IRISH WATER

LEAD IN DRINKING WATER MITIGATION PLAN – 061 KNOCKATAGGART WTP AA SCREENING

SCREENING TO INFORM APPROPRIATE ASSESSMENT

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GLOSSARY OF TERMS & ABBREVIATIONS

Appropriate Assessment: An assessment of the effects of a plan or project on European Sites.

Biodiversity: Word commonly used for biological diversity and defined as assemblage of living organisms from all habitats including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part.

Birds Directive: Council Directive of 2nd April 1979 on the conservation of wild birds (79/409/EEC) as codified by Directive 2009/147/EC.

Geographical Information System (GIS): A GIS is a computer-based system for capturing, storing, checking, integrating, manipulating, analysing and displaying data that are spatially referenced.

Habitats Directive: European Community Directive (92/43/EEC) on the Conservation of Natural Habitats and of Wild Flora and Fauna and has been transposed into Irish law by the Planning and Development Act 2000 (as amended) and the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477/2011). It establishes a system to protect certain fauna, flora and habitats deemed to be of European conservation importance.

Mitigation measures: Measures to avoid/prevent, minimise/reduce, or as fully as possible, offset/compensate for any significant effects on the environment, as a result of implementing a plan or project.

Natura 2000: European network of protected sites, which represent areas of the highest value for natural habitats and species of plants and animals, which are rare, endangered or vulnerable in the European Community. The Natura 2000 network of sites will include two types of area. Areas/ European Sites may be designated as Special Areas of Conservation (SAC) where they support rare, endangered or vulnerable natural habitats and species of plants or animals (other than birds). Where areas support significant numbers of wild birds and their habitats, they may become Special Protection Areas (SPA). SACs are designated under the Habitats Directive and SPAs are classified under the Birds Directive. In some situations, there may be overlap in extent of SAC and SPA.

Scoping: the process of deciding the content and level of detail of to be included in a Screening for AA, including the key environmental issues, likely significant environmental effects and alternatives which need to be considered, the assessment methods to be employed, and the structure and contents of the Appropriate Assessment Screening Report.

Screening: The determination of whether implementation of a plan or project would be likely to have significant environmental effects on the Natura 2000 network.

Special Area for Conservation (SAC): An SAC designation is an internationally important site, protected for its habitats and species. It is designated, as required, under the EC Habitats Directive (1992).

Special Protection Area (SPA): An SPA is a site of international importance for breeding, feeding and roosting habitat for bird species. It is designated under the EC Birds Directive (1979).

Statutory Instrument: Any order, regulation, rule, scheme or byelaw made in exercise of a power conferred by statute.

1. INTRODUCTION

Ryan Hanley was commissioned by Irish Water (IW) to undertake Screening for Appropriate Assessment (AA) for the proposed orthophosphate (OP) dosing (herein referred to as the Project) of drinking water supplied by Knockataggart Water Treatment Plant (WTP) in Co. Cavan to the Cavan Regional Water Supply Scheme (RWSS) Water Supply Zone (WSZ).

This report comprises information in support of the Screening of the Project 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 (hereafter referred to as the Habitats Directive). The report assesses the potential for significant effects resulting from the additional phosphorus (P) load to environmental receptors, resulting from OP dosing being undertaken to mitigate against consumer exposure to lead in drinking water. It is therefore necessary to consider the sources, pathways and receptors in relation to added P.

1.1 PURPOSE OF THIS REPORT

Screening for AA, as a first step in determining the requirement for AA, is to determine whether the Project is likely to have a significant effect on any European Site within the zone of influence (ZoI) of the Water Supply Zone (WSZ), either individually or in combination with other plans or projects, in view of the sites qualifying interests and conservation objectives. This Screening Report complies with the requirements of Article 6 of the Habitats Directive transposed in Ireland principally through the Planning and Development Act 2000 (as amended) and the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended). In the context of the proposed project, the governing legislation is the Birds and Habitats Regulations 2011 and the "public authority" is Irish Water, specifically:

"The public authority shall determine that an Appropriate Assessment of a plan or project is not required where the plan or project is not directly connected with or necessary to the management of the site as a European Site and if it can be excluded on the basis of objective scientific information following screening under this Regulation, that the plan or project, individually or in combination with other plans or projects, will have a significant effect on a European site."

1.2 THE PLAN

Irish Water, as the national public water utility, prepared a Lead in Drinking Water Mitigation Plan (LDWMP) in 2016 (here after referred to as the Plan). The Plan provides a framework of measures for implementation to effectively address the currently elevated levels of lead in drinking water experienced by some IW customers as a result of lead piping. The Plan was prepared in response to the recommendations in the *National Strategy to reduce exposure to Lead in Drinking Water* which was published by the Department of Environment, Community and Local Government[1] and Department of Health in June 2015.

The overall objective of the Plan is to effectively address the risk of failure to comply with the drinking water quality standard for lead due to lead pipework in as far as is practical within the areas of IW's responsibility. Lead in drinking water is derived from lead pipes that are still in place in the supply network. These pipes are mostly in old shared connections or in the short pipes connecting the (public) water main to the (private) water supply pipes (IW, 2016[2]). Problems can also be caused by lead leaching from domestic plumbing components made of brass and from lead-containing solder, with the most significant portion of the lead pipework lying outside of IW's ownership in private properties (IW, 2016). Lead can be dissolved in water as it travels through lead supply pipes and internal lead plumbing. When lead is in contact with water it can slowly dissolve, a process known as

[1] Now known as the Department of Housing, Planning and Local Government (DHPLG).
[2] Irish Water (IW) (2016) Lead in Drinking Water Mitigation Plan. https://www.water.ie/projects-plans/lead-mitigation-plan/Lead-in-Drinking-Water-Mitigation-Plan.pdf

plumbosolvency. The degree to which lead dissolves varies with the length of lead pipe, local water chemistry, temperature and the amount of water used at the property.

Health studies have identified risks to human health from ingestion of lead. In December 2013, the acceptable limit for lead in drinking water was reduced to 10 micrograms per litre (µg/l) as per the European Union (Drinking Water) Regulations. From 2003 to 2013, the limit was 25 µg/l, which was a reduction on the previous limit (i.e. pre 2003) of 50 µg/l.

The World Health Organisation (WHO), Environmental Protection Agency (EPA) and Health Service Executive (HSE) recommend lead pipe replacement (both lead service connections in the public supply, and lead supply pipes and internal plumbing in private properties) as the ultimate goal in reducing long-term exposure to lead. It is recognised that this will inevitably take a considerable period of time. In recognition of this, short to medium term proposals to mitigate the risk are being examined.

The Plan sets out the short, medium and longer term actions that IW intends to undertake, subject to the approval of the economic regulator, the Commission for Regulation of Utilities (CRU). It is currently estimated that 85% to 95% of properties meet the lead compliance standards when sampled at the customer's tap. The goal is to increase this compliance rate to 98% by end of 2021 and 99% by the end of 2027 (IW, 2016). This is subject to a technological alternative to lead replacement being deemed environmentally viable.

The permanent solution to the lead issue is to replace all water mains that contain lead. IW proposes that a national programme of replacement of public lead service pipes is required. However, replacing the public supply pipe or the private pipe on its own will not resolve the problem. Research indicates that unless both are replaced, lead levels in the drinking water could remain higher than the Regulation standards. Where lead pipework or plumbing fittings occur within a private property, it is the responsibility of the property owner to replace it.

The Plan assesses a number of other lead mitigation options available to IW. Other measures, including corrective water treatment in the form of pH adjustment and OP treatment, are being considered as an interim measure for the reduction of lead concentrations in drinking water in some WSZs.

IW proposes to introduce corrective water treatment at up to 400 WTPs. This would be rolled out over an accelerated 3-year programme, subject to site-specific environmental assessments. The corrective water treatment will reduce plumbosolvency risk over the short to medium term in high risk water supplies where it is technically, economically and environmentally viable to do so. This practice is now the accepted method of lead mitigation in many countries e.g. Great Britain and Northern Ireland. The dosing would be required to continue whilst lead pipework is still in use, subject to annual review on a scheme by scheme basis.

Orthophosphate (OP) is added in the form of Phosphoric acid - a clear, odourless liquid that is safe for human consumption. Phosphoric acid is already approved for use as a food additive (E338) in dairy, cereals, soft drinks, meat and cheese. The average adult person consumes between 1,000 and 1,500 milligrams (mg) of P every day as part of the normal diet. The OP dose rate for Cavan RWSS will be 0.8 mg/l P for treated water supplied from Knockataggart WTP.

1.3 PROJECT BACKGROUND

Phosphorus (P) can influence water quality status through the process of nutrient enrichment and promotion of excessive plant growth (eutrophication). It is therefore necessary to quantify any potential of environmental impact and the pathways by which the added (OP) may reach environmental receptors and to evaluate the significance of any such effects on European Sites. To facilitate the assessment of any significant effect to the receiving environment an Environmental Assessment Methodology (EAM) has been developed based on a conceptual model of P transfer (from the water distribution and wastewater collection systems), using the source-pathway-receptor framework.

The first step of Screening for AA is to identify the European sites that are in close proximity to or have a hydrological or hydrogeological connectivity to the WSZs affected by the proposed OP dosing. The

Screening recognises that for those European Sites with nutrient sensitive Qualifying Interests (habitats and species) which have connectivity to the WSZ, there are pathways for effects which require further evaluation. The Screening Report applies objective scientific information from the EAM as outlined in this document and evaluates whether the proposed dosing will give rise to significant effect on any of these European Sites, in the context of the Site-Specific Conservation Objectives (SSCO) as published on the NPWS website.

