1189Arc0009F03a
Approved By:	AG		
Scale:	1:2,000,000 @ A4	**Projection:**	ITM (IRENET95)
Date:	15/03/2016		

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10 MITIGATION AND MONITORING

10.1 INTRODUCTION

Article 10 of the SEA Directive requires that monitoring should be carried out in order to identify at an early stage any unforeseen adverse effects due to implementation of the NWSMP, with the view to taking remedial action where adverse effects are identified through monitoring. A monitoring programme is developed based on the indicators selected to track progress towards achieving strategic environmental objectives and reaching targets, enabling positive and negative impacts on the environment to be measured. The environmental indicators have been developed to show changes that would, as far as possible, be attributable to implementation of the NWSMP and are in line with those proposed under the higher order WSSP.

It should be noted that the success of the NWSMP in achieving the objectives of the WSSP, will be related to the implementation and prioritisation of the various elements of the NWSMP. For example, development of SOP for all wastewater activities from the WWTP to the reuse outlet, when implemented correctly, can provide good results, within short-time frames, for minimal relative monetary investment.

10.2 MITIGATION MEASURES

The Environmental Report has highlighted the more significant potential positive and negative environmental impacts from the implementation of the draft NWSMP (including cumulative impacts). Mitigation measures have been identified in **Table 10.1** and **Table 10.2** to reduce the negative impacts identified. Through the iterative process of SEA, some mitigation measures have already been incorporated into the draft NWSMP. This has been noted in the tables below. Mitigation measures arising from the Appropriate Assessment are also noted in the tables.

Table 10.1 – Mitigation Measures Relating to Assessment of Alternatives (see Chapter 8, 'Alternatives')

Reference	Proposed Mitigation Measure for Strategic Alternatives	Location in draft NWSMP
No plan versus NWSMP	Contracts shall ensure that, where practicable wastewater sludge is transported and spread on the nearest suitable spread lands to the source of the wastewater sludge to reduce impacts to air quality and climate.	Section 6.3
Transport alternatives	The suitability of sites for the provision of thickening/ dewatering shall take account of environmental considerations relating to odour, traffic, emissions to water and land use change prior to a final decision at site level.	Section 9.4
Infrastructure alternatives	The selection of new locations for 'Hub-centre and Satellite-site' systems will require detailed assessments on a site by site basis to establish suitability. This assessment shall take into account the environmental, social and financial impacts of any proposal. A review of other constraints such as an existing operational contract must also be taken into account.	Section 7.2

Reference	Proposed Mitigation Measure for Strategic Alternatives	Location in draft NWSMP
Outlet alternatives	Further research into alternative reuse outlets will include consideration of wider environmental impacts including biodiversity, water, soils, human health and food safety as a minimum with a view to developing Specific Standard Operating Procedures for reuse.	Section 9.9
	It is recommended that Irish Water formally liaise with the Regional Waste Authorities and suppliers in relation to thermal recovery capacity.	Section 3.6
	Inconsistencies between the Code of Good Practice and the Regulations will be addressed by Irish Water through Standard Operating Procedures.	Section 3.5.2

Table 10.2 - Mitigation Measures Relating to Assessment of Actions (see Chapter 9)

Reference	Proposed Mitigation Measure for Actions	Location in draft NWSMP
Policy Actions 1 - 2	Under Policy Action_1 and 2, reference to wastewater sludge management activities should be clarified to mean all activities from production of wastewater sludge at a treatment plant through to reuse and disposal of same.	Glossary
	The audit of wastewater sludge activities is essential to ensure progress is being made in ensuring compliance with good practice and to ensure an overall quality product is being generated. Therefore it is recommended that the audit process becomes an integral part of the quality assurance system and it addresses all wastewater sludge management activities from the operational WWTP to the disposal / reuse activity. Contractors who break contractual obligations will be penalised.	Section 10.9
	The audits of land spreading should be undertaken during the timescale of application of the biosolids to the lands to fully assess if compliance is being achieved.	Section 10.9
	A Standard Operating Procedure for reuse of wastewater sludge in agriculture and non-agricultural outlets will be developed and become a requirement of Irish Water contractors. This SOP should address inconsistencies in the legislation and COGP and specify clearly the best practice required for Irish Water contractors. The SOP will also promote a risk based approach to determine lands most at risk from land spreading activities. Irish Water will contractually require all Irish Water contractors to fully implement the most stringent requirements of the legislation and guidance.	Section 3.5.2 and Section 9.9
	The SEA has outlined that the existing COGP shall be revised through Irish Waters standard operating procedures to specifically address inconsistencies in legislation and existing guidelines. The COGP is not an Irish Water document, but Irish Water has committed to '*liaise with the Department of the Environment, Community and Local Government in relation to a review of the Code of Good Practice for the Use of Biosolids in Agriculture to* address inconsistencies in legislation and existing guidelines'.	Section 3.5.2

Reference	Proposed Mitigation Measure for Actions	Location in draft NWSMP
Admin Actions 1-3	It is recommended that the proposed national reporting database (including online reporting system and GIS systems) be cross referenced to sites and lands considered sensitive for the purposes of land spreading, as outlined in **Figure 9.1**, to ensure that conflicts do not occur.	Section 10.7
Research and Review Actions 1-6	As upgrades to infrastructure would result in more effluent generation the sensitivity of the receiving waters must be considered in advance and proposals. In projects where the only potential impact is on the final effluent discharges, screening for Appropriate Assessment is undertaken by the EPA as part of the wastewater discharge licensing process. (*Research and Review Action_1*).	Section 9.5
	Assessment of the feasibility of sludge reed beds must have regard to appropriate siting and in the first instance should have regard to the siting criteria presented in Section 10.2.1 (*Research and Review Action_2*).	Section 6.4.4
	Preliminary sensitivity mapping has been compiled to provide a high level interpretation of the geographic extent of the key sensitivities to land spreading. This sensitivity map (**Figure 9.1**) will be included in the SOP for reuse to be developed by Irish Water and will be used as a guide to decision making for any future land spreading proposed (Research and Review Action_3).	Section 10.8
	In the absence of detailed site specific information for increased anaerobic digestion capacity or detail of project proposals, a risk based approach is recommended and any review should ensure that sites proposed comply with siting criteria outlined in Section 10.2.1 of this Environmental Report as a minimum (*Research and Review Action_4*).	Section 9.5
	Irish Water will record how the existing standards for monitoring of wastewater sludge and soil samples comply with EU and international practice. This will provide a benchmark which can be used to determine what changes need to be made going forward (*Research and Review Action_5*).	Section 9.12.3
Infrastructure Planning Actions 1-3	Prior to finalising sites for upgrade to satellite sites, a risk based assessment should be undertaken to determine the implications of increased effluent on receiving waters and to ensure that Irish Water is addressing the implications and wider obligations under the Water Framework Directive (2000/60/EC) and the Habitats Directive (92/43/EEC) (*Infrastructure Planning Action 1)*.	Section 9.5
	New infrastructure and upgrades to existing infrastructure will consider the siting criteria outlined in Section 10.2.1 of this Environmental Report. (*Infrastructure Planning Actions 1-2).*	Section 9.5
	The following text should be included in the draft NWSMP: *Irish Water will carry out screening for Appropriate Assessment on proposed projects and any associated works, to ensure that there are no likely significant effects on the integrity (defined by the structure and function(s) of any European Site (s) and that the requirements of Article 6(3) and 6(4) of the EU Habitats Directive are fully satisfied.*	Section 9.5

Reference	Proposed Mitigation Measure for Actions	Location in draft NWSMP
	Irish Water will also ensure that in carrying out its activities associated with management of wastewater sludge, that they are in compliance with their our obligations as a public water authority under the Birds and Natural Habitats Regulations 2011-2015.	
Protection Actions 1-4	<u>As identified under Infrastructure Planning the following protection mitigation is also applicable to the Protection Actions.</u> The following text should be included in the draft NWSMP: *Irish Water will carry out screening for Appropriate Assessment on proposed projects and any associated works, to ensure that there are no likely significant effects on the integrity (defined by the structure and function(s) of any European Site (s) and that the requirements of Article 6(3) and 6(4) of the EU Habitats Directive are fully satisfied.* *Irish Water will also ensure that in carrying out its activities associated with management of wastewater sludge, that they are in compliance with their our obligations as a public water authority under the Birds and Natural Habitats Regulations 2011-2015.*	Section 9.5
	Preliminary sensitivity mapping has been compiled to provide a high level interpretation of the geographic extent of the key sensitivities to land spreading. This sensitivity map (**Figure 9.1**) will be included in the SOP for reuse to be developed by Irish Water and will be used as a guide to decision making for any future land spreading proposed (*Infrastructure Protection Actions 1-4)*	Section 10.7
	In order to minimise the risk of negative impacts associated with upgrades to existing infrastructure and provision of new infrastructure the siting criteria outlined in Section 10.2.1 should be applied to all such proposals (*Infrastructure Protection Actions 1-4)*.	Section 9.5
	Standard Operating Procedures should be developed for the full wastewater sludge lifecycle (*cradle to grave approach*).	Section 10.1
	The Standard Operating Procedures for landspreading will include a template for Nutrient Management Plans (NMPs) and a requirement to specifically consider environmental impacts and the potential to impact on the European Sites. These environmental issues will be included in both in the Nutrient Management Plan and the Standard Operating Procedures. These SOP's will be included as a contract requirement for contracts which include landspreading of sludge.	Section 10.8
	Irish Water will liaise with the DECLG and provide them with the findings of all audits undertaken to facilitate a coordinated response if required.	Section 3.5.2

10.2.1 Siting Criteria

As outlined in **Table 10.1**, the draft NWSMP has included the mitigation proposed. Whilst a number of the measures proposed in the NWSMP will have positive impacts on a number of Environmental

Protection Objectives (EPOs), the development of new wastewater sludge infrastructure could have potential negative impacts a number of the EPOs including biodiversity, flora and fauna, population and human health, soil/ geology, water, cultural heritage and landscape. Therefore the inclusion of siting criteria (Section 9.5 within the draft NWSMP) will assist in the proper planning and development of future wastewater sludge facilities.

As a minimum the siting criteria set out in the draft NWSMP (see below) must be followed. The proper siting of wastewater sludge facilities will ensure the impact on communities, the environment and important habitats can be minimised, managed and mitigated.

Siting Criteria

The location of new or upgraded wastewater sludge facilities must consider the following:

- Avoid, as far as possible, siting wastewater sludge infrastructure (including expansion to WWTP, sludge hub centre or sludge satellite) or related infrastructure in areas protected for landscape and visual amenity, geological heritage and/or cultural heritage value. Where this is unavoidable, an impact assessment should be carried out by a suitably qualified practitioner and appropriate mitigation and/or alternatives must be provided.
- Avoid siting wastewater sludge infrastructure or related infrastructure in proposed Natural Heritage Areas (pNHAs), Natural Heritage Areas (NHAs), Statutory Nature Reserves, Refuges for Fauna and Annex I Habitats occurring outside European designated sites.
- In order to protect habitats which, by virtue of their linear and continuous structure (e.g. rivers and their banks) or their contribution as stepping stones (e.g. ponds or small woods), are essential for the migration, dispersal and genetic exchange of wild species, these features will be protected as far as possible from loss or disruption through good site layout and design.
- To protect river habitats and water quality, ensure that no wastewater sludge facility, including clearance and storage of materials, takes place within a minimum distance of 25 m measured from each bank of any river, stream or watercourse.
- Ensure Sustainable Drainage System (SuDS) is applied to any wastewater sludge facility and that site-specific solutions to surface water drainage systems are developed, which meet the requirements of the Water Framework Directive and associated River Basin Management Plans.
- Avoid development of wastewater sludge infrastructure in flood risk areas. Reference should be made to the *Planning System and Flood Risk Management for Planning Authorities* (DECLG/OPW 2009) and the National Flood Hazard Mapping (OPW) while referring to the relevant Flood Risk Management Plan (FRMP).
- Ensure riparian buffer zones (minimum of 25 m) are created between all watercourses and any wastewater sludge facilities to mitigate flood risk. The extent of these buffer zones shall be determined in consultation with a qualified ecologist and following a Flood Risk Assessment. Any hard landscaping proposals shall be located outside of these buffer zones.
- To protect river habitats and water quality (including physical habitat and hydrological processes/regimes), ensure that no wastewater sludge facilities, including clearance and storage of wastewater sludge materials, takes place within a minimum distance of 25 m measured from each bank of any river, stream or watercourse.
- Avoid geologically unsuitable areas including karst where practicable, and areas susceptible to subsidence or landslides. Due consideration should be given to the primary water source of the area and the degree of surface water/groundwater interaction.

- Impact from a transport perspective will be assessed including road access, network, safety and traffic patterns to and from the proposed wastewater sludge facility in accordance with road design guidelines and/or relevant LA guidelines in relation to roads.
- Existing WWTP sites and brownfield sites should be considered for any expansions for wastewater sludge facilities. Opportunities to integrate wastewater sludge treatment with sites that produce wastewater sludge needs to be considered ensuring maximum efficiency of wastewater sludge processing.
- Ensure strict protocols are applied to prevent the spread of Invasive Alien Species.

In addition and following iterative discussions between the NWSMP Team and the SEA / AA Team a commitment has been included in the draft NWSMP to ensure that any project and any associated works, individually or in combination with other plans or projects, are subject to Screening for Appropriate Assessment to ensure there are no likely significant effects on the integrity (defined by the structure and function) of any Natura 2000 site(s) and that the requirements of Article 6(3) and 6(4) of the EU Habitats Directive are fully satisfied. The inclusion of this commitment is a positive example of how the SEA / AA processes have influenced the draft NWSMP.

10.2.2 Conclusion

Following an assessment of the draft NWSMP, the SEA Environmental Report and Natura Impact Statement have proposed mitigation measures and text alterations to the draft NWSMP. Irish Water has incorporated these amendments into the draft NWSMP. The actions within the draft NWSMP promote the sustainable management of wastewater sludge, protection of the environment and the Natura 2000 network ensuring that environmental considerations have been integrated into the draft NWSMP.

The draft NWSMP has outlined actions to address concerns from the food sector through better oversight of the wastewater sludge management process from WWTP to reuse / disposal. The draft NWSMP also includes specific actions to enable farmers and growers to utilise the beneficial properties in wastewater sludge as a valuable and cost effective source of nutrients and organic matter while providing greater comfort in the quality of the wastewater sludge product by improving transparency / compliance in the treatment process.

The development of any new wastewater sludge facilities will comply with a set of siting criteria, which are included in the draft NWSMP. In addition, both existing and new wastewater sludge facilities are required to comply with requirements and conditions required through the relevant planning and licensing systems.

The treatment and recovery of wastewater sludge will be required to comply with stringent measures that will be further developed by Irish Water, including: Standard Operating Procedures (SOPs) and Annual Audits of facilities and operators.

Many of the actions within the draft NWSMP relate to development of systems to better manage and coordinate existing wastewater sludge activities within Ireland. This will offer protection of the environment, agriculture and human health and as such, the draft NWSMP will result in a broadly positive impact on the environment. Potential negative impacts have been identified, particularly in relation to provision of infrastructure. To offset this impact, siting criteria have been developed and integrated into Chapter 9 of the draft NWSMP. This will contribute to avoiding and/or reducing potential negative impacts on the environment. Potential impacts are also identified in relation to

land spreading. To offset this impact, a preliminary sensitivity map has been developed and will become integrated into the SOP for reuse to be developed by Irish Water. It is also proposed that a new Nutrient Management Plan template will be developed as part of the SOP to ensure consistency in reporting and to explicitly require consideration of the environment when compiling the plans.

In line with the amended text of the draft NWSMP, all projects arising from the actions and recommendations will be required to complete screening for Appropriate Assessment under the Habitats Directive and to comply with the provisions of the Birds and Habitats Regulations 2011-2016.

10.3 MONITORING

Article 10 of the SEA Directive (2001/42/EEC) requires Member States to monitor the significant environmental effects of the implementation of plans "*in order, inter alia, to identify at an early stage unforeseen adverse effects to be able to undertake appropriate remedial action*". The primary purpose of monitoring is to cross-check significant environmental effects which arise during the implementation stage against those predicted during the draft NWSMP preparation stage. A monitoring programme is developed based on the indicators selected to track progress towards reaching the targets paired with each SEO, thereby enabling positive and negative impacts on the environment to be measured. The environmental indicators have been developed to show changes that would be attributable to implementation of the NWSMP.

The draft NWSMP is a Tier II Plan sitting below the Water Services Strategic Plan (WSSP) and therefore the monitoring programme for NWSMP has been developed in line with the WSSP monitoring programme. The monitoring has focused on aspects of the environment that are likely to be significantly impacted by the NWSMP.

Table 10.3 shows the Environmental Monitoring Programme to track progress towards achieving SEOs and reaching targets, and includes sources of relevant information.

It is the responsibility of Irish Water to undertake the monitoring of the NWSMP and the WSSP. It has been outlined in the WSSP that the WSSP monitoring will be assessed and reported by Irish Water "*within each revision of the WSSP*". . It was also outlined in the WSSP that indicators and targets may change in subsequent versions to reflect priorities for the forthcoming period of the WSSP. It has been proposed that reporting on monitoring for the NWSMP will be aligned as far as possible with the WSSP.

Table 10.3 – SEA Monitoring Programme

Environmental Component	Strategic Environmental Objectives (SEOs)	SEA Indicators	SEO Targets	Data Source for Indicators
Biodiversity and flora and fauna (BFF)	Prevent damage to terrestrial, aquatic and soil biodiversity, particularly EU designated sites and protected species resulting from Irish Water's activities.	The Status of EU Protected Habitats and Species (Article 17 Conservation Status Assessment Reports due every 6 years, current reports published in 2013) (Ire and NI).	Maintenance / achievement of favourable conservation status for all habitats and species protected under national and international legislation to be unaffected by implementation of the NWSMP[38].	NPWS/ NIEA (6 yearly reporting)
		Provision of appropriate and effective wastewater treatment.	Achievement of WSSP indicators in relation to "operating water services infrastructure in a manner that facilities the achievement of the water body objectives under the Birds and Habitats Directives" *(pg. 48 of the final WSSP).*	Irish Water (yearly reporting)
Population and Human Health (PHH)	Protect and reduce risk to human health in undertaking water services.	Indicators as listed in Chapter 4 and Chapter 5 of the WSSP* *Strategic Objective to Ensure a Safe and Reliable Water Supply (pg. 39-40 of the final WSSP); and* *Strategic Objective to Provide Effective Wastewater Management (pg. 42-43 of the final WSSP).*	In line with WSSP, contribute to the achievement of: ▪ All drinking water areas (including groundwater), as identified on the register of protected areas, to achieve good status, or maintain high status. ▪ All bathing waters, as identified on the register of	Irish Water and EPA

[38] Except as provided for in Section 6(4) of the Habitats Directive viz. There must be (a) no alternative solution available; (b) imperative reasons of overriding public interest for the plan to proceed; and (c) adequate compensatory measures in place.

Environmental Component	Strategic Environmental Objectives (SEOs)	SEA Indicators	SEO Targets	Data Source for Indicators
			protected areas, to achieve good status, or maintain high status. ▪ All economic shellfish waters, as identified on the register of protected areas, to achieve good status, or maintain high status. ▪ All water bodies designated for salmonids, as identified on the register of protected areas, to achieve good status, or maintain high status. ▪ Long term reduction in drinking water restriction notices.	
Food Production and Safety (FPS)	To contribute to protection of food safety by ensuring the quality of the wastewater sludge product for land spreading on agricultural land.	Audit of contractor compliance with the COGP and the legislation, as a minimum, prior to development of a quality assurance scheme.	To develop a quality assurance scheme for all Irish Water wastewater sludge to ensure that only treated and tested wastewater sludge of suitable quality is used for land spreading on agricultural lands.	Irish Water
Water(W)	Prevent deterioration of the status of water bodies with regard to quality and quantity due to Irish Water activities and contribute towards the improvement of water body status for rivers, lakes, transitional and coastal waters and groundwaters to at least good	Indicators as listed in Chapter 4 and Chapter 5 of the WSSP* *Strategic Objective to Ensure a Safe and Reliable Water Supply (pg. 39-40 of the final WSSP); and* *Strategic Objective to Provide Effective Wastewater*	In line with WSSP, contribute to the achievement of: ▪ No deterioration in status of waters currently with high or good status (WFD Objective). ▪ Restoration to good status of waters currently at moderate, poor or bad	Irish Water and EPA

Environmental Component	Strategic Environmental Objectives (SEOs)	SEA Indicators	SEO Targets	Data Source for Indicators
	status, as appropriate to the Water Framework Directive.	*Management (pg. 42-43 of the final WSSP).*	status (WFD Objective). ▪ Progressively reduce chemical pollution in waters (WFD). ▪ Limit pollution inputs to groundwaters and prevent deterioration (WFD Objective).	
Air and Climatic Factors (AQ)	Minimise contributions to climate change ad emissions to air (including greenhouse gas emissions) as a result of Irish Water activities and ensure the resilience of water supply and treatment infrastructure to the effects of climate change.	*EN1b on pg. 59 of the final WSSP* - Preparation and implementation of the Sustainable Energy Strategy. % increase in overall energy efficiency at Irish Water facilities.	Improve energy efficiency by 33% by 2020 (from the 2009 baseline).	Irish Water
		Number of complaints received related to odour.	Compliance with odour criteria to prevent deterioration in amenity beyond the site boundary for new or upgraded wastewater infrastructure and minimise emissions to air from wastewater sludge spreading.	Irish Water
		EN1c on pg. 59 of the final WSSP - Preparation and implementation of the Climate Change Adaptation and Mitigation Strategy)	Ensure resilience of infrastructure to the effects of climate change.	Irish Water
Material Assets (MA)	Provide new, and upgrade existing, wastewater management infrastructure to protect human health and ecological status of water bodies.	Wastewater services investment expenditure per annum.	Increase investment in wastewater management infrastructure.	Irish Water

Environmental Component	Strategic Environmental Objectives (SEOs)	SEA Indicators	SEO Targets	Data Source for Indicators
Soil and Geology (SG)	Avoid conflicts with, and contribute towards, the appropriate management of soil quality and quantity.	Audit of contractors compliance with the COGP and the legislation, as a minimum, prior to landspreading.	Accurate Nutrient Management Plan (NMP) for all lands proposed for spreading of Irish Water wastewater sludge.	Irish Water
Cultural Heritage (CH)	Avoid damage to cultural heritage resources resulting from Irish Water's activities.	*Implementation of Strategy EN1e on pg. 59* [Adherence to environmental and planning legislation]. Any change in the condition of monuments on the Record of Monuments and Places due to Irish Water activities.	No unauthorised physical damage or alteration of the context of cultural heritage features due to Irish Water activities.	Irish Water Archaeological Survey of Ireland Sites and Monuments Record
Landscape (L)	Avoid damage to designated landscapes resulting from Irish Water's activities.	*Compliance with WSSP Strategy EN1e on pg. 59* [Adherence to environmental and planning legislation]	Avoid damage to designated landscapes as a result of NWSMP implementation.	Irish Water

***See Appendix C**

11 NEXT STEPS

There is still some important work to complete before the National Wastewater Sludge Management Plan can be adopted.

Irish Water is inviting feedback as part of a public consultation closing on 18th May 2016.

The draft NWSMP, SEA Environmental Report and Natura Impact Statement are available to view at planning counters in main Local Authority Offices, and online at www.water.ie/projects-plans/wastewater-sludge-management/.

Written submissions or observations can be sent to Irish Water by Wednesday 18th May 2016:

By Email: nwsmp@water.ie

Or by Post: National Wastewater Sludge Management Plan, Irish Water, Colvill House, 24-26 Talbot Street, Dublin, Ireland

Submissions will be reviewed and relevant feedback incorporated into the final NWSMP. It is expected that the final NWSMP and SEA Statement will be published in Summer 2016. **Table 11.1** provides a summary of the remaining steps in this process.

Table 11-1 - Remaining Steps in the NWSMP, SEA and AA processes

Milestone	
National Wastewater Sludge Management Plan	**Strategic Environmental Assessment and Appropriate Assessment**
Publication of draft NWSMP	Publication of Environmental Report and Natura Impact Statement
End of statutory consultation (18^{th} May 2016)	End of statutory consultation Review of submissions and preparation of SEA Statement
Review of submissions and amendments to NWSMP	Review of submissions and preparation of SEA Statement
Adoption of NWSMP	n/a
Publication of final NWSMP (anticipated Summer 2016)	Publication of SEA Statement and final Natura Impact Statement

APPENDIX A

[Main Issues/ Suggestions from Consultees]

Main Issues / Suggestions from Statutory Consultees

Statutory Consultee	Issues Raised	How this has been dealt with in the Environmental Report and NWSMP?
Environmental Protection Agency (EPA)	Concerned about the current status of inadequate infrastructure and capacity for onward disposal of sludge from domestic wastewater treatment systems. The management of sludges arising from DWWTS are a national priority and should be reflected in the plan.	Irish Water have no remit to provide infrastructure for disposal of sludge from domestic wastewater treatment systems. However, where appropriate, facilities will be provided where it is considered that there is an ongoing demand. This has been addressed in Section 2 of the NWSMP.
	In considering the relationship with other relevant plans and programmes, it would be useful to categorise the various Plans, Programmes, legislation according to environmental aspect/topic i.e. water, waste, biodiversity etc.	The NWSMP is a national plan and therefore the review of its relationship with other plans and programmes has focused on relevant National, European and International frameworks. These are outlined in **Chapter 5** of the SEA Environment Report. **Appendix B** provides a comprehensive list of plans, programmes, policy and legislation containing environmental protection objectives, which have been considered relevant to wastewater and sludge management and which are categorised according to environmental aspect/topic.
	Useful to consider including references to other key relevant plans, programmes & legislation including the following: ▪ International conventions e.g. OSPAR, RAMSAR ▪ EU Directives/Regulations e.g. Waste Framework (2008/98/EC), Environmental Liabilities, Shellfish Water, Freshwater Fish Bathing Water, Drinking Water, IPPC etc. ▪ National Legislation/Policy/Guidance e.g. relevant aspects of the EPA Act 1992 as amended, Water Services Act, SEA Regulations, EIA Regulations etc. ▪ Regional e.g. Replacement Regional Waste Management Plans, relevant Shellfish Waters – Pollution Reduction Programmes and associated Characterisation Report, relevant River Basin Management Plans, relevant CFRAMS	The NWSMP is a national plan and therefore the review of its relationship with other plans and programmes has focused on relevant National, European and International frameworks. The environmental protection objectives from the identified legislation, and programmes were explored further to identify only those that are relevant and could influence the NWSMP. These are outlined in **Chapter 5** of the SEA Environment Report.
	The biennial reporting requirements of the Waste Statistics Regulation S.I. 2150/2002 on sludge (and other wastes) generated and treated by	Irish Water currently provide an Annual Sludge Return to the EPA. The current and proposed reporting system for wastewater

Review of International Level Plans, Programmes and Policies

Topic	Title	Summary of Objectives
Biodiversity	UN Convention on Biological Diversity (1992)	Objectives include the maintenance and enhancement of biodiversity. The formulation of the Plan should have regard to these objectives where possible and aim to minimise impacts on biodiversity. Impacts of the plan on biodiversity would primarily be at a site level (i.e. the location of a particular facility, etc.); however the favouring of development that carries a lower risk of damage to biodiversity could be emphasised in the plan.
	Ramsar Convention on Wetlands of International Importance (1971 and amendments)	Objectives include protection and conservation of wetlands, particularly those of importance to waterfowl as Waterfowl Habitat.
	OSPAR Convention (1992)	This Convention for the Protection of the Marine Environment in the North East Atlantic contains a number of Annexes that deal with prevention and elimination of pollution from land-based sources, dumping, incineration and offshore sources. It is also focused on the protection and conservation of the ecosystems and biological diversity of the maritime area.
Climate Change	UN Kyoto Protocol, The United Nations Framework Convention on Climate Change (UNFCCC) (Kyoto, 1997)	Objectives seek to alleviate the impacts of climate change and reduce global emissions of greenhouse gases (GHGs). The formulation of the Plan should give regard to the objectives and targets of Kyoto and aim to reduce GHG emissions from the management of residential and commercial development. Harnessing energy from natural resources could be considered to reduce overall GHG emissions.
Cultural Heritage	Convention for the Protection of the Archaeological Heritage of Europe (revised) (Valletta, 1992)	Objective is to protect the archaeological heritage as a source of the European collective memory and as an instrument for historical and scientific study.
	Convention for the Protection of the Architectural Heritage of Europe (Granada, 1985)	Objectives seek to provide a basis for protection of architectural heritage and are a means for proclaiming conservation principles, including a definition of what is meant by architectural heritage, such as monuments, groups of buildings and sites. The Convention also seeks to define a European standard of protection for architectural heritage and to create legal obligations that the signatories undertake to implement.
	World Heritage Convention United Nations Convention Concerning the Protection of the World Cultural and Natural Heritage (Paris, 1972)	Objectives seek to ensure the identification, protection, conservation, presentation and transmission to future generations of the cultural and natural heritage and ensure that effective and active measures are taken for these.
Human Health/Air	World Health Organisation (WHO) Air Quality Guidelines (1999) and Guidelines for Europe (1987)	Objectives seek the elimination or minimisation of certain airborne pollutants for the protection of human health.
	Stockholm Convention (2001)	Objectives seek to protect human health and the environment from persistent organic pollutants (POPs).

Review of European Level Plans, Programmes and Policies

Topic	Title	Summary of Objectives
Air/Noise	Ambient Air Quality and Cleaner Air for Europe (CAFE) Directive (2008/50/EC) and Fourth Daughter Directive (2004/107/EC)	The CAFE Directive was published in May 2008 and replaces the Air Framework Directive and the First, Second and Third Daughter Directives. The Fourth Daughter Directive will be included in CAFE at a later stage. Objectives seek to prevent and reduce air pollution and impacts on human health from air pollution. The policies and objectives of the NWSMP should have regard to these objectives and should aim to prevent such pollution and promote a scenario that would minimise the emission of the pollutants regulated under the directive(s).
	Industrial Emissions Directive (IED) (2010/75/EU)	The IED is the successor of the IPPC Directive. The Directive was transposed onto Irish law under the Industrial Emissions Regulations S.I. 138/2013. Objectives seek the reduction and control of emissions to the atmosphere arising from industrial activities through established permit procedures and the requirements for discharges (integrated pollution prevention and control (IPPC)).
	Environmental Noise Directive (END) (2002/49/EC)	Objectives seek to limit the harmful effects to human health from environmental noise. High levels of traffic noise especially can have a detrimental effect on the quality of life. On foot of the Directive, the four local authorities within the agglomeration of Dublin have prepared a Noise Action Plan, including noise maps for the Dublin Agglomeration. The Noise Action Plan is being revised for the period 2013-2018.
Biodiversity	EU Biodiversity Strategy to 2020	Relevant to the draft Plan is the EU Biodiversity Strategy, which aims to prevent and eliminate the causes of biodiversity loss and maintain and enhance current levels of biodiversity. The EU strategy has six main targets which focus on: full implementation of EU nature legislation; better protection for ecosystems and more use of green infrastructure; more sustainable agriculture and forestry; more sustainable fisheries; tighter controls on invasive alien species; and a greater contribution to averting global biodiversity loss.
	Conservation of Natural Habitats and of Wild Flora and Fauna (Habitats) Directive (92/43/EEC)	Objectives seek to prevent and eliminate the causes of habitat loss and maintain and enhance current levels of biodiversity. There are a number of SACs which have been designated for species and habitats of nature conservation importance. The draft Plan should seek to protect these designated areas and species.
	Conservation of Wild Birds (Birds) Directive (79/409/EEC)	The Directive was transposed into Irish law under the Birds and Habitats Regulations S.I. 477/2011 (as amended). Objectives seek to prevent and eliminate the causes of bird species loss and maintain and enhance current levels of biodiversity. The draft Plan should seek to protect these designated areas and species.
	Freshwater Fish Directive (2006/44/EC)	Objectives seek to protect those fresh water bodies identified by Member States as waters suitable for sustaining fish populations. For those waters it sets physical and chemical water quality objectives for salmonid waters and cyprinid waters. The draft Plan should seek to protect these rivers.