2. APPROPRIATE ASSESSMENT METHODOLOGY

2.1 LEGISLATIVE CONTEXT

Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora better known as the "Habitats Directive" 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 European Sites. 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 scope of the assessment is confined to the effects upon habitats and species of European Sites. As part of the assessment, a key consideration is 'in combination' effects with other plans or projects.

Articles 6(3) and 6(4) of the Habitats Directive set out the decision-making tests for plans and projects likely to affect European Sites (Annex 1.1). Article 6(3) establishes the requirement for AA:

"*Any plan or project not directly connected with or necessary to the management of the [European] site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subjected to appropriate assessment of its implications for the site in view of the site's conservation objectives. In light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public*".

Article 6(4) states:

"*If, in spite of a negative assessment of the implications for the [European] site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, Member States shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted*".

Over time legal interpretation has been sought on the practical application of the legislation concerning AA, as some terminology has been found to be unclear. European and National case law has clarified a number of issues and some aspects of European Commission (EC) published guidance documents have been superseded by case law.

2.2 GUIDANCE FOR THE APPROPRIATE ASSESSMENT PROCESS

The assessment completed in this Screening, had regard to the following legislation and guidance documents:

European and National Legislation:

- Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (also known as the 'Habitats Directive');
- Council Directive 2009/147/EC on the conservation of wild birds, codified version, (also known as the 'Birds Directive');
- European Communities (Birds and Natural Habitats) Regulations 2011 to 2015; and
- Planning and Development Act 2000 (as amended).

Guidance / Case Law:

- *Article 6 of the Habitats Directive – Rulings of the European Court of Justice*. Final Draft September 2014;
- *Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities*. DEHLG (2009, revised 10/02/10);
- *Assessment of Plans and Projects Significantly Affecting Natura 2000 sites: Methodological Guidance on the Provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*. European Commission (2002);
- *Communication from the Commission on the Precautionary Principle*. European Commission (2000b);
- *EC study on evaluating and improving permitting procedures related to Natura 2000 requirements under Article 6.3 of the Habitats Directive 92/43/EEC*. European Commission (2013);
- *Guidance Document on Article 6(4) of the 'Habitats Directive' 92/43/EEC. Clarification of the concepts of: Alternative Solutions, Imperative Reasons of Overriding Public Interest, Compensatory Measures, Overall Coherence, Opinion of the Commission*. European Commission (2007); and
- *Managing Natura 2000 sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC*. European Commission (2000a).

Departmental/NPWS Circulars:

- *Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities*. Circular NPWS 1/10 and PSSP 2/10. (DEHLG, 2010);
- *Appropriate Assessment of Land Use Plans*. Circular Letter SEA 1/08 & NPWS 1/08;
- *Water Services Investment and Rural Water Programmes – Protection of Natural Heritage and National Monuments*. Circular L8/08;
- *Guidance on Compliance with Regulation 23 of the Habitats Directive*. Circular Letter NPWS 2/07; and
- *Compliance Conditions in respect of Developments requiring (1) Environmental Impact Assessment (EIA); or (2) having potential impacts on Natura 2000 sites*. Circular Letter PD 2/07 and NPWS 1/07.

2.3 STAGES OF THE APPROPRIATE ASSESSMENT PROCESS

According to European Commission Methodological Guidance on the provisions of Article 6(3) and 6(4) of the Habitats Directive, the assessment requirements of Article 6 establish a four-staged approach as described below. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required. The four stages are as follows:

- Stage 1 – Screening of the proposed plan or project for AA;
- Stage 2 – An AA of the proposed plan or project;
- Stage 3 – Assessment of alternative solutions; and
- Stage 4 – Imperative Reasons of Overriding Public Interest (IROPI)/ Derogation.

Stages 1 and 2 relate to Article 6(3) of the Habitats Directive; and Stages 3 and 4 to Article 6(4).

Stage 1: Screening for a likely significant effect

The aim of screening is to assess firstly if the plan or project is directly connected with or necessary to the management of European Site(s); or in view of best scientific knowledge, if the plan or project, individually or in combination with other plans or projects, is likely to have a significant effect on a European site. This is done by examining the proposed plan or project and the conservation objectives of any European Sites that might potentially be affected. If screening determines that there is potential for significant effects or there is uncertainty regarding the significance of effects then it will be recommended that the plan is brought forward to full AA.

Stage 2: Appropriate Assessment (Natura Impact Statement or NIS)

The aim of Stage 2 of the AA process is to identify any impacts that the plan or project might have on the integrity of relevant European Sites. As part of the assessment, a key consideration is 'in combination' effects with other plans or projects. Where impacts are identified, mitigation measures can be proposed that would avoid, reduce or remedy any such negative impacts and the plan or project should then be amended accordingly, thereby avoiding the need to progress to Stage 3.

Stage 3: Assessment of Alternative Solutions

If it is not possible during the Stage 2 to reduce impacts to acceptable, non-significant levels by avoidance and/or mitigation, Stage 3 of the process must be undertaken which is to objectively assess whether alternative solutions exist by which the objectives of the plan or project can be achieved. Explicitly, this means alternative solutions that do not have negative impacts on the integrity of a European Site. It should also be noted that EU guidance on this stage of the process states that, 'other assessment criteria, such as economic criteria, cannot be seen as overruling ecological criteria' (EC, 2002). In other words, if alternative solutions exist that do not have negative impacts on European Sites; they should be adopted regardless of economic considerations.

Stage 4: Imperative Reasons of Overriding Public Interest (IROPI)/Derogation

This stage of the AA process is undertaken where no alternative solutions exist and where impacts remain. At this stage of the AA process, it is the characteristics of the plan or project itself that will determine whether or not the competent authority can allow it to progress. This is the determination of 'over-riding public interest'.

It is important to note that in the case of European Sites that include in their qualifying features 'priority' habitats or species, as defined in Annex I and II of the Directive, the demonstration of 'over-riding public interest' is not sufficient and it must be demonstrated that the plan or project is necessary for 'human health or safety considerations'. Where plans or projects meet these criteria, they can be allowed, provided adequate compensatory measures are proposed. Stage 4 of the process defines and describes these compensation measures.

2.4 INFORMATION SOURCES CONSULTED

To inform the assessment for the Project and preparation of this Screening Report, the following key sources of information have been consulted, however it is noted this is not an exhaustive list and does not reflect liaison and/ or discussion with technical and specialist parties from IW, RPS, NPWS, IFI, EPA etc. as part of Plan development.

- Information provided by IW as part of the project;
- Environmental Protection Agency – Water Quality www.epa.ie and www.catchments.ie;
- Geological Survey of Ireland – Geology, Soils and Hydrogeology www.gsi.ie;
- Information on the conservation status of birds in Ireland (Colhoun & Cummins 2013);
- National Parks and Wildlife Service – online Natura 2000 network information www.npws.ie;
- National Biodiversity Action Plan 2017 - 2021 (DCHG 2017);

- Article 17 Overview Report Volume 1 (NPWS, 2019a);
- Article 17 Habitat Conservation Assessments Volume 2 (NPWS, 2019b);
- Article 17 Species Conservation Assessment Volume 3 (NPWS, 2019c);
- EPA Qualifying Interests database, (EPA, 2015) and updated EPA Characterisation Qualifying Interests database (EPA/RPS, September 2016);
- River Basin Management Plan for Ireland 2018 - 2021 - www.housing.gov.ie;
- Ordnance Survey of Ireland – Mapping and Aerial photography www.osi.ie;
- National Summary for Article 12 (NPWS, 2013d); and
- Format for a Prioritised Action Framework (PAF) for Natura 2000 (2014) www.npws.ie/sites/default/files/general/PAF-IE-2014.pdf.
- Northern Ireland Environmental Agency- online Natura 2000 network information www.daera-ni.gov.uk

2.5 EVALUATION OF THE RECEIVING ENVIRONMENT

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 National Biodiversity Plan (DCHG, 2017) to address issues and halt the loss of biodiversity, in line with international commitments. The vision for biodiversity is outlined: "*That biodiversity and ecosystems in Ireland are conserved and restored, delivering benefits essential for all sectors of society and that Ireland contributes to efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally*".

Ireland aims to conserve habitats and species, through designation of conservation areas under both European and Irish law. The focus of this Screening is on those habitats and species designated pursuant to the EU Birds and EU Habitats Directives in the first instance, however it is recognised that wider biodiversity features have a supporting role to play in many cases where the Conservation Objectives of designated sites is to be maintained/restored.

2.5.1 Identification of European Sites

Current guidance (DEHLG, 2010) on the ZoI to be considered during the AA process states the following:

"*A distance of 15km is currently recommended in the case of plans, and derives from UK guidance (Scott Wilson et al., 2006). For projects, the distance could be much less than 15km, and in some cases less than 100m, but this must be evaluated on a case-by-case basis with reference to the nature, size and location of the project, and the sensitivities of the ecological receptors, and the potential for in-combination effects*".

A buffer of 15km is typically taken as the initial ZoI extending beyond the reach of the footprint of a plan, although there may be scientifically appropriate reasons for extending this ZoI further depending on pathways for potential effects. With regard to the current project, the 15km distance is considered inappropriate to screen all likely pathways for European Sites in view of all hydrological and hydrogeological connections to aquatic and water dependant receptors. Therefore, the ZoI for this project includes all of the hydrologically connected surface water sub catchments and groundwater bodies.

2.5.2 Conservation Objectives

Article 6(3) of the Habitats Directive states that:

Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications of the site in view of the site's ***conservation objectives.***

Qualifying Interests (QIs)/ Special Conservation Interests (SCIs) are annexed habitats and annexed species of community interest for which an SAC or SPA has been designated respectively. The Conservation Objectives (COs) for European Sites are set out to ensure that the QIs/ SCIs of that site are maintained or restored to a favourable conservation condition. Maintenance of favourable conservation condition of habitats and species at a site level in turn contributes to maintaining or restoring favourable conservation status of habitats and species at a national level and ultimately at the Natura 2000 Network level.