Topic	Title	Summary of Objectives
Sustainable Development	EU Common Agricultural Policy	Aims to provide farmers with a reasonable standard of living, consumers with quality food at fair prices and to preserve rural heritage. With increased development pressure from urban areas, protection of rural communities and agricultural enterprise must be a consideration of the Plan.
	Seventh Environmental Action Programme to 2020 of the European Community	Objectives seek to make the future development of the EU more sustainable. The formulation of the Plan should have regard to these objectives. Establishes the key EU "thematic strategies" (see EU waste strategy environment and health strategy and biodiversity strategy). The SEA will addresses direct and indirect impacts on land use and the environment.
	SEA Directive (2001/42/EC)	The SEA Directive was transposed onto Irish law under S.I. 436/2004, as amended in 2011. The draft Plan must take into account protection of the environment and integration of the Plan into the sustainable planning of the county as a whole.
	EIA Directive (2011/92/EU), as amended by Directive 2014/52/EU	The EIA Directive was transposed onto Irish law under S.I. 349/1989 (as amended). The Directive's objective is to require Environmental Impact Assessment of the environmental effects of those public and private projects, which are likely to have significant effects on the environment.
	Second European Climate Change Programme (ECCP II) 2005	The objectives seek to develop the necessary elements of a strategy to implement the Kyoto Protocol. The NWSMP should have regard to these objectives and ensure that development of infrastructure takes account of not only impacts from climate change but also any contribution to climate change.
Water	Water Framework Directive (2000/60/EC)	The Water Policy Regulations (S.I. 722/2003), Environmental Objectives (Surface Water) Regulations (S.I. 272/2009) and Groundwater Regulations (S.I. 9/ 2010) govern the shape of the WFD characterisation, monitoring and status assessment programmes in terms of assigning responsibilities for the monitoring of different water categories, determining the quality elements and undertaking the characterisation and classification assessments. The Surface Waters Regulations institute a wide-ranging set of environmental standards for Irish surface waters. The Groundwater Regulations establish environmental objectives to be achieved in groundwater bodies and include groundwater quality standards and threshold values for the classification of groundwater and the protection of groundwater against pollution and deterioration in groundwater quality. WFD objectives overall seek to maintain and enhance the quality of all surface waters in the EU. The formulation of the draft Plan should have regard to these objectives where possible. The assessment of potential impacts on water quality needs to be considered in the context of the WFD and the River Basin Management Plans and Programme of Measures for the three River Basin Districts which lay out the objectives for all waters within each region. It is noted the next cycle of River Basin Management Plans is due in 2017.

Topic	Title	Summary of Objectives
	Marine Strategy Framework Directive (2008/56/EC)	The Marine Strategy Framework Directive (MSFD) was transposed onto Irish law under the Marine Strategy Framework Regulations S.I. 249/2011. The aims are to protect the marine environment across Europe through achieving and maintaining good environmental status of marine waters by 2020, and acts as complimentary legislation to the WFD. To achieve this goal the directive has set out marine regions; Ireland falls within the North-east Atlantic Ocean Region and for the purposes of the MSFD Ireland is required to produce a Marine Strategy, preparation of which is underway. The first phase of work and public consultation has been completed and involved the assessment and characterisation of Ireland's marine waters. The next phase will involve the drafting of a programme of measures and the eventual implementation of environmental targets. The Irish Marine Strategy will ensure there is a system in place for managing human activities and to achieve and maintain good status of marine waters.
	Floods Directive (2007/60/EC)	The Floods Directive applies to river basins and coastal areas at risk of flooding. The directive was transposed into Irish law by the European Communities (Assessment and Management of Flood Risks) Regulations (S.I. 122/2010). The Regulations set out the responsibilities of the OPW and other public bodies in the implementation of the Directive. With trends such as climate change and increased domestic and economic development in flood risk zones, this poses a threat of flooding in coastal and river basin areas.
	Bathing Water Directive (2006/7/EC)	The Directive was transposed onto Irish law under the Bathing Water (Amendment) Regulations S.I. 79/2008. The overall objective of the revised directive remains the protection of public health whilst bathing, but it also offers an opportunity to improve management practices at bathing waters and to standardise the information provided to bathers across Europe. It is essential that the standards within the Bathing Water Directive are adhered to.
	Groundwater Directive (2006/118/EC)	The Environmental Objectives (Groundwater) Regulations S.I. 9/2010 was transposed into Irish Law and gives effect to the Groundwater Directive. Objectives seek to maintain and enhance the quality of all groundwaters in the EU. The formulation of the draft Plan should have regard to these objectives.
	Shellfish Waters Directive (2006/113/EC)	This Directive aims to protect or improve shellfish waters in order to support shellfish (bivalve and gastropod molluscs) life and growth, thereby contributing to the high quality of shellfish products directly edible by man. This Directive was transposed into legislation in Ireland by the European Communities (Quality of Shellfish Waters) Regulations 2006 (S.I. 268/2006), which were subsequently amended by the European Communities (Quality of Shellfish Waters) (Amendment) Regulations 2009 (S.I. 55/2009). The Directive requires Member States to designate those waters which need protection or improvement in order to support shellfish and sets out physical, chemical and microbiological water quality requirements that designated shellfish waters must either comply with ('mandatory' standards) or endeavour to meet ('guideline' standards). The Directive also requires Member States to establish programmes in order to reduce pollution.

Topic	Title	Summary of Objectives
	Drinking Water Directive (80/778/EEC) as amended by Directive 98/83/EC	The primary objective is to protect the health of the consumers in the European Union and to make sure drinking water is wholesome and clean. Irish Water is obliged to comply with, as relevant and appropriate, the requirements of the Directive and transposing regulations with regard to public water supplies. New drinking water regulations also came into force in 2014 - the Drinking Water Regulations S.I. 122/2014. These regulations provide the EPA with supervisory powers for public water supplies.
	Urban Wastewater Treatment Directive (91/271/EEC), as amended by Directive 98/15/EEC	The Directive was transposed into Irish law by the Urban Wastewater Treatment Regulations (S.I. 254/2001). The primary objective is to protect the environment from the adverse effects of discharges of urban wastewater, by the provision of urban wastewater collecting systems (sewerage) and treatment plants for urban centres. The Directive also provides general rules for the sustainable disposal of sludge arising from wastewater treatment. Irish Water is obliged to comply with, as relevant and appropriate, the requirements of the Directive and transposing regulations with regard to public wastewater schemes. Wastewater treatment capacity is a key issue for the future development as it has the potential to effect population, human health and biodiversity with the county.
	Sewage Sludge Directive (86/278/EEC)	The Directive is given effect in Irish law by the Waste Management (Use of Sewage Sludge in Agriculture) (Amendment) Regulations (S.I. 267/2001). The objective of the directive is to encourage the use of sewage sludge in agriculture and to regulate its use in such a way as to prevent harmful effects on soil, vegetation, animals and man. To this end, it prohibits the use of untreated sludge on agricultural land unless it is injected or incorporated into the soil.
	Nitrates Directive (91/676/EEC)	The Nitrates Regulations 2010, as amended by S.I. 31/2014 gives legal effect in Ireland to Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources (the Nitrates Directive). The directive has the objective of reducing water pollution caused or induced by nitrates from agricultural sources. Under the regulations, sewage sludge is considered a fertiliser under the definitions of the regulations: “fertiliser” means any substance containing nitrogen or phosphorus or a nitrogen compound or phosphorus compound utilised on land to enhance growth of vegetation and may include livestock manure, the residues from fish farms and sewage sludge. The Nitrates Regulations provide for the mandatory implementation of agricultural measures for protecting surface and groundwater quality by all Irish farmers. The measures include limits on storage and land spreading of nutrients, including no-spread zones adjacent to drinking water abstraction points, and uncultivated buffer/riparian strips, to prevent nutrients and sediment from entering water
	Dangerous Substances Directive (2006/11/EC)	This directive refers to pollution caused by certain persistent, toxic and bioaccumulable substances that are discharged into the aquatic environment of the community.
	Priority Substances Directive (2013/39/EU)	This directive amends Directives 2000/60/EC and 2008/105/EC regarding priority substances and water policy. Directive 2000/60/EC set out a strategy against water pollution, including the identification of priority substances pose a significant risk to, or through, the aquatic environment.

Topic	Title	Summary of Objectives
	Foreshore Act (as amended) 1933-2011	The foreshore is classed as the land and seabed between the high water of ordinary or medium tides and the twelve nautical mile limit. Under the Foreshore Act, a lease/licence must be obtained from the Minister for Agriculture, Food and the Marine for certain works undertaken on the foreshore which are deemed to be in relation to a fishery harbour centre or any function relating to: the use, development or support of aquaculture; or an activity involved in the use, development or support of sea-fishing including the processing and sale of sea-fish and manufacture of products derived from sea-fish.
	A Blueprint to Safeguard Europe's Water Resource	This Communication outlines actions that relate to better implementation of current water legislation, integration of water policy objectives into other policies and filling gaps particularly in relation to water quantity and efficiency. These actions are to ensure that water of sufficient quantity and good quality is available to service the needs of people as well as the environment and the EU's economy. The Blueprint's time horizon is closely related to the EU 2020 Strategy particularly the Resource Efficiency Roadmap, of which the Blueprint is the water milestone. However, the Blueprint covers a longer time span, up to 2050, and is expected to be the driver of long-term EU water policy.
Waste	Waste Framework Directive (2008/98/EC)	The directive sets out the definitions of waste and basic management principles for waste in order to ensure waste is managed so as to not impact the environment or human health. The Directive lays down some basic waste management principles: it requires that waste be managed without endangering human health and harming the environment, and in particular without risk to water, air, soil, plants or animals, without causing a nuisance through noise or odours, and without adversely affecting the countryside or places of special interest. The Directive requires that waste legislation and policy of EU Member States is applied according to a waste management hierarchy. The draft Plan should have regard to the principles as set out in the Directive and to regional plans such as the Southern, Eastern-Midlands and Connaught-Ulster Regional Waste Management Plans 2015-2021.
	Waste Statistics Regulation (2150/2002/EC, as amended)	The EU has created a framework for the production of statistics on the generation, recovery and disposal of waste. This regulation permits the gathering of regular and comparable data in EU countries and their transmission to Eurostat. The statistics collected allow the EU waste policy implementation to be monitored and evaluated.
	Environmental Liabilities Directive (2004/35/EC)	The Directive was transposed onto Irish law under S.I. 547/2008. The objective is the 'polluter pays' principle wherein those whose activities have caused environmental damage are held financially liable for remedying that damage; the legislation is particularly aimed at impacts to water quality status under the Water Framework Directive.
	Landfill Directive (99/31/EC)	The Landfill Directive sets targets to reduce landfilling of biodegradable municipal waste. The use of landfill for disposal of wastewater sludge is effectively banned by the Landfill Directive due to the requirement to set limits on the acceptance of biodegradable organic waste.
Population/	Biocidal Products (98/8/EC and	A biocide is classified as a substance (whether chemical or biological) designed to destroy or render harmless a

Topic	Title	Summary of Objectives
Human Beings	2007/107/EC)	harmful organism (e.g. disinfectants, preservatives etc.). These products have a high degree of regulation owing to the potential effects on human health and the environment. The directive is regularly updated as new products are manufactured and authorised. The new Biocidal Products Regulation (Regulation EU 528/2012) has been transposed by the European Union (Biocidal Products) Regulations S.I. 427/2013. Irish Water is required to, when preparing the NWSMP, ensure that the plan measures/strategies do not contravene the Regulation.
Climate	EU 20-20-20 Agreement	Under the EU's 20-20-20 Agreement, for the period beyond 2012 the EU Councils of Ministers have agreed to an ambitious target of 20% reduction on 2005 GHG emission levels for sectors outside the Emissions Trading Scheme (ETS) under the European Union's Effort Sharing Decision (Decision 406/2009/EC). Ireland's target is to reduce non-ETS emissions by 20% by the year 2020. The two main directives which set about achieving this target are the Energy Efficiency Directive (2012/27/EC, transposed into Irish law by the Energy Efficiency Obligation Scheme Regulations 2014 S.I. 131/2014) and the Renewable Energy Sources (RES) Directive (2009/28/EC, transposed into Irish law by the Renewable Energy Regulations S.I. 147/2011).
	Roadmap to a Resource Efficient Europe (Roadmap 2050)	The mission of Roadmap 2050 is to provide a practical, independent and objective analysis of pathways to achieve a low-carbon economy in Europe, in line with the energy security, environmental and economic goals of the European Union. The Roadmap focuses on establishing EU policy to cut total greenhouse gas emissions by 80-95% (compared to 1990 levels) by 2050. The National Low-Carbon Roadmap will be coordinated by the Department of the Environment, Community and Local Government with substantial input from other relevant Departments. The sectoral roadmap for the transport sector will be developed by the Department of Transport, Tourism and Sport.
	Renewable Energy Directive (2009/28/EC)	Directive 2009/28/EC on the promotion of the use of energy from renewable sources sets out the basis for the achievement of that target by setting individually binding renewable energy targets for all Member States. It is Irish Water's responsibility to cumulatively contribute towards – in combination with other users and bodies – the achievement of the objectives of this Directive.
Landscape	European Landscape Convention	The Convention's purpose is to promote landscape protection, management and planning of European landscapes and to organise European co-operation on landscape issues. It is the first international treaty to be exclusively concerned with protection, management and enhancement of European landscape. It is extremely wide in scope: the Convention applies to the Parties' entire territory and covers natural, rural, urban and rural-urban transitional areas, also including land, inland water and marine areas. The Convention covers every-day or degraded landscapes as well as those that can be considered outstanding i.e. recognition of the importance of all landscape types.

Review of National Level Plans, Programmes and Policies

Topic	Title	Summary of Objectives
Biodiversity	National Biodiversity Plan 2011 - 2016	In response to the requirements set out in Article 6 of the UN Convention of Biological Diversity 1992, the first Biodiversity Plan was prepared by the Department of Arts, Heritage and the Gaeltacht, subsequently revised in 2011. The Plan seeks to ensure the full and effective integration of biodiversity concerns in the development and implementation of other policies, legislation and programmes which is of critical importance if the conservation and sustainable use of biodiversity is to be achieved.
	Wildlife Acts 1976 - 2010	The purpose of the Wildlife Acts 1976-2010 is to provide for the protection of wildlife (both flora and fauna) and the control of activities, which may impact adversely on the conservation of wildlife.
	Flora Protection Order 2015	Objectives are to protect listed flora and their habitats from alteration, damage or interference in any way. This protection applies wherever the plants are found and is not confined to sites designated for nature conservation.
	European Communities (Natural Habitats) Regulations, SI 94/1997, as amended S.I. 233/1998 and S.I. 378/2005	These Regulations give effect to Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (Habitats Directive) and the Minister to designate special areas of conservation (endangered species and habitats of endangered species) as a contribution to an EU Community network to be known as NATURA 2000. See EU Habitats Directive.
	European Communities (Birds and Natural Habitats) Regulations, S.I. 477/2011 and S.I. 499/2013	The 1997 Regulations and their amendments as outlined above were subsequently revised and consolidated in the European Communities (Birds and Natural Habitats) Regulations 2011.
	All Ireland Pollinator Plan 2015-2020	Ireland has developed a strategy to address pollinator decline and protect pollinator service. A total of 81 actions have been identified in order to achieve this. It is about raising awareness about pollinators and how to protect them.
	Quality of Salmonid Waters Regulations 1988 (S.I. 293/1988)	Prescribe quality standards for salmonid waters and designate the waters to which they apply, together with the sampling programmes and the methods of analysis and inspection to be used by local authorities to determine compliance with the standards. Also, give effect to Council Directive No. 78/659/EEC on the quality of fresh waters needing protection or improvement in order to support fish life. See EU Water Framework Directive.

Topic	Title	Summary of Objectives
	NPWS Conservation Plans for SACs and SPAs	The Habitats Directive (92/43/EEC) provides legal protection for habitats and species of European importance. Articles 3 to 9 provide the legislative means to protect habitats and species of Community interest through the establishment and conservation of an EU-wide network of sites known as Natura 2000. These are Special Areas of Conservation (SACs) designated under the Habitats Directive and Special Protection Areas (SPAs) designated under the Conservation of Wild Birds Directive (79/409/ECC) as codified by Directive 2009/147/EC. The designation process, the NPWS produces a draft conservation plan for each SAC, SPA and NHA. Each plan lists the wildlife resources of the area, the current human uses, any conflicts between the two, and strategies for retaining the conservation value. These documents are made available on the NPWS website and to interested parties for a consultation period, following which the final version of the conservation plan is completed. It is intended that plans will be reviewed every 5 years.
	National Peatlands Strategy (Draft)	The Draft National Peatlands Strategy, prepared by the National Parks and Wildlife Service, will, when finalised, establish principles in relation to Irish peatlands in order to guide Government policy. The Draft Strategy aims to provide a framework for which all of the peatlands within the State can be managed responsibly in order to optimise their social, environmental and economic contribution.
Climate	National Policy Position on Climate Action and Low-Carbon Development	Following approval by Government, the Minister for the Environment, Community and Local Government issued a Minister's Statement, National Climate Policy Position, and the General Scheme of the Climate Action and Low-Carbon Development Bill. The National Policy Position paper sets out the current status of climate policy in Ireland and sets the wider context for national climate policy, including the low-carbon road-mapping process and key issues for consideration.
	National Climate Change Adaptation Framework (2012)	Sets out how Ireland is to meet its objectives under the Kyoto Protocol. The Strategy sits within the National Climate Change Adaptation Framework which provides the policy context for the national response to achieving the objectives in a strategic manner. The Framework also requires Local Authorities, relevant agencies and Government Departments to prepare and publish draft adaptation plans by mid-2014.
	Local Authority Climate Change Adaptation Plans	Under the National Climate Change Adaptation Framework, relevant government departments, relevant agencies and local authorities have been requested to commence preparation of sectoral and local adaptation plans and to publish drafts of these plans by mid-2014, if climate change is not already adequately addressed in local authority plans.
	National Climate Change Strategy 2007-2012	Objectives include the reduction of national GHG emissions (including those from the water sector). The Plan should give regard to these objectives and targets for reductions in CO_2 equivalents from the water sector.
	Ireland's Transition to a Low Carbon Energy Future 2015-2030	This White Paper which was published in December 2015 sets out a vision for transforming Ireland's fossil fuel-based energy sector into a clean, low carbon system by 2050.The objective is to guide a transition to a low carbon energy system, which provides secure supplies of competitive and affordable energy to our citizens and businesses. It is intended to publish an annual update and undertake a comprehensive review every five years with the first comprehensive review to be undertaken in 2020.