In Ireland 'generic' COs have been prepared for all European Sites, while 'site specific' COs (SSCOs) have been prepared for a number of individual Sites to take account of the specific QIs/ SCIs of that Site. Both the COs and SSCOs aim to define favourable conservation condition for habitats and species at the site level.

Generic COs which have been developed by NPWS encompass the spirit of SSCOs in the context of maintaining and restoring favourable conservation condition as follows:

For SACs:

- '*To maintain or restore the favourable conservation condition of the Annex I habitats and/or Annex II species for which the SAC has been selected*'.

For SPAs:

- '*To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for the SPA*'.

Favourable Conservation status of a habitat is achieved when:

- Its natural range, and area it covers within that range, are stable or increasing;
- The specific structure and functions which are necessary for its long term maintenance exist and are likely to continue to exist for the foreseeable future; and
- The conservation status of its typical species is "favourable".

Favourable Conservation status of a species is achieved when:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long term basis as a viable component of its natural habitats;
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long term basis.

A full listing of the COs and QIs/ SCIs for each European Site, as well as the attributes and targets to maintain or restore the QIs/ SCIs to a favourable conservation condition, are available from the NPWS website www.npws.ie. COs for the European Sites relevant for this Screening Report, are included in **Appendix A**.

2.5.3 Existing Threats and Pressures to EU Protected Habitats and Species

Given the nature of the proposed project, a review has been undertaken of those QIs/SCIs which have been identified as having sensitivity to orthophosphate loading. Information has been extracted primarily from a number of NPWS authored reports, including recently available statutory assessments on the conservation status of habitats and species in Ireland namely; The status of EU protected Habitats and Species in Ireland (NPWS 2019 a, b &c) and on information contained in Ireland's most recent Article 12 submission to the EU on the Status and trends of Birds species (NPWS 2013d). Water dependent species were identified as having the greatest connectivity and thus the highest sensitivity to the proposed dosing activity, and the Water Framework Directive SAC water dependency list (NPWS, December 2015), was used as part of the criteria for screening of European Sites

3. DESCRIPTION OF THE PROJECT

3.1 DESCRIPTION OF THE PROPOSAL

Knockataggart WTP typically supplies 4,500 m^3/day to the Cavan RWSS which supplies drinking water to Cavan town and a surrounding supply area including Butler's Bridge. Mains leakage across the WSZ is assumed to be 43%. The WSZ boundary encompass three WWTPs (Cavan WWTP, Butlersbridge WWTP and Stradone WWTP). There are an estimated 773 properties across the WSZs that are serviced by DWWTS and water discharged per person is assigned as 105 litres per day with an average of 2.7 persons per household assumed.

Based on an assessment of the risk of lead exceedances, and examination of the network configuration the Plumbosolvency Control Plan for Cavan RWSS recommends that universal dosing areas receive OP dosed water. Specifically, 0.8 mg/l P will be dosed at Knockataggart WTP (Figure 1).

Figure 1: Location of the Knockataggart Water Treatment Plant site, Co. Cavan

3.1.1 Construction Works

The Plumbosolvency Report has proposed that a bunded phosphoric acid storage tank (with capacity for a minimum of 60 days dosing of phosphoric acid at 75% concentration into supply) and dosing installations housed in kiosks, will be installed on constructed concrete ground slabs, located within the site of the existing Knockataggart WTP. The required 60 days storage volume at Knockataggart WTP site corresponds to 0.7m^3.

The scope of the **construction** works for the Knockataggart WTP site will include:

- Initial site assessment, and site investigation works to determine existing conditions, services and pipe cable duct layouts at the site;
- Installation of the OP dosing unit may include excavations, construction of new water process and duct chambers, duct and pipe laying and reinstatement works (a typical dosing unit is

shown in **Figure 2** and **Figure 3**). The exact location will be confirmed following initial site assessment and investigations. A kiosk will be required to house the OP dosing unit as there is insufficient storage space within the existing buildings. The kiosk will be housed on concrete ground slabs, located within the WTP Site. An estimated area required for provision of OP dosing kiosk is 30m^2, including a1.0m wide concrete apron around the kiosk;

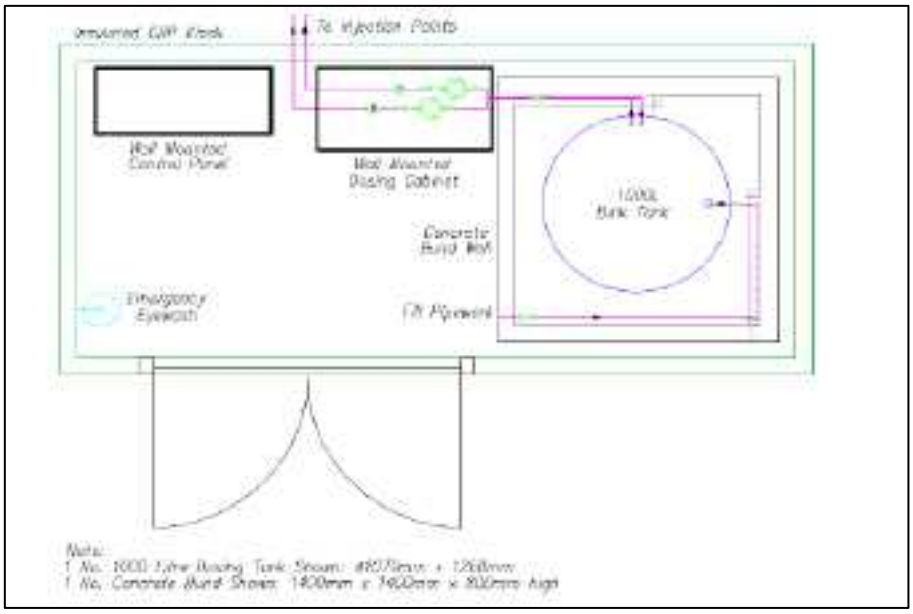

Figure 2: IW schematic of bulk tank kiosk layout in H3PO4 Installation with 500 litres< bulk storage ≤ 6,000 litres.

Figure 3: Typical orthophosphate dosing unit

3.1.2 Operational Works

The scope of the **operational** works includes the dosing of OP to treated water at a rate of 0.8 mg/l P for treated water from Knockataggart WTP in a process similar to the addition of chlorine for disinfection.

3.2 LDWMP APPROACH TO ASSESSMENT

3.2.1 Work Flow Process

In line with the relevant guidance, the Screening Report to inform AA comprises two main steps:

- **Impact Prediction** – where the likely potential impacts of this project (impact source and impact pathways) are examined.

- **Assessment of Effects** - where project impacts are assessed on the basis of best scientific knowledge (the EAM); in order to identify whether they are likely to give rise to significant effect on any European sites, in view of their COs;

At the early stages of consideration, IW identified the pathways by which the added orthophosphate may reach and / or affect environmental receptors including European Sites. In order to carry out a robust and defensible environmental assessment and to ensure a transparent and consistent approach, IW devised a conceptual model based on the 'source – pathway – receptor' framework. This sets out a specific environmental risk assessment of any proposed orthophosphate treatment and provides a methodology to determine the risk to the receiving environment of this corrective water treatment.

This conceptual Environmental Assessment Model (EAM), has been discussed with the EPA and has been developed using EPA datasets including the orthophosphate susceptibility output mapping for subsurface pathways; the nutrient risk assessment for waterbodies; water quality information; available low flow estimation for gauged and ungauged catchments; and a new methodology which has been developed for the assessment of water quality risk from domestic wastewater treatment systems.

Depending on the potential impacts identified, appropriate measures may be built into the project proposal, as part of an iterative process, to avoid / reduce those potential impacts for the orthophosphate treatment being proposed. Project measures adopted within the overall design proposal, as influenced by the Plumbosolvency Report and EAM output, may include selected placement of the orthophosphate treatment point within the WSZ; enhanced wastewater treatment (to potentially remove equivalent phosphorus levels related to the orthophosphate treatment at the WTP); reduced treatment rate; and water network leakage control. The EAM will be the basis of the decision support matrix to inform any programmes developed as part of the LDWMP. Further detail on the model is presented in **Section 3.2.2** below.

3.2.2 Environmental Assessment Methodology

The EAM has been developed based on a conceptual model of P transfer (see **Figure 4**), based on the source-pathway-receptor model, from the water distribution and wastewater collection systems.

- The *source* of phosphorus is defined as the orthophosphate dosing at water treatment plants which will be dependent on the water chemistry of the raw water quality, the integrity of the distribution network and the extent of lead piping.

- *Pathways* include discharges from the wastewater collection system (WWTP discharges and intermittent discharges – Storm Water Overflows (SWOs)), leakage from the distribution system and small point source discharges from Domestic Wastewater Treatment Systems (DWWTS).

- *Receptors*, and their sensitivity, is of key consideration in the EAM. A waterbody may be more sensitive to additional phosphorus loadings where it has a low capacity for assimilating the load e.g. high status sites, such as the habitat of the freshwater pearl mussel or oligotrophic lakes. Where an SAC/SPA is hydrologically connected to dosing from more than one WSZ, the potential for cumulative impacts on OP indicative water quality are considered in the EAM.

A flow chart of the methodology applied in the EAM is provided in **Figure 5** and illustrates the importance of the European Sites in the process. In all instances where nutrient sensitive qualifying

features within the Natura 2000 network are hydrologically linked with the WSZ, a Screening to inform AA will be required in the first instance. For each WSZ where orthophosphate treatment is proposed the conceptual model allows the quantification of loads in a mass balance approach to identify potentially significant pathways, as part of the risk assessment process.

A summary report outlining the EAM is available in **Appendix C**, which further outlines P dynamics and the consideration of P trends and capacity in receiving waters. It also sets out the risk to Orthophosphate indicative water quality status from an increase in orthophosphate loading arising from the proposed OP dosing.

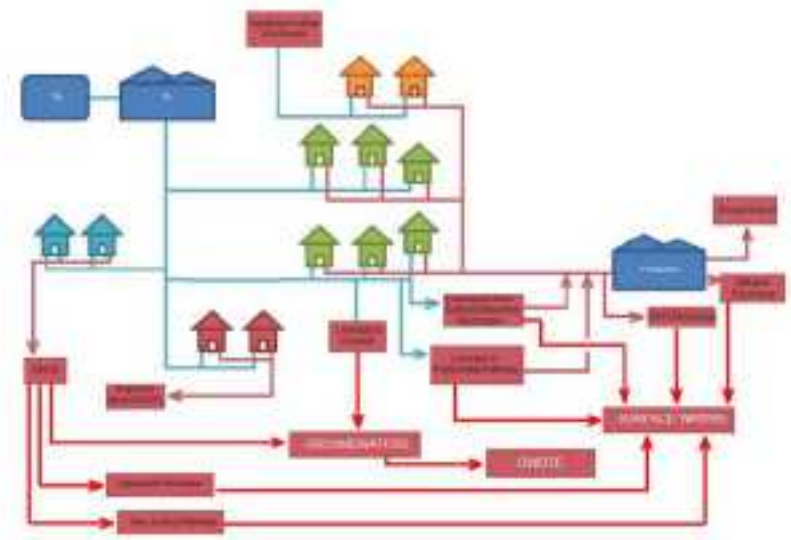

Figure 4: Conceptual Model of P Transfer

Diagrammatic layout of P transfers from drinking water source (top left), through DW distribution (blue), wastewater collection (brown) and treatment systems to environmental receptors (red). P transfers that by-pass the WWTP (leakages, storm overflows, discharges to ground, and misconnections) are also indicated.

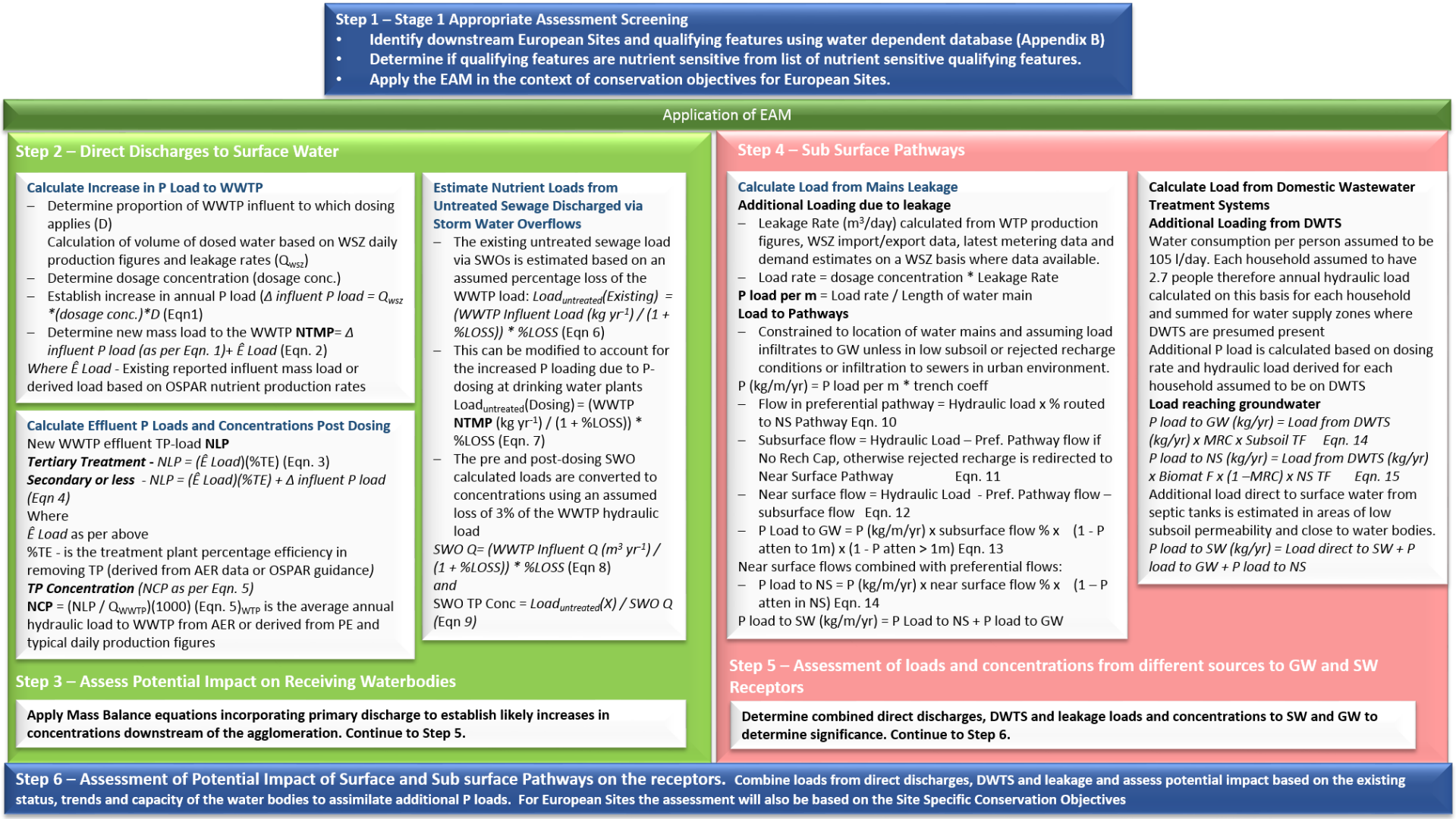

Figure 5: Stepwise Approach to the Environmental Assessment Methodology

4. PROJECT CONNECTIVITY TO EUROPEAN SITES

4.1 OVERVIEW OF THE PROJECT ZONE OF INFLUENCE

4.1.1 Construction Phase

Knockataggart WTP site boundary is located approximately 16.4 km east of the nearest European Site, the Lough Oughter and Associated Loughs SAC (000007) (Figure 6). The closest watercourse to the WTP is the Laragh_010 river waterbody which is located 80m south of the site boundary. The Laragh River flows into the Annalee River approximately 20km downstream. The Annalee River forms part of the Lough Oughter and Associated Loughs SAC approximately 13.4 km downstream of this point. There are no direct hydrological connections between the works and the Lough Oughter and Associated Loughs SAC. Given the absence of pathways, the location of the works and taking account of the scale of the construction of the OP Dosing Unit for the proposed scheme, the potential for direct or indirect impacts during construction at Knockataggart WTP can be screened out at an early stage. Consideration of potential impact is in the absence of mitigation and with the acknowledgement that the Dosing Units are within the existing IW site and have no links to European Sites. Therefore construction related impacts are not considered further.

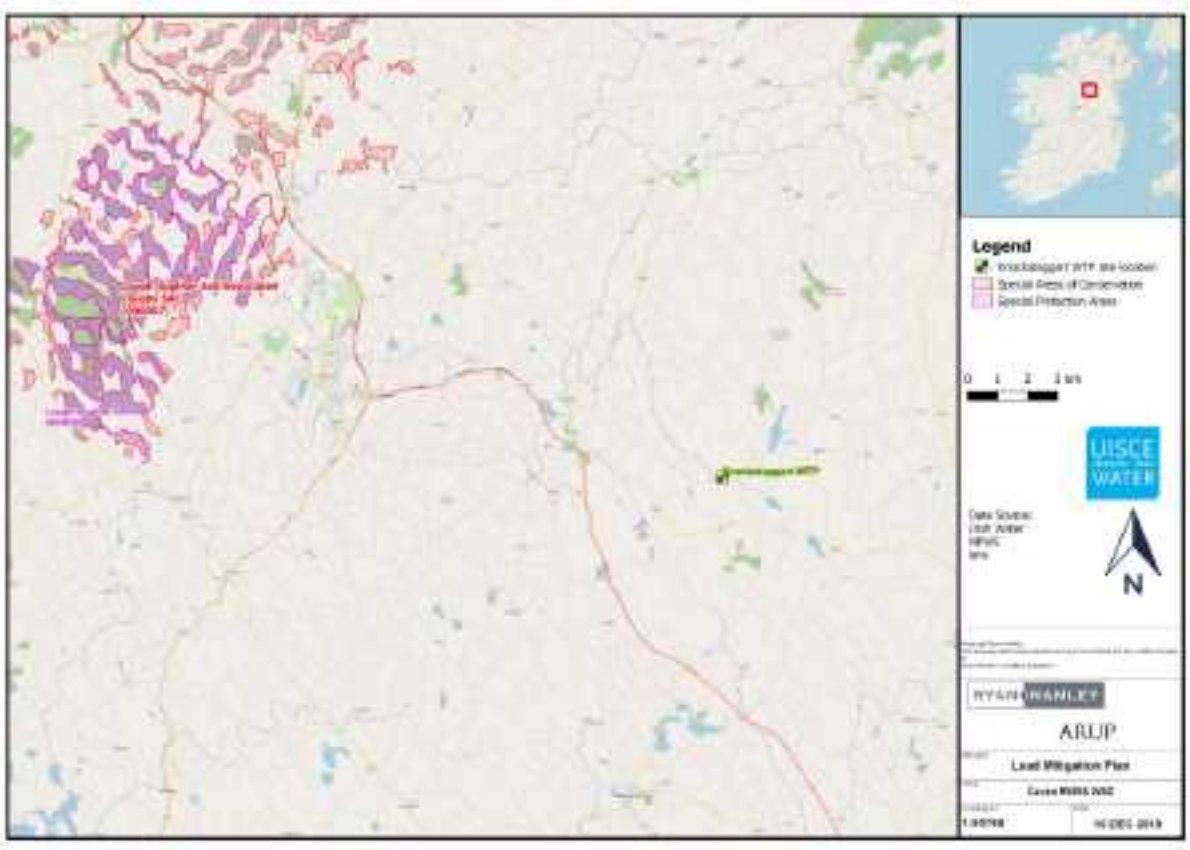

Figure 6: Location of the Knockataggart Water Treatment Plant site with respect to European Sites

4.1.2 Operational Phase

With regard to the operation of the proposed project, the pathways by which the added OP may reach and / or affect environmental receptors is considered by means of an operational ZoI, which was determined by establishing the potential for hydrological and hydrogeological connectivity between the Knockataggart WTP and associated RWSS and European Sites. This operational ZoI was therefore defined by the surface water sub-catchments and groundwater bodies that are hydrologically and hydrogeologically connected with the Project. European Sites within the operational ZoI are listed in **Table 1** and are displayed in **Figure 7**.