Topic	Title	Summary of Objectives
	Climate Change Adaptation and Mitigation Strategy *(to be developed)*	Still to be developed.
	National Renewable Energy Action Plan	The National Renewable Energy Action Plan (NREAP) sets out the Government's strategic approach and concrete measures to deliver on Ireland's 16% target under Directive 2009/28/EC. Member States are also required to submit a report on progress to the European Commission every two years with the final report to be submitted by 31 December 2021. To date Ireland has submitted two reports, the First was submitted in January 2012 and the second report was submitted in February 2014.
	Offshore Renewable Energy Development Plan	The OREDP recognises the opportunity for developing, in a sustainable manner, Ireland's offshore renewable energy resources and sets out the principles, policy actions and enablers for realising this potential. This would lead to an increase in the production of renewable electricity indigenously, which would contribute to greenhouse gas reductions and improve security of energy supply. The Sustainable Energy Authority of Ireland (SEAI) is providing financial support for wave and tidal ocean research, development and demonstration projects.
	Renewable Energy Regulations S.I. 147/2011	These Regulations give effect to Directive 2009/28/EC on the promotion of the use of energy from renewable sources.
	Irish Water Sustainable Energy Strategy	The Irish Water Sustainable Energy Strategy is currently under development and this will describe how Irish Water will achieve our 33% increase in energy efficiency obligation by 2020, using 2009 as our baseline year. The sustainable energy strategy will also set our how Irish Water will mitigate the effects of climate change by reducing our carbon emissions and inform on how we will manage our risk in relation to future energy costs as well as ensuring security of supply.
	Irish Water Climate Change Adaption and Mitigation Strategy	The Irish Water Climate Change Adaption and Mitigation Strategy is currently under development and is due to be published in Q3 2016.
Planning	National Spatial Strategy 2002-2020: People, Places and Potential	The National Spatial Strategy (NSS) is a 20 year planning framework to guide policies, programmes and investment in the interest of delivering balanced social, economic and physical development and population growth between the regions.
	Planning and Development Act (as amended) and the Planning and Development Regulations (S.I. 600/2001)	Revised and consolidated the law relating to planning and development by repealing and re-enacting with amendments the Local Government (Planning and Development) Acts, 1963 to 1999; to provide, in the interests of the common good, for proper planning and sustainable development including the provision of housing; to provide for the licensing of events and control of funfairs; to amend the Environmental Protection Agency Act 1992, the Roads Act 1993, the Waste Management Act 1996 (as amended), and certain other enactments.
	Planning and Development (Strategic Infrastructure) Act 2006	An act to provide for the making directly to An Bord Pleanála of applications for planning permission in respect of developments of strategic importance to the State.

Topic	Title	Summary of Objectives
Sustainable Development	Our Sustainable Future: A Framework for Sustainable Development in Ireland (2012)	This framework takes account of developments at international and EU level designed to deliver an effective transition to an innovative, low carbon and resource efficient future. It has followed the model used in the EU Sustainable Development Strategy, which focuses on identifying key gaps where progress has been limited since the 1997 National Sustainable Development Strategy and it aims to set out a range of measures to address the outstanding challenges.
	National Sustainable Development Policy	Under the terms of "Towards 2016", the current Social Partnership Agreement, the Government is committed to publishing a renewed National Sustainable Development Strategy in 2007. The Sustainable Development Unit is co-ordinating the preparation of this Strategy. The renewed Strategy will replace the first National Sustainable Development Strategy, "Sustainable Development – A Strategy for Ireland", published in 1997, and "Making Ireland's Development Sustainable", published in 2002.
	Food Harvest 2020/Food Wise 2025	Food Harvest 2020 (FH2020) is a strategy to chart the direction of agri-food, forestry and fisheries over the next 10 years. The detailed strategy report lists over 200 recommendations and suggestions towards which government and private enterprises will work, while setting out targets to be achieved by 2020. Agriculture is a historically and economically important indigenous industry for Ireland, but is continually connecting to global markets. Food Wise 2025 sets out the vision for the industry to continue along a course of growth, by identifying strategic growth opportunities, but also recognises that increased food production cannot occur in isolation from environmental considerations and emphasises sustainability.
	Agri-vision 2015 Action Plan	The Vision for agriculture is set out as follows: "Our vision involves an industry attaining optimal levels of efficiency, competitiveness and responsiveness to the demands of the market while also respecting and enhancing the physical environment". The Plan is based on a vision of a competitive agri-food sector contributing to the rural economy, society and environment and which utilises opportunities in non-food areas. The objective of the Plan is to put in place and implement the policies that support the flourishing of the agri-food sector at all stages of production.
	Green, Low-Carbon, Agri-environment Scheme (GLAS)	GLAS is an agri-environment scheme and forms part of the Rural Development Programme 2014-2020. GLAS achieves the objectives in respect of Articles 28 and 30 of the Rural Development Regulation and "ties in with the green vision for Irish agriculture as contained in Food Harvest 2020 and as promoted by Bord Bia in the Origin Green campaign." The scheme promotes sustainability through: preservation of traditional hay meadows and low-input pastures; low-aims to retain the carbon stocks in soil through margins, habitat preservation and minimum tillage etc. thus being low-carbon; and promotes agricultural production methods that are compatible with environmental and water protection, protection of the landscape and endangered species of flora and fauna and climate change mitigation.

Topic	Title	Summary of Objectives
	Forest Policy Review - Forests, products and people - Ireland's forest policy (a renewed vision) (DAFM)	The forerunner to this document was G*rowing for the Future* (1996). Substantial changes in the forest sector have occurred since then leading to a revision and the publication of a 'Renewed Vision'. The strategic goal of this vision is stated as: "*To develop an internationally competitive and sustainable forest sector that provides a full range of economic, environmental and social benefits to society and which accords with the Forest Europe definition of sustainable forest management*". The document sets out a summary of recommended policies and actions.
	Draft Forestry Programme 2014-2020: Ireland (DAFM)	The document sets out the state aid funding programme for forestry for the period 2014-2020. Four needs were identified in preparing the proposal, namely: to increase forest cover in Ireland in order to capture carbon, produce wood and help mitigation; to increase in a sustainable way enough biomass to help in meeting renewable energy targets; support to forest holders in the management of their plantations; and to optimise the benefits, environmental and social, of forestry. A number of schemes and measures are proposed in order to meet these needs, such as the Neighbour Wood Scheme and Native Woodland Conservation. The total cost of the programme is estimated at €666m for the period 2015 – 2020 (2014 is covered under the previous programme).
	Green Paper on Energy Policy in Ireland (DCENR)	The Green Paper on Energy Policy in Ireland was launched on 12th May 2014 commencing a public consultation process on the future of energy policy in Ireland for the medium to long-term. That process concluded on 31st July and the Department of Communications, Energy and Natural Resources (DCENR) worked on the analysis of the 1,200 submissions received. On the 24th September 2014 a further Stakeholder Engagement process was launched. This included six special topic seminars on each of the six priority areas and a seventh seminar on energy prices and costs. There were also four regional seminars in Moate, Cork, Sligo and Wexford to facilitate wider engagement of stakeholders.
	Towards a Sustainable Energy Future for Ireland (SEAI)	Energy growth in Ireland is predicted to grow by 2-3% annually to 2020, still relying heavily on imported fossil fuels. This policy paper outlines the energy options for Ireland, the government's core goals including sustainability of development, security of energy supply as well as economically and technologic efficiencies.
	Bioenergy Plan *(under development)*	The draft Bioenergy Plan October 2014 outlined a vision statement. This vision outlines that: *'Bioenergy resources contributing to economic development and sustainable growth, generating jobs for citizens supported by coherent policy, planning and regulation, and managed in an integrated manner.'* The Bioenergy Plan will identify the opportunity for the sustainable development of Ireland's bioenergy resources. It will provide a framework for the sustainable development of Ireland's bioenergy sector and will be implemented through a number of identified policy and enabling actions. The Bioenergy Plan will be one element in a national landscape of energy, renewable energy and bioenergy policy.
	Investing in our Transport Future: A Strategic Framework for Integrated Land Transport	Investing in our Transport Future is an integrated, evidence-based framework which establishes the overall principles guiding expenditure decisions in transport. It outlines the business case for investment in transport infrastructure including road, heavy and light rail, pedestrian and cycle facilities. This land transport funding framework is required for delivering projects based on policy in the context of exchequer funds. The Framework will guide key land transport investment decisions based on a number of identified priorities, however, it does not set out a list or identify specific projects to be prioritised.

Topic	Title	Summary of Objectives
Water	Government Guidelines on the Planning System and Flood Risk Management (2009)	The flood risk guidelines were issued under Section 28 of the Planning and Development Act 2000 (as amended), and sets out that development plans and local area plans, must establish the flood risk assessment requirements for their functional area. Flood risk assessment is required by planning authorities to be an integral and leading element of their development planning functions. The guidelines are specifically aimed at linking planning and development with flood protection and flood risk assessment and recommend a clear and transparent assessment of flood risk at all stages in the planning process. It is a requirement of the guidelines that the draft Plan and all future planning decisions have regard to the guidelines.
	Irish Coastal Protection Strategy Study Phase 1 (2013)	The Irish Coastal Protection Strategy Study (ICPSS) was commissioned as a national study in 2003 with the aim of providing information to aid decision-making at a strategic level regarding the issues of coastal flooding and coastal erosion, and to inform planning and development in and around coastal areas. The study was completed in 2013 and contains strategic coastal erosion maps and flood hazard maps for the present scenario and looking forward to the future (to 2100).
	Water Services Strategic Plan	Irish Water has prepared a Water Services Strategic Plan (WSSP) which is required under Section 33 of the Water Service No. 2 Act of 2013 (WSA). The plan takes a 25 year view towards the vision that *'Through responsible stewardship, efficient management and strong partnerships, Ireland has a worldclass water infrastructure that ensures secure and sustainable water services, essential for our health, our communities, the economy and the environment'.* The WSSP forms the highest tier of asset management plans (Tier 1) which Irish Water will prepare and it will set the overarching framework for subsequent detailed implementation plans (Tier 2) and water services projects (Tier 3).
	National Water Resources Plan *(to be developed)*	Irish Water has proposed to prepare and implement a National Water Resources Plan to guide the strategic development of water supplies in Ireland in order to: comply with water quality standards; to build in security of supply through interconnection, where practicable, of the existing water supply networks; and to develop new, water sources to serve regional schemes.
	National Strategy to Reduce Exposure to Lead in Drinking Water *(under development)*	Irish Water is working to develop and implement a Lead Strategy which will aim to reduce the potential for dissolved lead from pipework to enter drinking water to and to replace public lead water mains over a ten year period.
	Wastewater Compliance Strategy *(to be developed)*	Irish Water is proposing to prepare and implement a Wastewater Compliance Strategy which would aim to improve management of the wastewater systems. This will seek to address unacceptable discharges through improvements to treatment and remediate problems associated with combined sewers, where feasible.
	Waste Water Discharge (Authorisation) Regulations S.I. No. 684 of 2007	This has been derived from the Dangerous Substances Directive 2006/11/EC, to address pollution caused by certain toxic substances that are discharged to the aquatic environment and to establish a framework for Community action in the field of water policy.
	National Water Sludge Management Plan *(to be developed)*	A national water sludge management plan will be developed by Irish Water in due course as a national plan for the management of sludges arising primarily from facilities under the control of Irish Water. As such the assessment is focussed at a national strategic level.

Topic	Title	Summary of Objectives
	Water Compliance Strategy *(to be developed)*	This strategy has yet to be developed; currently no information available.
	Irish Water's Capital Investment Programme 2014-2016	In May 2014, Irish Water published its Investment Programme covering the period 2014-2016. The estimate is that €1.77 billion is required over the programme period. Investment priorities are set out for where improvements are needed urgently, and cover drinking water quality, leaks, water and wastewater compliance and availability and customer service. Irish Water's priorities as set out in the programme include the following: ▪ Eliminating Boil Water Notices in Roscommon; ▪ Providing more water and in particular reducing disruption to supply in the Dublin area; ▪ Improving Water Quality; ▪ Investing for economic development; ▪ Tackling leakage; ▪ Increasing wastewater treatment capacity and improving environmental compliance; ▪ Better Control and Monitoring; and ▪ Improving existing plants.
	Northern Ireland Water Resources Management Plan 2012	Northern Ireland Water (NIW) is the organisation responsible under law for the supply of drinking water to the population of Northern Ireland. As such, NIW has developed a strategy to maintain drinking water supplies over the next 25 years. The Plan details how NIW Water intends to meet the drinking water needs of the population of Northern Ireland over the period 2010 to 2035. The WRMP takes into account forecast changes in population, housing and water usage and incorporates any predicted changes to our climate.
	Ireland's Nitrates Action Programme (NAP)	Ireland's first Nitrates Action Programme (NAP) came into operation in 2006 and gave effect to the Nitrates Directive. The NAP was given effect through a series of regulations, most recently the European Communities (Good Agricultural Practice for Protection of Waters) Regulations 2009 (S.I. 101/2009), known as the Nitrates Regulations. The aim of the NAP is to prevent pollution of surface waters and groundwater from agricultural sources and to protect and improve water quality. In accordance with the Nitrates Directive and Article 28 of the Good Agricultural Practice Regulations, the Minister for the Environment, Community and Local Government, in consultation with the Minister for Agriculture, Food and the Marine reviewed the NAP for the first time in 2010. This resulted in a revised Nitrates Action Programme (NAP2) and the current Good Agricultural Practice Regulations (also known as the 'GAP Regulations' and as the 'Nitrates Regulations'). NAP2 expired on 31 December 2013; it is intended to finalise Ireland's third NAP (NAP3) and related regulations after which NAP3 will run until the end pf 2017.

Topic	Title	Summary of Objectives
	Harnessing Our Ocean Wealth - An Integrated Marine Plan for Ireland	The National Integrated Marine Plan establishes a roadmap for the government's vision, high-level goals and integrated actions across policy, governance and business to enable Ireland's marine potential to be realised. The plan provides a new momentum for growth in the marine area and seeks to ensure government departments work together more efficiently and effectively. The Plan will also allow Ireland to strike a balance between protecting our marine ecosystems and maximising the use of its resources as a source of economic growth.
	National Strategic Plan for Sustainable Aquaculture Development *(under development)*	The requirement to prepare such a Plan is set out in a Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, and the Committee of the Regions, Com (2013) 229 final, entitled "*Strategic Guidelines for the Sustainable Development of EU Aquaculture*". In light of the European Guidelines, the plan will have to outline national aquaculture targets taking into account the current situation in Ireland in relation to aquaculture. The plan will cover four priority areas: administrative procedures, co-ordinated spatial planning, competitiveness and creating a level playing field. Growth targets for the plan are already established in national policy through Food Harvest 2020.
	Seafood Development Programme 2014 – 2020	The European Maritime and Fisheries Fund is the new proposed fund for the EU's maritime and fisheries policies for the period 2014-2020. In line with the reform of the Common Fisheries Policy (CFP) the funding will help with the transition to sustainable fishing and will support coastal communities in diversifying their economies. This new fund will be used to co-finance projects, along with national funding. Ireland has drawn up the Seafood Operational Programme 2014-2020 which will specify how it intends to spend the money allocated. The Programme will identify actions that each member state intends to fund through the European Maritime and Fisheries Fund. The Programme relates to a range of seafood aspects such as aquaculture, fisheries, markets, seafood processing, safety and training. Once this programme is approved it will be the responsibility of the national authorities to put in place the schemes required. The National Strategic Plan for Aquaculture (2014-2020) is being produced in tandem with the Seafood Operational Programme (2014-2020). The Seafood Operational Programme will cover a wider ranging number of aspects of the seafood sector than the Strategic Plan for Aquaculture which will focus on the aquaculture sector.
Waste	Waste Management (Amendment) Act 2001	The Act 2011 provides for a number of revisions to the Waste Management Act 1996 and in particular, provides greater flexibility in the setting of the levy on plastic bags and the landfill levy. Objectives include (amongst others) the more effective and environmentally sensitive management of wastes in Ireland.
	Waste Management Act 1996 (as amended) and the European Communities (Waste Directive) Regulations 2011	The Waste Framework Directive sets out the approach for the sustainable management of waste in the Member States of the European Community and this has been transposed into Irish law by the Waste Management Act 1996 and the European Communities (Waste Directive) Regulations 2011. This legislation requires the preparation of a regional waste management plan for all regions within the state.