The EAM process identified 15 river waterbodies and 6 lake waterbodies potentially impacted following OP dosing of drinking water. This AA Screening identifies the connectivity between EAM identified surface waterbodies and downstream receiving waterbodies and European Sites:

- Laragh_010 (IE_NW_36L010030) river waterbody flows into the Laragh_020 (IE_NW_36L010080), Laragh_030 (IE_NW_36L010400), Annalee_070 (IE_NW_36A020900), Annalee_080 (IE_NW_36A021000), Annalee_090 (IE_NW_36A021150), Annalee_100 (IE_NW_36A021400), Erne_080 (IE_NW_36E011300), Erne_090 (IE_NW_36E011410), Erne_100 (IE_NW_36E011440), Erne_110 (UKGBNI1NW363604081), Upper Lough Erne (UKGBNI1NW363602063) river waterbodies, the Erne Upper lake waterbody (UKGBNI1NW363602063) and the Erne Lower lake water body (UKGBNI13NW0007).

- Stradone_010 (IE_NW_36S020075) river waterbody flows into the Stradone_020 (IE_NW_36S020200), Laragh_030 (IE_NW_36L010400), Annalee_070 (IE_NW_36A020900), Annalee_080 (IE_NW_36A021000), Annalee_090 (IE_NW_36A021150), Annalee_100 (IE_NW_36A021400), Erne_080 (IE_NW_36E011300), Erne_090 (IE_NW_36E011410), Erne_100 (IE_NW_36E011440), Erne_110 (UKGBNI1NW363604081), Upper Lough Erne (UKGBNI1NW363602063) river waterbodies, the Erne Upper lake waterbody (UKGBNI1NW363602063) and the Erne Lower lake water body (UKGBNI13NW0007).

- Cavan_010 (IE_NW_36C020300) river waterbody flows into the Cavan_020 (IE_NW_36C020400), Annalee_100 (IE_NW_36A021400), Erne_080 (IE_NW_36E011300), Erne_090 (IE_NW_36E011410), Erne_100 (IE_NW_36E011440), Erne_110 (UKGBNI1NW363604081), Upper Lough Erne (UKGBNI1NW363602063) river waterbodies, the Erne Upper lake waterbody (UKGBNI1NW363602063) and the Erne Lower lake water body (UKGBNI13NW0007).

The EAM process identified 2 groundwater body. Groundwater bodies touching or intersecting the WSZs, are also included in the ZoI. Hydrogeological linkages in karst areas are considered:

- Cavan (IE_NW_G_061)

- Killashandra (IE_NW_G_062)

Cavan (IE_NW_G_061) groundwater body discharges to rivers and streams crossing the GWB, reflecting short flow paths. Flow paths are likely to be between 30-300m owing to the poor productivity of this aquifer (Geological Survey Ireland, 2004). As a result of this only those European Sites within a 300m radius of the dosing zone within this groundwater body are considered in the ZoI.

Killashandra (IE_NW_G_062) groundwater body discharges locally to streams and rivers crossing the aquifer and also to small springs and seeps, reflecting short flow paths. Flow paths are likely to be between 30-300m owing to the poor productivity of this aquifer (Geological Survey Ireland, 2004). As a result of this only those European Sites within a 300m radius of the dosing zone within this groundwater body are considered in the ZoI. European Sites within the ZoI are listed in **Table 1** and are displayed in **Figure 7**.

Table 1: European Sites within the Zol of the Proposed Project

Site Name	SAC/ SPA Code	Water Dependent Species/ Habitats	Nutrient Sensitive	Potential Hydrological/ Hydrogeological Connectivity
Lough Oughter and Associated Loughs SAC	**000007**	**Yes**	**Yes**	**Yes**
Donegal Bay (Murvagh) SAC	**000133**	**Yes**	**Yes**	**Yes**
Durnesth Lough SAC	**000138**	**Yes**	**Yes**	**Yes**
St. John's Point SAC	**000191**	**Yes**	**Yes**	**Yes**
Bunduff Lough and Machair/Trawalua/Mullaghmore SAC	**000625**	**Yes**	**Yes**	**Yes**
Lough Oughter SPA	**004049**	**Yes**	**Yes**	**Yes**
Donegal Bay SPA	**004151**	**Yes**	**Yes**	**Yes**
Upper Lough Erne SAC	**UK0016614**	**Yes**	**Yes**	**Yes**
Upper Lough Erne SPA	**UK9020071**	**Yes**	**Yes**	**Yes**

4.2 IDENTIFICATION OF RELEVANT EUROPEAN SITES

Each European Site was assessed for the presence of water dependent habitats and species, nutrient sensitivity and hydrological/hydrogeological connectivity (operational and construction Zol), and on this basis, the potential for risk from the proposed Project was identified (**Table 2**) and are displayed in **Figure 7**.

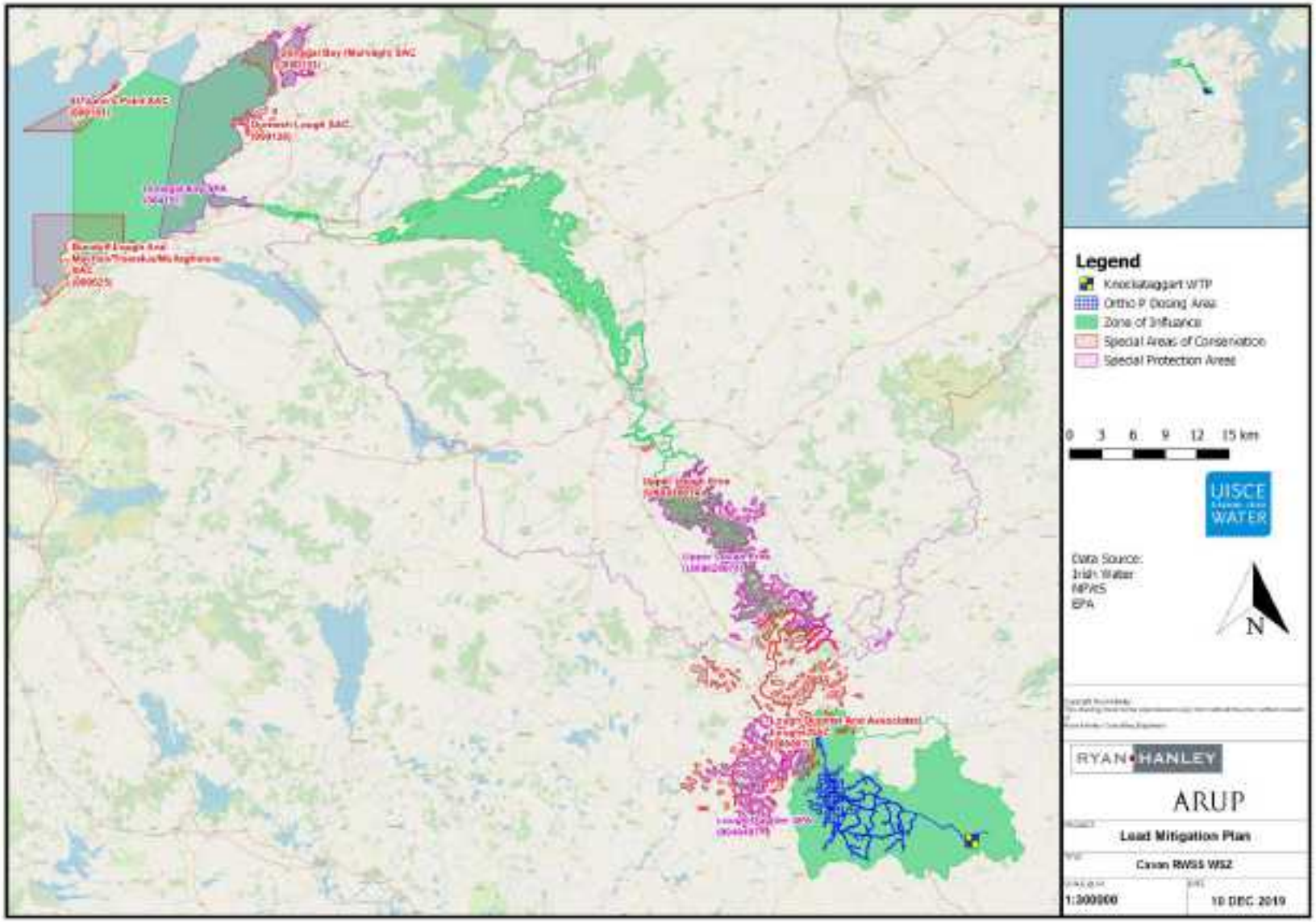

Figure 7 European Sites within the ZOI of the Proposed Project

Table 2: European Sites Hydrologically Connected to or Downstream of the WTP and WSZ