Topic	Title	Summary of Objectives
	Changing our Ways (1998)	This document set the following ambitious targets for achievement over a fifteen year timescale: a diversion of 50% of overall household waste away from landfill; a minimum 65% reduction in biodegradable municipal wastes consigned to landfill; materials recycling of 35% of municipal waste; recovery of at least 50% of construction and demolition waste within a five year period, with a progressive increase to at least 85% over fifteen years, and rationalisation of municipal waste landfills, with progressive and sustained reductions in numbers, leading to an integrated network of some 20 or so state-of-the-art facilities incorporating energy recovery and high standards of environmental protection.
	National Waste Prevention Programme 'Towards a Resource Efficient Ireland'	The National Waste Prevention Programme is a non-statutory strategic plan which sets out the framework for waste prevention and resource efficiency in Ireland. This plan seeks to continue to work with established links within local authorities and seeks to work in partnership with the newly established waste planning regions.
	National Hazardous Waste Management Plan 2014-2020	The EPA has published the 3rd National Hazardous Waste Management Plan which sets out priorities to improve the management of hazardous waste in Ireland. Their priority actions include in the first instance the prevention of hazardous waste. In addition, the plan seeks to improve Ireland's self-sufficiency for the management hazardous waste and continued identification and regulation of legacy issues, such as the remediation of historic unregulated waste disposal sites. A key aspect of the plan is the continuation of prevention projects to reduce the generation of hazardous waste in certain priority sectors, led by the EPA through the National Waste Prevention Programme including coordination with the Regional Waste Management Plans.
Landscape	National Landscape Strategy 2015-2025	Objectives are to provide a cross-sector approach at government level to plan and manage the landscape (rural and urban) alongside communities and stakeholders. An implementation programme is included in the Landscape Strategy and will take place over the duration of the strategy period. The key objectives of the strategy are: ▪ To recognise landscapes in law; ▪ The provision of a policy framework to put measures in place for the management and protection of landscape; ▪ To develop a National Landscape Character Assessment through data-gathering and an evidence-based description of character assessment; ▪ To develop landscape policies; ▪ To increase awareness of the landscape and public consultation; and ▪ To identify education and training needs.

Topic	Title	Summary of Objectives
Cultural Heritage	Government Policy on Architecture 2009-2015	This paper addresses issues that have arisen in the years since the publication of the first policy on architecture by setting out a number of goals: emphasising sustainable development of the environment and urban design; the encouragement and support of high quality modern architecture; the incorporation of architectural heritage in a more holistic and integrated manner; and developing actions which respond to and promote awareness in these areas. This Policy in tandem with the Government's policy "Building Ireland's Smart Economy: A Framework for Sustainable Economic Renewal" sets out a number of priorities and actions that the Government will be taking in the short and medium term. Key elements include investment in research and development, a focus on co-ordinated "forward planning" and investment in renewable energy together with the promotion of the green enterprise sector and the creation of jobs.
	National Heritage Plan 2002 - 2006	Core objective is to protect Ireland's heritage. Plan uses the "polluter pays principle" and the "precautionary principle." Sets out archaeological policies and principles that should be applied by all bodies when undertaking a development.
	Framework and Principles for the Protection of Archaeological Heritage (1999)	The document sets out the basic principles of national policy regarding the protection of archaeological heritage. The document focuses particularly on the principles which should apply in respect of development and archaeological heritage.
	The National Monuments Acts (1930 to 2004)	Objectives seek to protect monuments of national importance by virtue of the historical, architectural, traditional, artistic or archaeological interest attaching to them and includes the site of the monument, the means of access to it and any land required to preserve the monument from injury or to preserve its amenities.
	The Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999	Provides for the establishment of a National Inventory of Architectural Heritage (NIAH). The objective of the NIAH is to aid in the protection and conservation of the built heritage, especially by advising planning authorities on the inclusion of particular structures in the Record of Protected Structures (RPS).
	Guidelines for Planning Authorities: Architectural Heritage Protection, 2004	The Planning and Development Act 2000, required additional development objectives relating to the protection of structures which are deemed to be of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest and to preserve the character of architectural conservation areas.
	The Planning and Development Act 2000	Under this Act the County Councils are required to compile and maintain a Record of Protected Structures (RPS) in their Development Plans. Sites included in the RPS are awarded automatic protection and may not be demolished or materially altered without grant of permission under the Planning Acts.

Review of Regional Level Plans, Programmes and Policies

Topic	Title	Summary of Objectives
Planning	Regional Planning Guidelines	The Regional Planning Guidelines provide an evidence based framework and policy guidance to local authorities in the areas of spatial growth, settlement hierarchy, population and housing targets, economic development, infrastructure provision, rural development, flood risk management, heritage, environment, and social infrastructure objectives. Three new Regional Assemblies came into being on 1st January 2015, namely the Northern & Western, the Midland & Eastern and the Southern Regional Assemblies. The RPGs are intended to remain in place until at least 2016, after which they will be replaced by the Regional Spatial and Economic Strategies.
	Regional Spatial and Economic Strategies	Regional Spatial and Economic Strategies (RSES) are intended to replace the current Regional Planning Guidelines. The RSES are expected to cover the period 2016-2022. Regional structures and functions are currently being revised and strengthened; the existing 8 regional authorities and 2 assemblies are being replaced by 3 new Regional Assemblies to perform an updated range of strategic functions. In addition to formulating RSESs, the main functions of the new Regional Assemblies will also include strategic functions under relevant legislation, functions that relate to EU funding programmes as well as oversight of local authority performance and the implementation of national policy.
Water and Wastewater	River Basin Management Plans and associated programmes of measures	A key development in meeting the requirements of the Water Framework Directive has been the publication of River Basin Management Plans. The plans implement the objectives of the Water Framework Directive. The aim is to achieve good water quality status in all waterbodies by 2015, through the implementation of a programme of Measures (POM). The Minister for the Environment, Community and Local Government has put in place new governance structures and administrative arrangements for the implementation of a second cycle of River Basin Management Plans and this will change the context for future reporting on water quality in Ireland. The existing seven River Basin Districts are to be reconfigured into three RBDs. The next cycle of RBM plans will cover the period 2015-2021, with delivery of this next phase and updated measures expected in 2017.
	Catchment Flood Risk Assessments and Management Plans (CFRAMS)	The Catchment Flood Risk Assessment and Management (CFRAM) programme commenced in Ireland in 2011 and form a key part of the medium to long-term strategy for the management of flood risk in Ireland. The CFRAMs deliver on key components of National Flood Policy and the Floods Directive (2007/60/EC). The CFRAMs are composed of three phases, including: preliminary flood risk assessment; CFRAM specific catchment studies and activities; and implementation and review. Consultation stages are also provided for (on the preliminary flood risk assessment, flood hazard mapping and flood risk management plans).
	Water Quality Management Plans	Water Quality Management Plans are a requirement under The Water Pollution Acts, 1977 and 1990 and regulations made thereunder. The aim of the plans is to manage and protect water at catchment based level.

Topic	Title	Summary of Objectives
	Groundwater Protection Schemes	Groundwater protection schemes are undertaken jointly between the Geological Survey of Ireland and the local authorities. The objectives of such schemes are to preserve groundwater quality, in particular having regard to extraction for drinking water purposes. The schemes do not have any statutory authority but do set out a framework to help inform decision-making and provide guidelines for the local authorities in carrying out their functions.
	Shellfish Pollution Reduction Programmes	The aim of the Shellfish Waters Directive is to protect or improve shellfish waters (see Shellfish Waters Directive, 2006/113/EC). The Directive requires Member States to designate waters that need protection in order to support shellfish life and growth. The Directive also provides for the establishment of pollution reduction programmes for the designated waters, of which there are 63 nationally.
	Freshwater Pearl Mussel Sub-Basin Management Plans	The Freshwater Pearl Mussel is protected under Annex II and V of the Habitats Directive and is legally protected in Ireland under Schedule 1 of the Wildlife Act. In 2009, legislation was enacted to support the achievement of favourable conservation status for FPM - S.I. 291 of 2009 and NPWS developed 27 FPM Sub-basin Management Plans as designated under S.I. 291 of 2009 to address measures to halt the decline in the species.
Waste	Regional Waste Management Plans 2015-2021	Ireland is divided into 3 regions for the purposes of waste management – Eastern-Midlands, Southern and Connacht-Ulster Regions. The plan sets out the framework for the management of waste in a sustainable way, with overall targets to reduce the quantity of household waste generated per capita per year on year, to eliminate the disposal of residual waste to landfill and to aim for a reuse and recycle target of 50% of municipal waste by 2020.

Statutory Consultee	Issues Raised	How this has been dealt with in the Environmental Report and NWSMP?
	wastewater treatment activities should be reflected in the Plan.	sludge has been addressed in Section 10 of the NWSMP.
	Reference provided to SEA related guidance and information available on EPA website.	The information has been noted and consulted in the preparation of the SEA Environment Report.
	Clarify the extent to which the focus of the Plan and the associated SEA will include relevant aspects of alternative management options considered for all forms of non-hazardous sludge currently arising and predicted to arise over the lifetime of the plan.	The NWSMP will consider wastewater sludge only. Section 1 of the NWSMP will clarify the scope of the plan. An assessment of alternative management options has been included in Section 8 and Section 9 of the NWSMP.
	The plan should incorporate an additional objective to establish a register of Urban WWTPs and an associated national reporting system for recording information on the generation and treatment of wastewater sludge (and other waste arising from the activity). These objectives and associated data are relevant for national waste reporting purposes.	Registers of Urban WWTP's have been developed by Irish Water. Details of plans to expand the asset register are included in Section 10 of the NWSMP.
	The water related aspects and implications of the Plan need to be further considered, in the context of determining potential for conflict with achievement of the WFD objectives. The plan should identify and select appropriate mitigation measures where required and should be designed to ensure compliance with the WFD.	The main mitigation measure proposed in relation to achievement of WFD objectives is compliance with S.I. 31 of 2014 European Union (Good Agricultural Practice For Protection Of Waters) Regulations 2014. The purpose of these regulations was to give further effect to several EU Directives including Directives in relation to protection of waters against pollution from agricultural sources ("the Nitrates Directive"), dangerous substances in water, waste management, protection of groundwater, public participation in policy development and water policy (the Water Framework Directive. Details of monitoring, reporting and quality assurance procedures proposed by Irish Water are included in Section 10 of the NWSMP. This Section provides details on how compliance with the legislation will be monitored. Chapter 9 of the SEA Environmental Report has assessed the key actions of the NWSMP and Chapter 10 has outlined mitigation measures for incorporation within the NWSMP to ensure compliance with the WFD.
	The Plan should include a reference to and take into account the relevant	Compliance with legislation and good practice will ensure issues

Statutory Consultee	Issues Raised	How this has been dealt with in the Environmental Report and NWSMP?
	aspects of the recently published *Significant Water Management Issues in Ireland (SWMI) Report* (DECLG, 2015) and the *Water Quality in Ireland 2010-2012 Report* (EPA, 2015), as appropriate in undertaking the SEA.	identified in the *Significant Water Management Issues in Ireland (SWMI) Report* (DECLG, 2015) are addressed by the NWSMP. Measures to monitor sludge management activities are included in Section 10 of the NWSMP. Key findings of the recently published *Significant Water Management Issues in Ireland (SWMI) Report* (DECLG, 2015) and *Water Quality in Ireland 2010-2012 Report* (EPA, 2015) have been discussed in **Chapter 6**, of the SEA Environment Report.
	It would also be useful to include a section and relevant maps describing the potential risk of flooding to existing infrastructure.	Flood Risk has been considered and is discussed in **Chapter 6**, of the SEA Environment Report.
	The Plan should clarify which population figures will be taken into account in estimating future sludge generation quantities. The Plan and the SEA should consider the location and capacity aspects of the necessary sludge management infrastructure. The capacity to treat domestic wastewater sludge should be factored into predicted sludge volumes and be linked to predicted population growth in the Regional Planning Guidelines and relevant Core Strategies. The Regional Spatial & Economic Strategies (likely to be prepared in the lifetime of the Plan), should also be taken into account, as appropriate, upon their adoption.	Section 2 of the NWSMP addresses the current and predicted future sludge loads. This includes an assessment of population growth rates. Section 7 of the NWSMP addresses the current location and size of existing infrastructure and identifies shortfalls. Specific infrastructure requirements over the lifetime of the plan will be addressed on a case by case basis taking into account Irish Water policies in relation to new connections and provision for growth.
	The EPA does not maintain a municipal solid waste database. Wastewater treatment sludge is not classed, by the EPA, as municipal waste.	This has been noted and any reference to an EPA municipal solid waste database has been removed.
	The plan should consider the systems, processes, monitoring and records required to ensure that the volumes of sludge to be removed from wastewater treatment plans (for offsite, disposal, reuse or recovery) are accurately recorded and reported on. These should clearly be described in the Plan.	Details of monitoring, reporting and quality assurance procedures proposed by Irish Water are included in Section 10 of the NWSMP.
	A commitment should be included in the Plan to ensure the appropriate annual wastewater return information is provided to the EPA in a timely manner.	Irish Water are currently providing the EPA with annual sludge returns. These are provided separately to the annual wastewater return information and as such is not considered in the NWSMP. Reporting of wastewater sludge data will be considered in Section 10 of the NWSMP.

Statutory Consultee	Issues Raised	How this has been dealt with in the Environmental Report and NWSMP?
	It should be noted that the current sludge volumes removed from waste water treatment plants may not accurately reflect the potential/ predicted volumes that should be removed, as some plants do not de-sludge at the required frequency. This should also be taken into account in the Plan.	Section 2 of the NWSMP addresses the current and predicted future sludge loads. This will include predicted sludge quantities based on current and future treatment processes and current and predicted population equivalents.
	The Current sludge management practices operating at WWTPs should be described in the plan. This should highlight the necessary additional measures/processes required to ensure compliance with the Waste Water Treatment Directive and EPA Wastewater Discharge Authorisations.	It is not within the scope of the NWSMP to address specific operating practices at individual WWTP's. However, the impact of on-site sludge management practices on compliance with the Waste Water Treatment Directive and EPA Wastewater Discharge Authorisations are considered in Section 10 of the NWSMP.
	The Plan and SEA should take into account the potential increase in wastewater sludge production likely from ongoing and planned sludge handling improvements at several WWTPs. Appropriate sludge handling facilities are required at WWTPs to ensure performance of these plants is not adversely affected. The Agency notes in particular that there is a deficit of appropriate sludge handling facilities/ infrastructure in the west of Ireland. This needs to be addressed in the Plan.	Section 2 of the NWSMP addresses the current and predicted future sludge loads. This will include predicted sludge quantities based on current and future treatment processes and current and predicted population equivalents. Section 7 of the NWSMP addresses the current location and size of existing infrastructure and identifies shortfalls. Specific infrastructure requirements over the lifetime of the plan will be addressed on a case by case basis taking into account Irish Water policies in relation to new connections and provision for growth.
	The Plan should include a commitment that sludge is only applied to agricultural land where it is both environmentally and agronomically safe and appropriate to do so. It should also be ensured that it is applied at levels which ensure that the nutrients can be effectively used for plant growth or assimilated into the soil.	It is Irish Water's policy to comply with the Code of Good Practice for Use of Biosolids in Agriculture in addition to all applicable legislation. This will ensure that, where sludge is used in agriculture, that it is both environmentally and agronomically safe and appropriate. Details of monitoring, reporting and quality assurance procedures proposed by Irish Water are included in Section 10 of the NWSMP. This Section provides details on how compliance with the legislation will be monitored and controlled.
	The Plan should consider including a commitment in the plan to establish a system for improved tracking of sludge spreading, in order to minimise the risk of overspreading and increasing the risk of runoff & leachate.	Details of monitoring, reporting and quality assurance procedures proposed by Irish Water are included in Section 10 of the NWSMP. This Section provides details on monitoring of sludge spreading.
	The Plan should include a commitment to ensure that sludge applied to	It is Irish Water's policy to comply with the Code of Good Practice

Statutory Consultee	Issues Raised	How this has been dealt with in the Environmental Report and NWSMP?
	agricultural lands complies with the *Sewage Sludge in Agriculture Regulations* (S.I. No. 267 of 2001) and that an appropriate regime is put in place for the testing of sludge and landbanks to demonstrate compliance.	for Use of Biosolids in Agriculture in addition to all applicable legislation. Details of monitoring, reporting and quality assurance procedures proposed by Irish Water are included in Section 10 of the NWSMP. Wastewater sludge and landbanks are currently tested in accordance with the requirements of the Sewage Sludge in Agriculture Regulations (S.I. No. 267 of 2001).
	A commitment should also be included to undertake risk assessments for any significant industrial effluent/pharmaceutical effluent discharging to a municipal waste water treatment plant, to assess its potential impact on the sludge and on its proposed disposal/recovery options.	Irish Water is currently reviewing all non-domestic discharges to municipal sewers and wastewater treatment plants. As part of this review, a risk assessment of significant industrial discharges will be undertaken. This will include an assessment of potential impact on the sludge and on its proposed disposal/recovery options. Details on source control are included in Section 10 of the NWSMP.
	We recommend that you also consider consultation with the National Waste Collection Permit Office (NWCPO). They would be able to advice on aspects such as the operators authorised to collect wastewater sludge. They also gather annual return information from collectors on the collections and transfers of wastewater sludge.	Noted. Consultation with NWCPO has taken place.
	We also recommend that you consult with the lead authorities for the three waste management plan regions.	Consultation with the three waste management plan regions has taken place and a written submission was received on behalf of the three waste management plan regions which has been addressed separately under the non-statutory public consultation.
Department of Agriculture, Food & the Marine (DAFM)	A critical criterion set out in Bord Bia's quality assurance standards is that the use of raw or treated sewage/sludges are prohibited from being used on Bord Bia certified farms. It was noted that while the merit the use of wastewater treated sludge as a fertiliser was understood, that the	Irish Water are consulting with stakeholders impacted by the use of wastewater sludge and will provide information on outlets to stakeholders as appropriate to ensure full transparency on outlets. Details of monitoring, reporting and quality assurance

Statutory Consultee	Issues Raised	How this has been dealt with in the Environmental Report and NWSMP?
	sentiment among the processors and their customers in relation to the use of municipal sludge on agricultural land is strongly negative, particularly given the positioning of the Irish food sector at the high quality end of the market.	procedures proposed by Irish Water are included in Section 10 of the NWSMP. The NWSMP will take into account the food safety implications of land-spreading and the recommendations of the FSAI in relation to this. It is also Irish Water Policy to comply with the Code of Good Practice for the Use of Biosolids in Agriculture. This in addition to improved levels of monitoring and control will address a number of the current concerns relating to use of wastewater sludge in agriculture. The SEA Environment Report has included a separate topic on Food Production and Safety under **Chapter 6**, which discusses the negative perceptions in relation to the spreading of sludges, the prohibited use of raw or treated sewage sludges under Quality Assurance Schemes, food safety concerns and the merits of sludge as a fertiliser.
	Attention is drawn to current legislation and guidance document in relation to the treatment and utilisation of wastewater sludge, in addition to food safety concerns as highlighted in 'The Food Safety Authority (FSAI) Scientific Committee report (2008), as well as environmental impacts and sustainability issues.	The current legislation and guidance documents, including existing codes of practice and best practice guidance in relation to the treatment and utilisation of wastewater sludge are considered relevant to the NWSMP and as such have been taken into consideration during the preparation of the actions within the NWSMP. The legislation and guidance documents have been outlined in **Chapter 5** of the SEA Environment Report. In relation to Food Safety Concerns, **Chapter 7** of the SEA Environmental Report has included a specific Environmental Protection Objective (EPO) for the protection.
	The DAFM noted its support for recommendations in the FSAI report and also noted the 11 recommendations in the FSAI report which relate to the minimum safe standards required when land-spreading organic agricultural and municipal and industrial materials on agricultural land for food production.	The SEA Environment Report has included a separate topic on Food Production and Safety under **Chapter 6** of the SEA Environment Report, which discusses the negative perceptions in relation to the spreading of sludges, the prohibited use of raw or treated sewage sludges under Quality Assurance Schemes, food safety concerns and the merits of sludge as a fertiliser.

Statutory Consultee	Issues Raised	How this has been dealt with in the Environmental Report and NWSMP?
		The NWSMP will take into account the food safety implications of land-spreading and the recommendations of the FSAI in relation to this. It is also Irish Water Policy to comply with the Code of Good Practice for the Use of Biosolids in Agriculture. This in addition to improved levels of monitoring and control will address a number of the current concerns relating to use of wastewater sludge in agriculture.
	The DAFM also noted the sewage sludge is considered a fertiliser under the definitions of the Nitrates Regulations and as such must be taken into account when considering the maximum amounts of available nitrogen and phosphorus that may be applied to meet the requirements to promote crop growth and that the total nitrogen and total phosphorus content per tome shall be declared by the supplier in accordance with the Waste Management (Use of Sewage Sludge in Agriculture) Regulations, 1998 to 2001 and any subsequent amendments thereto.	The SEA Environment Report has included a separate topic on Food Production and Safety under **Chapter 6**, which discusses the negative perceptions in relation to the spreading of sludges, the prohibited use of raw or treated sewage sludges under Quality Assurance Schemes, food safety concerns and the merits of sludge as a fertiliser.
Department of Arts, Heritage and the Gaeltacht (DAHG)	It is recommended that the Environmental Report in the SEA should include an Archaeological Impact Assessment of the potential impact that works carried out under the NWSMP may have on known or potential archaeological sites including the underwater cultural heritage.	It is recognised that impacts to specific monuments and subsurface unknown archaeology are more appropriately assessed at a project level e.g. proposals for new wastewater infrastructure. At the strategic level of the NWSMP, the focus will be on appropriate siting guidance that can alleviate conflict at later stages in the planning hierarchy and contribute to avoidance of risk as far as possible. Siting criteria have been included in the NWSMP to help ensure siting of new wastewater and sludge infrastructure going forward will take environmental considerations, including archaeology into account as early as possible.
	Irish Water is advised that the screening for appropriate assessment, and appropriate assessment as may be required, are to be undertaken pursuant to SI 477 of 2011, European Communities (Birds and Natural Habitats Regulations), 2011.	Screening for Appropriate Assessment (AA) of the NWSMP has been carried out in line with the requirements of Article 6(3) of the EU Habitats Directive (Directive 92/43/EEC) on the Conservation of Natural Habitats and of Wild Fauna and Flora as transposed into Irish law through the European Communities

Statutory Consultee	Issues Raised	How this has been dealt with in the Environmental Report and NWSMP?
		(Birds and Natural Habitats) Regulations 2011 (477/2011), as amended.
	It is recommended that the statements and conclusions in relation to appropriate assessment screening be clarified, in line with the relevant legislative requirements.	The legislative requirements in relation to screening for appropriate assessment (AA) have been reviewed. Screening for Appropriate Assessment (AA) has been carried out in line with the requirements of Article 6(3) of the EU Habitats Directive (Directive 92/43/EEC) on the Conservation of Natural Habitats and of Wild Fauna and Flora as transposed into Irish law through the European Communities (Birds and Natural Habitats) Regulations 2011 (477/2011), as amended.
	The following environmental effects need to be considered: ▪ The implications of acidification and deposition for nature conservation. ▪ The potential for habitat loss (from new sludge infrastructure). ▪ Habitat deterioration from spreading and subsequent changes to chemical composition (phosphate, copper) of surface run-off and environmental receptors etc. ▪ Disturbance to Annexed species (including birds). A review of peer-reviewed literature should be undertaken to gain a fuller understanding of how these impacts may affect species and habitats, *e.g.* on vegetation and structure and functioning of ecosystems and through the trophic levels. An example includes "*Nitrogen deposition and Natura 2000: Science and Practice in Determining Environmental Impacts*" by Hicks et al 2011.	The NWSMP has as one of its core objectives: *The protection of the environment and prevention of harmful effects on soil, vegetation, fauna and humans*, providing a clear foundation for the protection of the environment including European Sites. However, notwithstanding this, Irish Water recognises the broader environmental impacts of the NWSMP in terms of potential emissions to land, water and air. The SEA Environment Report has included a separate topic on Biodiversity, Flora and Fauna under **Chapter 6**, which given the strategic nature of the NWSMP, has focused biodiversity primarily at a national level. A Screening for Appropriate Assessment has been carried out and has determined that in applying the precautionary principle, the AA process in relation to the draft NWSMP must proceed to Stage II Appropriate Assessment and the preparation of a Natura Impact Statement (NIS) to fully inform the Appropriate Assessment to be undertaken by Irish Water.
	With regard to the Biodiversity Flora and Fauna issues scoped in, National Parks and Nature Reserves should also be considered. It is inferred that species protected under European and national legislation are included within "flora and fauna" but this would benefit from elaboration.	These have been considered and included in **Chapter 6** of the SEA Environment Report.

Statutory Consultee	Issues Raised	How this has been dealt with in the Environmental Report and NWSMP?
	For Biodiversity, Flora and Fauna the scope of the SEA should include: ▪ All nature conservation sites, including European sites, sites protected under national legislation, National Parks etc.; ▪ Species of wild flora and fauna, including rare and protected species and their habitats; Annex IV (Habitats Directive) species of flora and fauna, and their key habitats (i.e. breeding sites and resting places), which are strictly protected wherever they occur, whether inside or outside sites, (including data on rare and protected species from NPWS, the National Biodiversity Data Centre, BirdWatch Ireland, etc.); ▪ Other species of flora and fauna and their key habitats which are protected under the Wildlife Acts, 1976-2000, wherever they occur; ▪ 'Protected species and natural habitats' as defined in the Environmental Liability Directive (2004/35/EC) and European Communities (Environmental Liability) Regulations, 2008, including: o Birds Directive – Annex I species and other regularly occurring migratory species, and their habitats (wherever they occur) o Habitats Directive – Annex I habitats, Annex II species and their habitats, and Annex IV species and their breeding sites and resting places (wherever they occur) ▪ Stepping stones and ecological corridors including nature conservation sites (other than European sites), habitat areas and species' locations covered by the wider obligations of the Habitats Directive. ▪ All watercourses, surface water bodies and associated wetlands, including floodplains and flood risk areas;	Given the strategic nature of the NWSMP, focus of the baseline for biodiversity is primarily at a national level however consideration has been given to the items listed and these have been included in **Chapter 6**, of the SEA Environment Report.
	The Environmental Report is required to contain environmental protection objectives. The environmental protection objectives for Biodiversity, Flora and Fauna should integrate with the objectives and obligations of other directives such as the Habitats Directive, the Birds Directive, the Water Framework Directive and the Floods Directive, the Wildlife Acts 1976-2000	The environmental protection objectives and their relationship with the NWSMP and various plans, programmes, policy and legislation have been identified and discussed in **Chapter 5** of the SEA Environment Report. These environmental protection objectives have been integrated

Statutory Consultee	Issues Raised	How this has been dealt with in the Environmental Report and NWSMP?
	and the National Biodiversity Plan.	into the development of the SEA objectives which are outlined in **Chapter 7** of the SEA Environment Report. In addition, **Appendix B** provides a comprehensive list of plans, programmes, policy and legislation containing environmental protection objectives, which have been considered relevant to wastewater and sludge management.
	It is stated that the recommendations arising from the SEA and AA of the Water Services Strategic Plan will be reviewed and incorporated as relevant into the SEA and AA of the NWSMP. However it should be considered that such recommendations may need to be incorporated into the NWSMP itself (and other Tier 2 Implementation Plans), particularly if it is mitigation on which the higher-level plan relies for any conclusion that it will not adversely affect the integrity of European sites.	The NWSMP has included where relevant the recommendations of the Water Services Strategic Plan. **Chapter 10** of the SEA Environmental Report outlines a Monitoring Programme which aligns with the Water Services Strategic Plan Monitoring Programme.
	It is not clear if disposal of sludge at sea, or incineration is being considered; if it is, this will expand the potential implications for nature conservation that will need to be considered and assessed in both the SEA and NIS (e.g. potential implications of heavy metal loading from incineration on fauna).	Disposal of sludge at sea is not being considered as an option. Incineration of sewage sludge is one of the options being considered. The appropriate assessment will consider all of the Alternatives outlined in the NWSMP and will assess the preferred option presented in the NWSMP. The comments have been noted in relation to potential implications of heavy metal loading from incineration on fauna.
	Under the Biodiversity, Flora & Fauna SEA Indicators, it is unclear what kind of “margaritifera plans” are being referred to. Under the Soil SEA Indicators, clarification on what is meant by “management” of peatlands is required.	The SEA Indicators for Biodiversity, Flora and Fauna and Soil have been reviewed and updated to provide clarity. The SEA Indicators proposed are consistent with those outlined in the SEA Statement of the Water Services Strategic Plan (WSSP), which is a Tier 1 plan and as such provides the context for subsequent detailed implementation plans, Tier 2 (i.e. the NWSMP). These SEA Indicators have are outlined in **Chapter 7** of the SEA Environment Report.
	The following data and information sources were suggested:	The data and information sources were consulted in the

Statutory Consultee	Issues Raised	How this has been dealt with in the Environmental Report and NWSMP?
	▪ The NPWS website for source of data, information and publications, including GIS datasets; ▪ Site-specific conservation objectives, and associated backing documents and GIS datasets in the case of some European sites; ▪ Due regard to developments in the interpretation and application directives and legislation arising from jurisprudence of the Court of Justice of the European Union, and of the Irish Courts, particularly in regard to Article 6 of the Habitats Directive.	preparation of the SEA Environment Report.
Department of Communications, Energy & Natural Resource (DCENR)	Inland Fisheries Ireland (IFI) as part of DCENR suggested that in determining the likely significant effects of the NWSMP some key issues from a fisheries perspective for consideration in the SEA should include: ▪ Water quality ▪ Fish spawning and nursery areas ▪ Ecosystem structure and functioning ▪ Sport and commercial fishing and angling ▪ Amenity and recreational areas	Information on water quality and biodiversity on a national scale has been included in **Chapter 6** of the SEA Environment Report. The effects of the NWSMP on the environment have been assessed in both **Chapter 8** Alternatives and **Chapter 9** Assessment within the SEA Environment Report.
	IFI suggested that consideration should be given to watercourses outside formal European designation which may hold species that are designated under the European Habitats Directive i.e. salmon and lamprey (sea, river and brook), which are listed as an Annex II Species.	These watercourses have been considered and are included in **Chapter 6**, Baseline of the SEA Environment Report. The NWSMP is a national plan and as such the SEA is directed at a national level.
	The Geological Survey of Ireland (GSI) as part of DCENR recommended that geology is included together with Soils under the heading Soil & Geology and that the Environmental Component – Soil & Geology of the SEA Objective is modified to "Avoid conflicts with, and contribute toward, where possible, the appropriate management of soils and geology".	The SEA Environment Report has included under **Chapter 6** of the SEA Environment Report a specific heading addressing both Soils and Geology. The SEA Objective has also been updated in **Chapter 7**, Environmental Protection Objectives of the SEA Environment Report.
	GSI recommended that the Soils and Geology section of the SEA should provide information about the description of the bedrock and lithologies (types of strata), quaternary geology, landslide hazard and geological heritage should be included and potential impacts recognised. Use of maps	Given the strategic nature of the NWSMP, focus of the baseline for Soils and Geology is primarily at a national level however consideration has been given to Bedrock Geology, Mines and Quarries and Geological Heritage as outlined in **Chapter 6** of the

Statutory Consultee	Issues Raised	How this has been dealt with in the Environmental Report and NWSMP?
	is recommended where appropriate.	SEA Environment Report.
	GSI provided links to their online resources with relevant datasets which should be considered in the Baseline Data Sources and Extent of Assessment.	The information sources have been noted and consulted during the preparation of the SEA Environment Report.
Northern Ireland Environment Agency (NIEA)	Suggestion that to ensure that there are no adverse environmental impacts on Northern Ireland, that adequate mitigation and monitoring measures are highlighted in the Environmental Report and built into the NWSMP.	Details of monitoring, reporting and quality assurance procedures proposed by Irish Water are included in Section 10 of the NWSMP.
	Inclusion of a clear statement in the SEA Environmental Report indicating whether or not the implementation of the Plan, in combination with any identified measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment, is likely to have a significant effect on Northern Ireland.	This has been noted.
	NIEA provided links to their information sources which should highlight the current state of the environment in Northern Ireland at a regional level for inclusion in the baseline assessment.	The information sources have been noted and consulted during the preparation of the SEA Environment Report.
	Recommendation that Air and Climatic Factors should include an SEO Target to "Minimise emissions to air from sewage sludge treatment / spreading', and 'Minimise effects on sensitive habitats from contact/deposition of air pollutants (specifically ammonia) from sewage sludge treatment/spreading activities.'	This has been noted.