Site Name	SAC/ SPA Code	Conservation Objectives Establishment Date	Feature Code	Qualifying Interests / Special Conservation Interests	Water Dependent Species /Habitats	Nutrient Sensitive	Potential hydrological/ hydrogeological Connectivity
Lough Oughter and Associated Loughs	**SAC 000007**	**21st Feb 2018**	1355	Otter *Lutra lutra*	Yes	Yes	Yes for Operational Impacts
			3150	Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* type vegetation	Yes	Yes	
			91D0	Bog woodland	Yes	Yes	
Lough Oughter Complex	**SPA 004049**	**21st Feb 2018**	A005	Great Crested Grebe *Podiceps cristatus*	Yes	Yes	Yes for Operational Impacts
			A038	Whooper Swan *Cygnus cygnus*	Yes	Yes	
			A050	Wigeon *Anas penelope*	Yes	Yes	
Donegal Bay	**SPA 004151**	**17th May 2012**	A003	Great Northern Diver (*Gavia immer*)	Yes	Yes	Yes for Operational Impacts
			A046	Light-bellied Brent Goose (*Branta bernicla hrota*)	Yes	Yes	
			A065	Common Scoter (*Melanitta nigra*)	Yes	Yes	
			A144	Sanderling (*Calidris alba*)	Yes	Yes	
			A999	Wetland and Waterbirds	Yes	Yes	
Donegal Bay (Murvagh)	**SAC 000133**	**9th July 2012**	1140	Mudflats and sandflats not covered by seawater at low tide	Yes	Yes	Yes for Operational Impacts
			1365	Harbour Seal *Phoca vitulina*	Yes	Yes	
			2130	*Fixed coastal dunes with herbaceous vegetation ('grey dunes')	Yes	Yes	
			2190	Humid dune slacks	Yes	Yes	
Durnesh Lough	**SAC 000138**	**5th July 2012**	1150	Coastal lagoons*	Yes	Yes	Yes for Operational Impact
			6410	*Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)	Yes	Yes	
St. John's Point	**SAC 000191**	**10th Mar 2015**	1160	Large shallow inlets and bays	Yes	Yes	Yes for Operational Impacts
			1170	Reefs	Yes	Yes	
			6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites)	No	Yes	
			6410	*Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)	Yes	Yes	
			7230	Alkaline fens	Yes	Yes	
			8240	Limestone pavements*	No	Yes	
			8330	Submerged or partially submerged sea caves	Yes	Yes	
Bunduff Lough and Machair /	**SAC 000625**	**3rd Mar 2015**	1140	Mudflats and sandflats not covered by seawater at low tide	Yes	Yes	Yes for
			1160	Large shallow inlets and bays	Yes	Yes	

Site Name	SAC/ SPA Code	Conservation Objectives Establishment Date	Feature Code	Qualifying Interests / Special Conservation Interests	Water Dependent Species /Habitats	Nutrient Sensitive	Potential hydrological/ hydrogeological Connectivity
Trawalua / Mullaghmore			1170	Reefs	Yes	Yes	Operational Impacts
			1395	Petalwort *Petalophyllum ralfsii*	Yes	Yes	
			2120	Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)	Yes	Yes	
			2130	*Fixed coastal dunes with herbaceous vegetation ('grey dunes')	Yes	Yes	
			21A0	Machairs (*in Ireland)	Yes	Yes	
			5130	*Juniperus communis* formations on heaths or calcareous grasslands	No	No	
			6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites)	No	Yes	
Upper Lough Erne SAC	**SAC UK0016614**	**1st April 2015**	3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition type vegetation	Yes	Yes	Yes for Operational Impacts
			91A0	Old sessile oak woods with *Ilex* and *Blechnum* in the BI	No	Yes	
			91E0	*Alluvial forests with Alnus glutinosa and *Fraxinus excelsior*	Yes	Yes	
			1355	Otter *Lutra lutra*	Yes	Yes	
Upper Lough Erne	**SPA UK9020071**	**1st April 2015**	A038	Whooper Swan (*Cygnus cygnus*)	Yes	Yes	Yes for Operational Impacts

* indicates a priority habitat under the Habitats Directive

5. EVALUATION OF POTENTIAL IMPACTS

5.1 CONTEXT FOR IMPACT PREDICTION

The methodology for the assessment of impacts is derived from the *Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites* (EC, 2002). When describing changes/activities and impacts on ecosystem structure and function, the types of impacts that are commonly presented include:

- Direct and indirect impacts;
- Short and long-term impacts;
- Construction, operational and decommissioning impacts; and
- Isolated, interactive and cumulative impacts.

5.2 IMPACT IDENTIFICATION

Operational Phase

In considering the potential for impacts from implementation of the Project, a "source–pathway–receptor" approach has been applied.

The AA has considered the potential for the following significant effects to occur:

- Altered structure and functions relating to the physical components of a habitat ("structure") and the ecological processes that drive it ("functions"). For aquatic habitats these include attributes such as vegetation and water quality.
- Altered species composition due to changes in abiotic conditions such as water quality;
- Reduced breeding success (e.g. due to disturbance, habitat alteration, pollution) possibly resulting in reduced population viability; and
- Impacts to surface water and groundwater and the species they support (changes to key indicators).

The source-pathway-receptor approach has identified a number of impact pathways associated with the orthophosphate dosing. These will be evaluated in relation to the potential for significant effects to any European Site with regard to:

- Excessive phosphate within an aquatic ecosystem may lead to eutrophication; with corresponding reduction in oxygen levels, reduction in species diversity and subsequent impacts on animal life;
- Groundwater dependent habitats include both surface water habitats (e.g. hard oligo-mesotrophic lakes) and Groundwater Dependent Terrestrial Ecosystems (GWDTEs, e.g. alkaline fens). Any change in the water quality of these systems may have subsequent effects on these habitats and species; and therefore, will be subject to an evaluation of the significance of any such effect;
- The discharge of additional P loads to the environment (through surface and sub surface pathways) may have implications for nutrient sensitive species such as the freshwater pearl mussel, Atlantic salmon and the white-clawed crayfish.
- Phosphorus (P) in wastewater collection systems is the result of drinking water and derived from a number of other sources, including P imported from areas outside the agglomeration

through import of sludges or leachates for treatment at the plant. The disposal and use of P removed in wastewater sludge is regulated (i.e. through nutrient management plans) and should not pose further threat of environmental impact;

- Leakage of phosphates from the drinking water supply network to the environment from use of OP;
- Direct discharges of increased P to waterbodies from the wastewater treatment plant licensed discharges; and
- Potential discharges to waterbodies of untreated effluent potentially high in OP Storm Water Overflows (SWOs).

5.3 ASSESSMENT OF IMPACTS RELATING TO OPERATIONAL ACTIVITIES

Article 6 of the Habitats Directive states that:

Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications of the site in view of the site's conservation objectives.

The focus of this section of the Screening to inform AA is the potential for significant effects arising from the additional OP load due to OP dosing at Knockataggart WTP. The conceptual model developed for OP transfer identified the surface and groundwater bodies that have the potential to be impacted by the OP dosing and which could provide a hydrological or hydrogeological pathway to the European Sites. These waterbodies are listed in **Table 3**. The table identifies the following:

- European sites included in for assessment;
- Waterbodies hydrologically or hydrogeologically connected to the European Sites;
- Existing OP indicative water quality and trend of each waterbody;
- The baseline OP concentration of each waterbody;
- 75% of the upper threshold;
- Cumulative OP load to surface from leakage, DWWTS and agglomerations;
- The modelled OP concentration following dosing at the WTP; and,
- The OP potential baseline concentration (mg/l P) following dosing at the WTP.

The EAM has been completed assuming the capacity of a waterbody is a measure of its ability to absorb extra pressures before its status changes. For example, a river waterbody at Good Status will have mean phosphate values in the range 0.025 to 0.035 mg/l P. River waterbodies with mean phosphate concentrations of 0.0275 mg/l P have 75% capacity left, i.e. high capacity, while river waterbodies with a mean of 0.0325 mg/l P have lower capacity (25%) as the concentrations are closer to the Good/Moderate Status boundary. In assessing the additional loads from the proposed orthophosphate dosing, the capacity of the water will be assessed. This information is available on the WFD App on a national basis using the "Distance to Threshold" parameter, where waterbodies with high capacity are termed "Far" from the threshold and those with low capacity are "Near" the threshold.

It is predicted that OP dosing will not have a significant impact on Orthophosphate indicative water quality (or the Conservation Objectives of a European Site) where it does not cause the P concentration to increase to a level within 25% of the remaining capacity left within the existing status band, i.e. cause a change in the distance to threshold from far to near. This assessment will be supported by

trend analysis as outlined below to ensure the additional OP dosing and statistically significant trends for a waterbody will not result in deterioration in status by 2021 even where the distance to threshold is currently assessed to be far. Where the waterbody baseline concentration is "Near" to the threshold before the effect of OP dosing is considered, this does not cause an automatic fail for this test. If the predicted increase in concentration due to OP is very low (i.e. below 5%/ <0.00125 mg/l P of the High/Good status) this test will pass as the OP dosing itself is not having a significant impact on the Orthophosphate indicative water quality and thus not having the potential for significant effects on connected European Sites in terms of aquatic and water dependant Qis/SCIs and their conservation objectives.

The identification of statistically and environmentally significant trends for waterbodies is a specific requirement of the WFD and the Groundwater Daughter Directive. Guidance on trends in groundwater assessments (UKTAG 2009, EPA 2010) indicates that trends are environmentally significant if they indicate that the Good Status will not be achieved within two future river basin cycles, i.e. within the next 12 years.

An additional test for groundwater bodies states that downward trends should not be reversed as a result of pollution. This test applies to any GWB with statistically significant trends according to the WFD App and the Sens Slope provided is used to assess direction and strength of trend. If the trend is negative and the predicted increase in OP concentration is lower than the absolute value of the Sens Slope, then the test passes. This assessment has used the EPA WFD App data relating to waterbody monitoring and characterisation downloaded in January 2022.

Table 3: Surface and groundwater bodies within the WSZ with a hydrological or hydrogeological connection to European Sites

Site Name (Code)	Contributing WB Code_Name	WB Type[1]	P Status[2] and Trends[3]	Baseline[4] P Conc.[5] (mg/l P)	75% of Status Threshold (mg/l P)	Cumulative P load to SW[6]	Modelled Conc.[7] (mg/l P)	Potential Baseline Conc. @ 0.8mg/l P	Evaluation
Lough Oughter and Associated Loughs SAC (000007)	Cavan	GWB	*Good*	*0.0175*	0.0263	3.3	0.00003	0.0175	No deterioration to OP indicative WQ
	Killashandra	GWB	*Good*	*0.0175*	0.0263	8.8	0.0007	0.0182	No deterioration to OP indicative WQ
	Annalee_090	RWB	Good	0.0340	0.0325	112	0.0002	0.0342	No deterioration to OP indicative WQ
	Annalee_100	RWB	Poor	0.0604	0.0868	219.5	0.0003	0.0607	No deterioration to OP indicative WQ
	Erne_080	RWB	Moderate	0.0425	0.0508	219.5	0.0002	0.0427	No deterioration to OP indicative WQ
	Erne_090	RWB	Moderate	0.0506	0.0508	258	0.0002	0.0508	No deterioration to OP indicative WQ
	Erne_100	RWB	*Moderate*	*0.0352*	0.0508	258	0.0002	0.0354	No deterioration to OP indicative WQ
	Erne_110	RWB	*Moderate*	*0.0391*	0.0508	258	0.0002	0.0393	No deterioration to OP indicative WQ
	Upper Lough Erne	RWB	*Moderate*	*0.0455*	0.0508	258	0.0002	0.0457	No deterioration to OP indicative WQ
	Erne Upper	LWB	*Good*	*0.0180*	0.0213	258	0.0002	0.0182	No deterioration to OP indicative WQ
Lough Oughter Complex SPA (004049)	Erne_080	RWB	Moderate	0.0425	0.0508	219.5	0.0002	0.0427	No deterioration to OP indicative WQ
Donegal Bay (Murvagh) SAC (000133)	Donegal Bay (Erne)	CWB	Summer High/ Winter High	0.0025/ 0.0125	0.0188	219.5	0.0001	0.0026/ 0.0126	No deterioration to OP indicative WQ

[1] Monitoring period is annual unless specified.
[2] Surrogate Status indicated in italic.
[3] Distance to threshold in parentheses.
[4] Baseline year is 2014.
[5] Surrogate concentration is given in italic mg/l P
[6] Cumulative P load to SW from Upstream Dosing Areas, Leakage, DWWTS and agglomerations (kg/yr)
[7] Values above 5% of Good / High boundary (0.00125 mg/l P), Good/ Moderate boundary (0.00175 mg/l P), Moderate/ Poor boundary (0.0028 mg/l P) and Bad/ Poor boundary (0.0048 mg/l P) for SW or 5% of Good / Fail boundary (0.00175 mg/l P) for GW highlighted in yellow.

Site Name (Code)	Contributing WB Code_Name	WB Type[1]	P Status[2] and Trends[3]	Baseline [4] P Conc.[5] (mg/l P)	75% of Status Threshold (mg/l P)	Cumulative P load to SW[6]	Modelled Conc.[7] (mg/l P)	Potential Baseline Conc. @ 0.8mg/l P	Evaluation
Durnesh Lough SAC (000138)	Donegal Bay (Erne)	CWB	Summer High/ Winter High	0.0025/ 0.0125	0.0188	219.5	0.0001	0.0026/ 0.0126	No deterioration to OP indicative WQ
St. John's Point SAC (000191)	Donegal Bay (Erne)	CWB	Summer High/ Winter High	0.0025/ 0.0125	0.0188	219.5	0.0001	0.0026/ 0.0126	No deterioration to OP indicative WQ
Bunduff Lough and Machair/ Trawalua/ Mullaghmore SAC (000625)	Donegal Bay (Erne)	CWB	Summer High/ Winter High	0.0025/ 0.0125	0.0188	219.5	0.0001	0.0026/ 0.0126	No deterioration to OP indicative WQ
Donegal Bay SPA (004151)	Erne Estuary	TWB	Summer High/ Winter Good	0.0230/ 0.0290	0.0188/ 0.0363	219.5	0.0001	0.0231/ 0.0291	No deterioration to OP indicative WQ
	Donegal Bay (Erne)	CWB	Summer High/ Winter High	0.0025/ 0.0125	0.0188	219.5	0.0001	0.0026/ 0.0126	No deterioration to OP indicative WQ
Upper Lough Erne SAC (UK0016614)	Erne 110	RWB	*Moderate*	*0.0391*	0.0508	258	0.0002	0.0393	No deterioration to OP indicative WQ
	Upper Lough Erne	RWB	*Moderate*	*0.0455*	0.0508	258	0.0002	0.0457	No deterioration to OP indicative WQ
Upper Lough Erne SPA (UK9020071)	Erne 110	RWB	*Moderate*	*0.0391*	0.0508	258	0.0002	0.0393	No deterioration to OP indicative WQ
	Upper Lough Erne	RWB	*Moderate*	*0.0455*	0.0508	258	0.0002	0.0457	No deterioration to OP indicative WQ

5.3.1 Assessment of direct impact from WWTPs and Storm Water Overflows

The conceptual model developed for P transfer identifies a number of pathways by which orthophosphate can reach receptors. In the case of these pathways, factors contributing to the potential direct impacts are:

- the quantitative increase in P loading to wastewater collecting systems;
- the efficiency of P removal at WWTPs;
- the increased P loading to surface waters via storm water overflows; and
- the sensitivity of receptors.

For the purposes of assessing the potential impact on the receiving environment within the EAM, a number of scenarios have been assessed at the agglomerations which receive water from the WSZ (**Table 4**). The baseline Orthophosphate indicative water quality in the existing situation prior to orthophosphate dosing is established and compared to the potential loading to the receiving waters post-dosing. In-combination impacts of the operation of the SWO and the continuous discharge from the WWTP were also assessed within the EAM.

The pre-dosing scenario is based on a mass balance calculation of both the intermittent SWO discharges, in combination with the continuous discharge from the WWTP. A comparison of the pre- and post-dosing scenarios is made to identify changes in predicted concentrations downstream of the point of discharge. A summary of the results and evaluation of orthophosphate dosing downstream of each agglomeration is provided below.

Table 4 provides the data used for the WWTP continuous discharge, and the SWO intermittent discharge, to compare with the emission limit values (ELVs) from the waste water discharge licence (WWDL) (if it has been set) that are applicable to the agglomeration discharge to transitional waters or freshwaters.

Table 4: Increased loading/concentration due to Orthophosphate Dosing – Dosing rate = 0.8 mg/l P at Knockataggart WTP

Agglom. & Discharge Type	ELV from WWDL		TP Load Kg/yr	Ortho P Concentration mg/l *TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)*		
				0.5	*0.4*	*0.68*
Butlersbridge Primary Discharge	**No ELVs**	Pre-Dosing	143	3.74	2.99	5.08
		Post Dosing	161	4.21	3.36	5.72
		% Increase	12.6%	12.6%	12.4%	12.6%
Cavan Town Primary Discharge	**Total Phosphate 2.0 mg/l Orthophosphate 0.13 mg/l Compliant**	Pre-Dosing	146	0.04	0.08	0.13
		Post Dosing	146	0.04	0.08	0.13
		% Increase	0%	0%	0%	0%
Cavan Town SWOs (7 No.)		Pre-Dosing	140	0.18	0.36	0.62
		Post Dosing	159	0.20	0.41	0.70
Stradone Primary Discharge	**No ELVs**	Pre-Dosing	14	3.74	2.99	5.08
		Post Dosing	14	3.77	3.02	5.13
		% Increase	0%	0.8%	1.0%	1.0%
Stradone SWOs (1 No.)		Pre-Dosing	1	1.14	0.91	1.55
		Post Dosing	1	1.15	0.92	1.56

Butlersbridge WWTP Agglomeration

Butlersbridge WWTP provides primary treatment and the assessment assumes that additional loading will not receive treatment as described by the EAM. There are no ELVs for this WWTP. The annual average effluent OP concentration will increase from 3.74 mg/l P to 4.21 mg/l P as a result of dosing

(12.6% increase). There are no SWOs associated with the WWTP. The WWTP discharges into the Annalee_100 river waterbody.

Cavan Town WWTP Agglomeration

The Cavan Town WWTP provides tertiary treatment and the assessment assumes that additional loading will be entirely treated at the plant. Cavan Town WWTP has an ELV for OP of 0.13 mg/l and TP of 2 mg/l. The WWTP is currently compliant with its ELV. The annual average effluent OP concentration is 0.04 mg/l P. The annual average SWO effluent concentration will increase from 0.18 mg/l P to 0.20 mg/l P as a result of dosing. The WWTP discharges into the Cavan_010 river waterbody.