Submissions were also received from individuals and groups as part of the non-statutory public consultation which ran in parallel to the scoping consultation. The main themes raised as part of this consultation are summarised below.

Main Issues / Suggestions from Non-Statutory Consultees

	Issue Raised	How this has been dealt with in the Environmental Report and NWSMP?
Fingal Co. Co	Suggestion in relation to the assessment that there is a quantitative assessment of the environmental impact of the options using a waste management lifecycle assessment tool such as the Danish Easewaste or the UK Wrate tool, which measure the impact with regard to greenhouse emissions, impact on soil, impact on air and water	This comment has been noted and will be considered, if feasible as part of the SEA assessment process. Such quantitative approach will depend on the actions outline in the NWSMP.
Individual	Suggestion to examine the use of Dried Sludge Cakes as a land-build / land-fill for low lying fields subject to waterway flooding as a sustainable alternative to incineration	It is Irish Water policy to re-use wastewater sludge, where feasible. However, due to restrictions in agricultural use, alternative outlets, including incineration are considered in Section 8 of the NWSMP. Development of alternative outlets for wastewater sludge will be considered in the NWSMP. However, due to the nutrient content of wastewater sludge it is unlikely to be considered suitable for use immediately adjacent to surface waters due to the potential for run-off of nutrients from the sludge.
Connacht-Ulster, Eastern Midlands and Southern Waste Regions	Suggestions in relation to the policies, plans and programmes that should be included in the SEA Environmental Report. Suggestion in relation to additional information that should be included to: ▪ Highlight how the NWSMP measures align with WFD requirement; ▪ Reasons should be documented in cases where environmental criteria are proposed to be scoped out; ▪ Consideration should be given to the problems identified in previous sludge management plans for generating alternatives	The suggestions have been included in **Chapter 5,** Relevant Plans, Policies and Programmes of the SEA Environment Report. The main mitigation measure proposed in relation to achievement of WFD objectives is compliance with S.I. 31 of 2014 European Union (Good Agricultural Practice For Protection Of Waters) Regulation. The purpose of these regulations was to give further effect to several EU Directives including Directives in relation to protection of waters against pollution from agricultural sources ("the Nitrates Directive"), dangerous substances in water, waste management, protection of groundwater, public participation in policy development and water policy (the Water Framework Directive). Details of monitoring, reporting and quality assurance procedures proposed by Irish Water are included in Section 10 of the NWSMP.

	Issue Raised	How this has been dealt with in the Environmental Report and NWSMP?
		This Section provides details on how compliance with the legislation will be monitored. A review of Standards and Plans, which included Sludge Management Plans has been included in the Section 3 of the NWSMP.
Cré	Suggestion in relation to a policy in Denmark for the management of domestic wastewater sludge that should be examined for Ireland. Proposed measures which provide the best food safety should be a key factor for all considerations in developing the plan and suggested the following reports as sources of other information: ▪ Food Safety Implications of Land-spreading Agricultural, Municipal and Industrial Organic Materials on Agricultural Land used for Food Production in Ireland (Food Safety Authority of Ireland, 2008) ▪ Cré (2013) The Management of Sewage Sludge in Ireland. Cré also stated that they have reviewed the management of sewage sludge in Ireland and is making the following recommendations: ▪ The 'Code of Good Practice for the Use of Biosolids in Agriculture' should be made into legislation. ▪ There are a number of exemptions and provisions in the current Regulations which should be removed as they conflict with the Code of Good Practice and give rise to food safety concerns. Specific examples of the legislative changes required include: Untreated Sludge: The Code of Good Practice states that untreated wastewater sludge should not be landspread or injected into soil. However, the Regulations allows for the latter practice. The Regulations should be changed to prevent untreated sludge being landspread or injected into the soil. Residual Sludge from Septic Tanks: The provision under the Regulations for the use of residual sludge from septic tanks on grassland and the use of	Irish Water have no remit to provide infrastructure for disposal of sludge from domestic wastewater treatment systems. However, where appropriate, facilities will be provided where it is considered that there is an ongoing demand. This will be addressed in Section 2 of the NWSMP. The NWSMP will take into account the food safety implications of land-spreading and the recommendations of the FSAI in relation to this. It is also Irish Water Policy to comply with the Code of Good Practice for the Use of Biosolids in Agriculture. Landspreading of untreated wastewater sludge is not permitted by Irish Water and records are kept of all landspreading. Details of monitoring, reporting and quality assurance procedures proposed by Irish Water are included in Section 10 of the NWSMP. This will apply to all wastewater sludge produced by Irish Water.

	Issue Raised	How this has been dealt with in the Environmental Report and NWSMP?
	untreated sludge (worked/injected into ground) in agriculture is a matter of concern as it may introduce pathogens into the food chain. The Regulations should be changed to prevent residual sludge from septic tanks being landspread untreated. No Records of Sludge from Plants less than 5,000 persons: The Sludge register does not have to contain details of sludge from plants of 5,000 p.e. This represents a breakdown in the traceability and monitoring necessary for the safe use of sludge in agriculture and is a matter of concern. The Regulations should be changed to remove this exemption for plants less than 5,000 p.e. The current draft SEA Scoping report is flawed as it does not acknowledge the potential environmental impact of sludge from plants less than 5,000 persons. Cré proposed that composting of the sludge produced by the on-site mobile desludging of septic tanks has many advantages. The Danish model is based on this concept and should be considered.	
IGFA	Outlined concerns over gaps in knowledge concerning the transfer of chemical contaminants and pathogens into the food chain through land spreading of Organic Municipal and Industrial materials on land used for food production and the lack of a transparent and robust public health monitoring and surveillance system.	It is Irish Water's policy to comply with the Code of Good Practice for Use of Biosolids in Agriculture in addition to all applicable legislation. Details of monitoring, reporting and quality assurance procedures proposed by Irish Water are included in Section 10 of the NWSMP. Wastewater sludge and soil are currently tested to provide robust food safety protection.
Carlow County Council	Consideration to the effects on human health (pathogens, heavy metals etc) resulting from landspreading of sludge should be included in the scoping of environmental issues. This could be via food crops or directly from contact with sludge. Transport costs are a significant factor in sludge treatment and disposal and while regional hubs might have a number of advantages due to the scale of operations the transport costs may negate these.	The NWSMP will take into account the food safety implications of land-spreading and the recommendations of the FSAI in relation to this. It is also Irish Water Policy to comply with the Code of Good Practice for the Use of Biosolids in Agriculture. This includes monitoring of sludge and soil samples for metals and pathogens. Landspreading of untreated wastewater sludge is not permitted by Irish Water. The NWSMP has considered the cost and environmental impacts for transport of high levels of wastewater sludge.

	Issue Raised	How this has been dealt with in the Environmental Report and NWSMP?
ICMSA	Should be specific mention of food production (production on farms, food processing and distribution). The review of appropriate sludge treatment processes should take account of the current and emerging situation regarding the concern and opposition to agricultural use. Quality assurance schemes such as the Bord Bia schemes should be included in the policies, plans and programmes and the consequences that arise from the schemes for restricted use in agriculture should be considered. Special and unique environmental issues in relation to food production should be dealt with separately as key environmental considerations. It is not clear what is meant by the use of sludge in land remediation taking account of actual Irish situation. The SEA should specifically address in detail the issue of the use of sludge on farms and the environmental impact of same as well as the impact of the general management of sludge on the food sector in Ireland and measures to prevent or mitigate any perceived risks.	The SEA Environment Report has included a separate topic on Food Production and Safety under **Chapter 6** which discusses the negative perceptions in relation to the spreading of sludges, the prohibited use of raw or treated sewage sludges under Quality Assurance Schemes, food safety concerns and the merits of sludge as a fertiliser. The NWSMP will take into account the food safety implications of land-spreading and the recommendations of the FSAI in relation to this. It is also Irish Water Policy to comply with the Code of Good Practice for the Use of Biosolids in Agriculture.
CEWEP Ireland	Greater consideration to be given to the impact of quality assurance schemes, customer demands and other market pressures on agriculture and the food production industry on the available land-bank for sludge spreading. Suggestion that reference to the effect on food quality is considered as a parameter within the SEA issues of Human Health and Soil and Land Use and that a more extensive list of potential soil (and hence food supply chain) contaminants as a result of land spreading, including but not limited to: heavy metals, Persistent Organic Pollutants(POPs), Environmental Persistent Pharmaceutical Pollutants (EPPP) and personal care products (e,g, antibiotics, endocrine disrupting hormones). The impact on diversion from landspread on fertiliser use should be considered under Material Assets. Supports the proposed alternatives to land spreading including incineration with energy recovery, but would rule out incineration without energy	Irish Water are consulting with stakeholders impacted by the use of wastewater sludge and will provide information on outlets to stakeholders as appropriate to ensure full transparency on outlets. Details of monitoring, reporting and quality assurance procedures proposed by Irish Water are included in Section 10 of the NWSMP. The NWSMP will take into account the food safety implications of land-spreading and the recommendations of the FSAI in relation to this. It is also Irish Water Policy to comply with the Code of Good Practice for the Use of Biosolids in Agriculture. This includes monitoring of sludge and soil samples for metals and pathogens. Landspreading of untreated wastewater sludge is not permitted by Irish Water. The NWSMP has considered the constituents of wastewater sludge and their potential impact on soil and the food supply chain. Available treatment processes for wastewater sludge has been

	Issue Raised	How this has been dealt with in the Environmental Report and NWSMP?
	recovery as this is seen to be an unsustainable approach which does not adhere to BAT. Mono-incineration with phosphorous recovery from the ash should also be considered in the context of the phosphorous material cycle. Additional alternatives for consideration could include; anaerobic digestion and composting. The different capabilities of each alternative should be recognised in terms of treating or removing contaminants from the nutrient cycle.	considered in the NWSMP. This will include an assessment of the advantages and disadvantages including recovery options.
Irish Dairy Industry Association (IDIA)	Consideration of food producing lands, the importance of Ireland's agri-food sector, National programmes such as the Bord Bia Quality Assurance Scheme should be taken into account along with the heavily dependent practice of spreading municipal sludge (whether treated or untreated) on agricultural land. Consideration of farms participating in important National Quality Assurance schemes which cannot receive municipal sludge for landspreading.	Irish Water are consulting with stakeholders impacted by the use of wastewater sludge and will provide information on outlets to stakeholders as appropriate to ensure full transparency on outlets. Details of monitoring, reporting and quality assurance procedures proposed by Irish Water are included in Section 10 of the NWSMP. The NWSMP will take into account the food safety implications of land-spreading and the recommendations of the FSAI in relation to this. It is also Irish Water Policy to comply with the Code of Good Practice for the Use of Biosolids in Agriculture. Landspreading of untreated wastewater sludge is not permitted by Irish Water. This in addition to improved levels of monitoring and control will address a number of the current concerns relating to use of wastewater sludge in agriculture.
Bord na Móna	The final NWSMP should highlight the potential advantages/disadvantages of each sludge treatment and disposal option, e.g. land-filling, composting, incineration, pyrolysis, gasification and anaerobic digestion. The final NSWMP should give careful consideration to the location of future agglomerations or centralisation of WWTP's bearing in mind the transportation distances which would be considered by potential investors to the anaerobic digestion marketplace.	The NWSMP will consider the available treatment and disposal options for wastewater sludge including an assessment of current and future loads. The NWSMP will include a transportation assessment taking into account transport distances and volumes of wastewater sludge.
Enva Ireland Limited	The fertiliser and soil organic matter benefits from the use of biosolids as a fertiliser and soil improver should be included as an environmental consideration.	The NWSMP will consider the value of wastewater sludge in relation to energy, nutrient and organic content. The NWSMP will consider how the value of wastewater sludge can be optimally used.

	Issue Raised	How this has been dealt with in the Environmental Report and NWSMP?
	Suggestion of a Quality Assurance scheme, associated kitemark and audit process for Irish Water and relevant contractors involved in the production of biosolids and recovery to land as a fertiliser and soil improver as an important factor. The quality of Ireland's WWTP sludges (i.e. not dominated by heavy industry) vs some areas of mainland Europe needs to be considered. The majority of imported grain to feed our national herd (livestock such as cattle, sheep or pigs) in Ireland comes from countries where landspreading of biosolids is common practice. The scientific and real tangible sustainability benefits of utilising this national resource as a fertiliser and soil improver does not get the recognition it deserves.	Details of monitoring, reporting and quality assurance procedures proposed by Irish Water are included in Section 10 of the NWSMP.
Clare County Council	The lists of plans, policies and programmes does not appear to include any documents on alternative energy or climate change, which would be relevant to consideration of energy generation from digestion of sludge. Under Sludge outlets as an alternative, issues to be considered should include size of land banks required, buffer zones, neighbouring land uses, vulnerability of groundwater and surface water. Consideration of alternatives should go look at any emerging new technologies and innovative ways of treating and/or disposing of sludge.	The list of plans, policies & programmes in **Chapter 5** of the SEA Environment Report has been updated to include those associated with energy and climate change. The NWSMP will consider options available for treatment of wastewater sludge including energy recovery options and emerging new technologies. A separate Climate Change Strategy is also being prepared by Irish Water which will further consider renewable energy options. The NWSMP will consider the size of landbanks required for use of sewage sludge in agriculture and the restrictions in relation to potential environmental impacts.
Bord Bia	Bord Bia operates Quality Assurance Schemes for the key primary production enterprises at processor and at farm level. It is a requirement of all Bord Bia's Quality Assurance Schemes that raw or treated sewage sludges are prohibited from being used on Bord Bia Certified farms. This applies to all land owned or managed by the farmer member of the relevant scheme. Bord Bia is currently working with individual County Councils to compile a register of all farms where municipal sludges are spread.	Irish Water are consulting with stakeholders impacted by the use of wastewater sludge and will provide information on outlets to stakeholders as appropriate to ensure full transparency on outlets. Details of monitoring, reporting and quality assurance procedures proposed by Irish Water are included in Section 10 of the NWSMP.
Individual	Consideration of the use of slatted units as an alternative for bio methane	The NWSMP considers treatment options in Section 4. The provision

	Issue Raised	How this has been dealt with in the Environmental Report and NWSMP?
	production and fertiliser.	of anaerobic digestion of a higher proportion of the wastewater sludge produced will be considered in the NWSMP. Increasing energy recovery is in line with Irish Water policies. It is not within the scope of NWSMP to consider the detailed design of new infrastructure.
Individual	Feedback noted that to comply with the Aarhus Convention and the Public Participation Directive 2003/35/EC, there is a requirement to have meaningful public consultation through the holding of public meetings, workshops and discussions to comply with the SEA directive, in other words the SEA process must be adhered to in both the spirit and the letter of the Directive. It was felt that the published SEA Scoping Report does not make provision for public participation at the earliest stage as there has not been an opportunity to have meaningful consultation and discussions at the earliest possible stage, and it was felt that stakeholders were left with the much-reduced opportunity of outlining concerns in writing. There was feedback that the following information should have been included in the Scoping Document: ▪ Tonnage, source and the chemical composition including heavy metals, that are present in sewage sludge; ▪ Endocrine Disrupting Chemicals (EDCs), Emerging Contaminants (ECs); and Prions should also have been considered; ▪ Quantities of sewage sludge produced in each of the 3 Waste Management Regions (Eastern-Midlands, Connaught-Ulster and Southern Region)in 2012 giving a national total of 472,317 tonnes of sewage sludge; ▪ The quantity of Landfill Leachate received in wastewater treatment plants in 2012 as per Waste Management Regions. There is documentation that the maximum concentration of heavy metals in soils exceeded the maximum permitted values on land in agricultural use where sewage sludge was spread and referenced the EPA Bi annual 'Waste Water Reviews' 2000 –2001 and 2002-2003. The EPA Urban Waste Water	The SEA Scoping Report for the NWSMP was published on Tuesday, 12th May 2015. Consultation 1 was a non-statutory public consultation in which Irish Water sought feedback from the public, statutory consultees and interested bodies on the SEA Scoping Report and any additional information, not currently contained in the Scoping Report, that should be considered for the SEA, or any other comments or suggestions that should be considered. This consultation phase ran for six weeks from Tuesday, 12th May to Wednesday, 24th June 2015. Statutory Consultation on the Draft NWSMP and associated Environmental Reports will be carried following publication of the draft documents. This will represent a further opportunity for the public and interested stakeholders to have their say. An assessment of alternative management options is included in Section 9 of the NWSMP. This includes an assessment of the risks to each outlet and includes Persistent Organic Pollutants, Pathogens, Metal Content, emerging contaminants, industrial discharges and landfill leachate acceptance. It is Irish Water's policy to comply with the Code of Good Practice for Use of Biosolids in Agriculture in addition to all applicable legislation. Details of monitoring, reporting and quality assurance procedures proposed by Irish Water are included in Section 10 of the NWSMP. Wastewater sludge and soil are currently tested to provide robust food safety protection. This includes monitoring of sludge and soil samples for metals and pathogens. The NWSMP, through the SEA, has identified the areas of agricultural land that are suitable for landspreading based on technical limitations (heavy metal content, groundwater vulnerability) and environmental considerations (proximity to watercourses and designated sites).

	Issue Raised	How this has been dealt with in the Environmental Report and NWSMP?
	Discharges Report 2002- 2003, was also referenced stating that the EPA reports show that the maximum-recorded levels of heavy metals on agricultural land where sewage sludge was spread of being up to 12 times the maximum level of heavy metal recorded in the sewage sludge in 2003. Feedback included a view that the Scoping Report should state the proposed mitigating measures for the lands where the maximum concentration of heavy metals in soils exceeds the permitted levels, where Ringsend sludge was reused in agriculture. There is no Environmental Report on the issue of Heavy Metals on Agricultural Soils, nor is there any reference to the lack of compliance of any local, national and international environmental laws, acts, regulations, licences etc. It was also stated that there is no legislation covering the use of sewage sludge on agricultural land in Ireland, only a code of conduct. This compares to the Netherlands where the use of sewage sludge on agricultural land is banned by legislation. The Dutch chemical analysis and control of sewage sludge is sufficiently detailed to allow them to identify the source of sewage sludge from the legal and illegal chemical composition of the sewage sludge. All sewage sludge in the Netherlands is dried and incinerated. This policy is to protect the quality and reputation of Dutch agricultural produce. When it comes to food safety, perceptions matter more than facts. The current standards in Ireland address neither. Will Irish Water research, collect, correlate and publish up to date international findings on the risks associated with sewage sludge spreading? Stakeholder had the following specific questions: ▪ Does Irish Water analyse the chemical composition of Landfill Leachate delivered to Wastewater Treatment Plants and will these results be published as part of the required baseline information? ▪ Will all aspects of the Thornhill Sewage Sludge Storage facility including the storage of grain for animal and human consumption on the same site be examined? ▪ There is a need to take account of the uptake of contaminants, heavy metal and other in crops that have been grown for human consumption	Section 11 of the NWSMP addressed Research Opportunities into technologies that provide sustainable outlets with low-energy consumption, energy recovery and recovery of nutrients may provide future options for wastewater sludge management in Ireland. Irish Water has developed a Research and Innovation Policy as outlined in Section 11 of the NWSMP. Leachate must be analysed to assess nutrient and metal content. Ongoing monitoring and controls are required to mitigate against any risk to the wastewater sludge produced and will be addressed in the NWSMP. Given the strategic nature of the NWSMP, the focus is primarily at a national level however consideration has been given to storage facilities and has been addressed in Section 10 of the NWSMP. It is proposed to develop an independently assessed quality assurance scheme in relation to sludge management. Details of monitoring, reporting and quality assurance procedures proposed by Irish Water are included in Section 10 of the NWSMP.

	Issue Raised	How this has been dealt with in the Environmental Report and NWSMP?
	or animals that have been fed on grass or crops grown where heavy metals exceeded the permitted levels. The 2015 harvest shall commence shortly from areas where sewage sludge was spread where the permitted heavy metal levels were exceeded. Will these areas be identified? ▪ Will Irish Water investigate to assess whether all contacts with external plant operators and contractors have been carried out to the required standard? ▪ In the event of there being breaches in the required standards will Irish Water seek compensation for damages, including costs of replacement and/ or decontamination if necessary? Will Irish Water apply the "Polluter Pays" principle?	
Blacksod Bay Protection Association Group	The stakeholder had specific comments regarding the proposed Sludge Storage/Treatment facility located in Corclough East, Belmullet, Co. Mayo: ▪ Who will be responsible for the design, build and operation of the plant? ▪ Can you provide us with a copy of the design of plant for review? ▪ Would like a full Environmental Impact Assessment as part of Strategic Sludge Management Plan? ▪ How will Irish Water control contamination to wildlife from discharge from proposed sewer outfall? ▪ How does Irish Water propose to protect safe uncontaminated shellfish for human consumption? ▪ How does Irish Water propose to control adequate dilution and dispersion of the treated effluent? ▪ How does Irish Water propose to control water quality affected from proposed wastewater discharge? ▪ How will Irish Water control water pollution, dust emissions and noise during the construction phase? ▪ How will Irish Water control the noise level during construction and	Section 7 of the NWSMP addresses the current location and size of existing infrastructure and identifies shortfalls. Specific infrastructure requirements over the lifetime of the NWSMP will be addressed on a case by case basis taking into account Irish Water policies in relation to new connections and provision for growth, however it is not within the scope of NWSMP to consider the detailed design of new infrastructure.

	Issue Raised	How this has been dealt with in the Environmental Report and NWSMP?
	operation phases of the proposed Sludge Storage/Treatment facility? ▪ How will Irish Water control light nuisance caused by light pollution from security lighting at night-time? ▪ How will Irish Water control emission of aerosols by proposed aeration equipment as there are very vulnerable people in close proximity to this location? ▪ How will Irish Water deal with the issue of odour and air quality from these plants as this is of huge concern? ▪ Can Irish Water confirm how the proposed discharge will be monitored and controlled to prevent a deterioration of the Bathing Water Quality of the nearby beach? ▪ The proposed outfall and the discharge point at the outfall end will be exposed during times of low tide. How will this be controlled? ▪ How will Irish Water deal with the issue that these plants would attract rodents and pests? ▪ How will Irish Water deal with the issue of visual intrusion to the long-distance scenic views? ▪ How will Irish Water operate the plant in high flooding periods?	

APPENDIX B

[Other Plans, Programmes and Legislation]

APPENDIX C

[Water Services Strategic Plan Indicators]

Indicators and Targets

Indicators and targets for ensuring a safe and reliable water supply are presented in the table below.

ENSURE A SAFE AND RELIABLE WATER SUPPLY					
Indicators	**Definition**	**Current Baseline**	**End of 2021 Target**	**End of 2027 Target**	**2040 Target**
AIM WS1	Manage the Sustainability and Quality of Drinking Water from Source to Tap to Protect Human Health				
Drinking Water Microbiological Standards	% of national samples meeting microbiological compliance standards	99.82% (based on currently available data)	99.99%	99.99%	99.99%
Boil Water Notices	Notices in place >200 days	23,000 people on notices (2014)	0 people on notices	0 people on notices	0 people on notices
Treatment Plants on the EPA 2013 RAL	Carry out Remedial Action at all WTPs on the EPA's 2013 RAL	126 WTPs on the 2013 RAL (list Appendix 1)	100% of required remedial action undertaken		
Drinking Water Lead standards	% of national samples meeting Lead Compliance Standards sampled in the public network.	Estimated 85–95% meeting standard of 10µg/l*	98% meeting standard of 10µg/l**	99%**	99.5% meeting standard of 10µg/l
Drinking Water Chemical Standards	% of national samples meeting chemical compliance standards	99.51% (based on currently available data)	99.75%	99.90%	99.90%
Drinking Water Trihalomethane Standards	% of national samples meeting THM compliance standards	90.3% (based on currently available data)	93%	99%	99.50%

* To be established through a comprehensive national monitoring programme
** Based on technological alternative to lead replacement being available

ENSURE A SAFE AND RELIABLE WATER SUPPLY					
Indicators	**Definition**	**Current Baseline**	**End of 2021 Target**	**End of 2027 Target**	**2040 Target**
AIM WS2	Manage the Availability, Sustainability and Reliability of Water Supplies Now and into the Future				
Water Supply Interruptions	Average hours of supply interruption per property served (per year) - hours lost due to water supply interruption for 3 hours or longer (planned or unplanned)	Not currently available. To be defined by end of 2016	Transition from unplanned to planned supply interruptions with targeted reduction in number of interruptions	On track to achieving long term target	0.13 hours lost per annum - planned and unplanned interruptions
Water Pressure	% of properties at or above reference level (minimum of 15 metre pressure head at property meter)	Not currently available. To be defined by end of 2016.	From 2019, 2% per annum decrease in properties below pressure reference level	On track to achieving long term target	99.9% receiving appropriate pressure
AIM WS3	Manage Water Supplies in an Efficient and Economic Manner				
Leakage	Leakage expressed as a % of treated water put into the distribution system	Approx. 49% of treated water	Less than 38% of treated water	Less than 30% of treated water	Achieve Sustainable Economic Level of leakage (*currently considered 18 to 22% in the UK)
National Water Resources Planning (NWRP)	Implement National Water Resources Plan	Large number of small unsustainable Water Treatment Plants (WTPs) (Circa 900 in total). (Define the appropriate number of WTPs based on NWRP to be developed and implemented by 2018)	Rationalisation of WTPs & Water Supply Zones. Target reduction to 780 WTPs.	Continue programme of rationalisation base on cost benefit and available funding	Fully implement NWRP target for optimum number and scale of water treatment plants

Objectives and Strategies

The proposed strategies and performance targets to achieve this objective are summarised in the table below and are detailed in the remaining sections of this chapter.

	Strategy	Purpose
	Aim WW1 - Manage the operation of wastewater facilities in a manner that protects environmental quality	
WW1a	Prepare and implement a Wastewater Compliance Strategy.	Contribute to the management of environmental water quality. Meet the Urban Wastewater Treatment Directive and work towards meeting the requirements of the Water Framework Directive River Basin Management Plans.
WW1b	Produce appropriate guidance documentation and Standard Operating Procedures.	To enable optimal operation and maintenance of wastewater treatment facilities and collection networks to achieve the best possible outcomes.
WW1c	Develop and implement Capital Investment Plans on a prioritised basis to progressively achieve compliance.	Target capital investment to progressively achieve compliance with the Urban Waste Water Treatment Directive and the Water Framework Directive.
WW1d	Manage the wider potential environmental impacts associated with the construction and operation of wastewater systems.	Improvement in environmental compliance, reduction in complaints associated with construction and operation of wastewater treatment plants and networks.
	Aim WW2 - Manage the availability and resilience of wastewater services now and into the future	
WW2a	Implement risk assessments for all agglomerations in terms of short, medium and long term risks to customer service.	To ensure sustainability in customer service levels.
WW2b	Manage existing wastewater assets and plan for new assets based on short, medium and long term sustainability.	To maintain service levels in the face of changing demands and asset condition, while having regard to requirements under the Water Framework Directive.
WW2c	Identify properties at risk of flooding from combined sewers, and implement measures to reduce risk on a phased basis.	Reduce risk of combined sewer flooding of properties thereby protecting public health and minimising the adverse social impact of property flooding.
WW2d	Identify and manage critical wastewater assets.	To build strategic resilience within the wastewater infrastructure to minimise the risk and consequence of critical asset failure.

Strategy		Purpose
Aim WW3 - Manage the Affordability and Reliability of Wastewater Services		
WW3a	Adopt an asset management based approach to capital maintenance and capital investment.	To optimise the lifecycle of assets, extend asset life and reduce operating costs.
WW3b	Develop and implement strategies and standards to minimise the unit costs of wastewater treatment including standardising treatment processes.	To optimise costs and meet the various appropriate discharge requirements by availing of the best technologies and extending the usage of standardisation, automation and control systems.
WW3c	Optimise energy consumption in wastewater treatment plants and collection systems.	To reduce energy consumption across all installations thereby reducing operating costs through efficient plant and process selection and maximising energy recovery opportunities.
WW3d	Ensure adequate governance and control of discharges to the sewer network, having regard for best practice and value.	To ensure that discharges from the trade sector are controlled and managed to minimise loads at source, thereby reducing loads to treatment.
WW3e	Engage with regulators and stakeholders.	To give certainty with regard to customer charges and to develop strategies for future growth and investment in infrastructure.
WW3f	Optimise capital and operational investments in wastewater services.	To minimise costs while maintaining a compliant and sustainable level of service.

WW1: MANAGE THE OPERATION OF WASTEWATER FACILITIES IN A MANNER THAT PROTECTS ENVIRONMENTAL QUALITY.

[WW1a] Prepare and implement a Wastewater Compliance Strategy.

We will develop a Wastewater Compliance Strategy setting out a pathway to ensure that the discharges from the wastewater treatment systems that we manage comply with the water quality standards required by the Urban Waste Water Treatment Directive (UWWTD) and to support the objectives of the Water Framework Directive. We will continue to investigate all wastewater treatment plants that are failing or at risk of failing to meet the UWWTD and prioritise these for remedial work or upgrades.

Indicators and Targets

Indicators and targets for the effective management of wastewater are presented in the table below.

Strategic Objective	PROVIDE EFFECTIVE MANAGEMENT OF WASTE WATER			
	Definition	**Current Baseline (Based on Current Knowledge)**	**End of 2021 Target**	**2040 Target**
AIM WW1	Manage the operation of wastewater facilities in a manner that protects environmental quality			
Waste Water Treatment - Compliance with the Urban Wastewater Treatment Directive requirements	% of total population equivalent served by WWTP compliant with the UWWTD	60%	90%	100%
Waste Water Treatment - Compliance with discharge Emmission Limit Values (ELVs) to achieve WFD objectives	% of WWTP serving > 500 PE compliant with the EPA Discharge Licence ELVs	35%	60%	100%
Pollution Incidents caused by Irish Water Waste Water Treatment Systems	Number of Category 2 (localised pollution) incidents reported to the EPA	149	75	20
AIM WW2	Manage the availability and resilience of waste water services now and into the future			
Sewer Flooding; flooding which occurs when capacity of below ground assets is exceeded due to heavy rainfall, resulting in flooding inside and outside of buildings	Number of incidents of sewer flooding of properties	Not available. Develop register to record number, cause, extent of flooding	Accurate register of number of properties at risk of flooding from sewers. Historic high priority flood sites addressed	80% reduction in number of properties which flood frequently (more than once in 10 years)
AIM WW3	Manage the affordability and reliability of waste water services			
Licenced Discharges to Sewers	% of national licensable trade effluent load discharged to sewers under conditions determined by Irish Water in accordance with polluter pays principle	Not available. Commence establishment of register to trade effluents producers and apply a risk weighting to each	50% of trade effluent load licensed covering priority classes of discharges	> 95% of trade effluent load licensed (allowing for turnover of small businesses)

Objectives and Strategies

The proposed strategies to achieve this objective of protecting and enhancing the environment are summarised in the table below and are detailed in the remaining sections of this chapter.

	Strategy	Purpose
Aim EN1 – Ensure that Irish Water services are delivered in a sustainable manner which contributes to the protection of the environment		
EN1a	Implement a Sustainability Policy and Sustainability Framework	To ensure that Irish Water services are delivered in a sustainable manner balancing the need to support the social and economic development of the country with the need to protect water resources and the water environment.
EN1b	Prepare and implement a Sustainable Energy Strategy.	To meet our obligations under the National Energy Efficiency Plan (2009-20).
EN1c	Prepare and implement a Climate Change Adaptation and Mitigation Strategy.	To support national objectives for climate change mitigation and to meet our obligations under the National Climate Change Adaptation Framework to ensure the resilience and sustainability of water services.
EN1d	Adopt a Green Procurement Approach and drive efficient use of all our resources.	To ensure that we utilise resources efficiently in our management of water and wastewater services.
EN1e	Adhere to environmental and planning legislation when planning and developing water services assets.	To ensure that all future Irish Water infrastructure meets national planning and environmental legislation and to protect sites of natural and cultural importance.

Liffey Descent. Photo: Colm Ennis