Stradone WWTP Agglomeration

Stradone WWTP provides secondary treatment and the assessment assumes that additional loading will not receive treatment as described by the EAM. The annual average effluent OP concentration will increase from 3.74 mg/l P to 3.77 mg/l P as a result of dosing (0.8% increase). The annual average SWO effluent concentration will increase from 1.14 mg/l P to 1.15 mg/l P as a result of dosing. This WWTP discharges into the Stradone_020 river waterbody.

5.3.2 Combined assessment of direct and indirect impacts to receiving waterbodies

This section presents the results of the EAM regarding the combined loading as a result of increased OP dosing from the WWTP discharge, seepage from mains and DWWTS. Upstream dosing areas have been considered and cumulatively assessed by the EAM. The figures presented here are representative of this.

River waterbodies

- Annalee_090 (IE_NW_36A021150), Annalee_100 (IE_NW_36A021400), Erne_080 (IE_NW_36E011300), Erne_090 (IE_NW_36E011410), Erne_100 (IE_NW_36E011440), Erne_110 (UKGBNI1NW363604081), Upper Lough Erne (UKGBNI1NW363602063) river waterbodies are directly connected to the **Lough Oughter and Associated Loughs SAC (000007**).

- Erne_080 (IE_NW_36E011300 river waterbody is directly connected to the **Lough Oughter SPA (004049).**

- Erne_110 (UKGBNI1NW363604081), Upper Lough Erne (UKGBNI1NW363602063) river waterbodies are directly connected to the **Upper Lough Erne SAC (UK0016614)** and **Upper Lough Erne SPA (UK9020071).**

The OP dosing contributes OP load to receiving RWBs via loading from mains leakage and domestic wastewater treatment systems (DWWTS) via subsurface pathways. The increase in OP concentrations in river waterbodies following dosing is up to 0.0019 mg/l P. The resulting OP concentrations following dosing ranges between 0.0188 mg/l P and 0.0765 mg/l P. The increases do not cause a deterioration in the status of any of the above listed river waterbodies. All rivers will receive a predicted dosing concentration below the 5% of Good/ High boundary (0.00125 mg/l P) (as highlighted in Table 3) and as predicted loadings are within the 75% of upper threshold of its respective OP indicative water quality status there is no risk of deterioration in the status of any RWBs.

Groundwater bodies

- Cavan (IE_NW_G_061) and Kilashandra (IE_NW_G_062) groundwater bodies are hydrologically linked to the **Lough Oughter and Associated Loughs SAC (000007).**

The OP dosing contributes OP load to receiving GWBs via subsurface and surface pathways. The increase in Orthophosphate concentrations due to dosing is up to 0.0007 mg/l P. The resulting OP

concentrations following dosing ranges between 0.0175 mg/l P and 0.0182 mg/l P. The modelled increases in concentrations of these groundwater bodies are below the 5% significance threshold for GW (0.00175 mg/l P) and the WFD status remains unchanged, i.e. Good (See Table 3 above). Therefore, there is no risk of deterioration in WFD status for these groundwater bodies.

Lake waterbodies

- Erne Upper lake waterbody is hydrologically linked to the **Lough Oughter and Associated Loughs SAC (000007)**, the **Upper Lough Erne SAC (UK0016614)** and **Upper Lough Erne SPA(UK9020071).**

The increase in OP as a result of drinking water dosing is adopted as Total Phosphorus (TP) to assess the potential impact on lakes. The increase in concentrations in the Lake Waterbodies (LWB) as a result of the drinking water dosing is up to 0.0002 mg/l TP. The increase in baseline does not cause a deterioration in WFD OP indicative water quality, i.e. remains *Good* following dosing.

Transitional and coastal waterbodies

- Erne estuary (IE_NW_030_0100) waterbody is hydrologically linked to the and **Donegal Bay SPA (004151).**

- Donegal Bay (Erne) (IE_NW_010_0000) coastal waterbody is hydrologically linked to **Donegal Bay SPA (004151), Donegal Bay (Murvagh) SAC (000133), St. John's Point SAC (000191)** and **Bunduff Lough and Machair/ Trawalua/ Mullaghmore SAC (000625)**

The increase in OP concentrations in the transitional and coastal waterbodies as a result of the OP dosing is up to 0.0001 mg/l P. The resulting Orthophosphate concentrations following dosing ranges from 0.0026 mg/l P to 0.0291 mg/l P. Impact from OP dosing on transitional and coastal waterbodies does not lead to a reduction in their status and concentrations increase. All transitional and coastal waterbodies have predicted dosing concentrations below the 5% of Good/High boundary (0.00125mg/l P) (as highlighted in Table 3) and therefore there is no risk of deterioration in the WFD OP indicative water quality of these waterbodies.

5.3.3 Conclusions

The EAM model data identifies that additional OP dosing as part of this Project does not cause a deterioration in the OP indicative water quality of any surface waterbody or groundwater body listed in **Table 3**. Concentrations from other dosing areas with regard to cumulative loading on downstream waterbodies has been considered in this assessment. Section 6 evaluates the WFD 'no deterioration' in the context of AA and the QIs of the European Sites.

6. EVALUATION OF POTENTIAL FOR SIGNIFICANT EFFECTS

The key pressure associated with the proposed OP dosing is the potential for increased OP levels in the receiving waters and the connectivity to the qualifying interests (habitats and species) identified in **Table 2** that are both water dependent and nutrient sensitive (**Appendix B**). Nine European sites remain for evaluation of potential for significant effect with respect to construction and operational affects: **Lough Oughter and Associated Loughs SAC (000007), Donegal Bay SAC (000133), Durnesh Lough SAC (000138), St. John's Point SAC (000191), Bunduff Lough and Machair / Trawalua / Mullaghmore SAC (000625), Lough Oughter SPA (004049), Donegal Bay SPA (004151) Upper Lough Erne SAC (UK0016614), Upper Lough Erne SPA (UK9020071).** The potential for the proposed orthophosphate dosing to give rise to significant effects on these habitats and species, in view of their conservation objectives, are assessed in detail below.

6.1 LOUGH OUGHTER AND ASSOCIATED LOUGHS SAC 000007

6.1.1 (3150) Natural eutrophic lakes with Magnopotamion or Hydrocharition – type vegetation

Lough Oughter and the lakes associated with it have been described as a maze of waterways, islands, small lakes and peninsulas incorporating 90 inter-drumlin lakes and 14 basins in the course of the Erne River (NPWS, 2013). There are no SSCOs for Lough Oughter (NPWS, 2018), however, a detailed report 'The Vegetation, ecology and conservation of the Lough Oughter Lake System, Co. Cavan' (Conaghan, 1999), describes the character and environmental problems associated with this system, in addition to potential conservation measures. This report cites the site as being a good example of natural eutrophic lakes with Magnopotamion or Hydrocharition – type vegetation.

Rich pondweed lake habitat (3150)/ natural eutrophic lakes is misleading by name, as Ireland does not have significant phosphorus-rich deposits, hence typically lakes cannot be characterised as naturally 'eutrophic' (O'Connor, 2015). In fact, eutrophication is reported as a significant problem, with a reduction in water quality observed for the past 30 years, owing to the intensive cattle-based agricultural activities in the surrounding land (Conaghan, 1999).

The conservation objective adopted from the nearby Lough Forbes Complex SAC (001818) is to 'restore the concentration of nutrients in the water column to sufficiently low levels to support the habitat and its typical species; annual average TP concentration should be ≤ 20 µg/l.

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to natural eutrophic lakes in Lough Oughter and Associated Loughs SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Erne Upper (IE_NW_36_672) lake waterbody has *Good* OP indicative water quality, a baseline concentration of *0.0180* mg/l P, a cumulative load of 258 kg/yr, a baseline following dosing of 0.0182 mg/l P and a Good OP indicative water quality following dosing, i.e. no change in WFD indicative water quality status. The modelled increase is below the 5% significant threshold for good/high status for SW bodies (0.00125 mg/l P) and therefore there is no impact from the proposed project on this waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Knockataggart WTP have demonstrated that there will be no change in the OP WFD indicative water quality on the Erne Upper lake waterbody, there is sufficient capacity within the status threshold, and no alteration to water quality within the receiving waterbodies connected to Lough Oughter and associated Loughs SAC. When compared to the SAC targets for water quality in Eutrophic lakes the target of ≤20µg/l TP is not exceeded. On the basis of the EAM data, there will be no potential for alteration to natural eutrophic lakes in Lough Oughter and Associated Loughs SAC. Therefore, potential for significant effects on this habitat can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of eutrophic lakes, no deterioration of its favourable conservation condition is identified.

6.1.2 (91D0) Bog Woodland

Lough Oughter and associated Loughs SAC does not, at this time, have an SSCO for Bog Woodland. The SAC site synopsis describes that, in areas of wet bog with good Sphagnum cover, bog woodland has developed. The SSCO for this habitat 91D0 at other sites do not set out any targets and attributes relating to water quality. Bog woodland typically occurs on raised bog habitat and cutaway bog. While Lough Oughter and Associated Loughs SAC is not designated for active areas of degraded raised bog, the SSCO's for these habitats can be referred to within the context of Bog Woodland.

Water quality is an attribute of the raised bog habitat and the target is to maintain or restore water quality on the high bog and in transitional areas close to natural reference conditions (depending on site). Water chemistry within raised bogs is influenced by atmospheric inputs (rainwater). However, within soak systems, water chemistry is influenced by other inputs such as focused flow or interaction with underlying substrates. Water chemistry in areas surrounding the high bog varies due to influences of different water types (bog water, regional groundwater and run-off from surrounding mineral lands).

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to bog woodland in Lough Oughter and Associated Loughs SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Annalee_90 (IE_NW_36A021150) river waterbody has Good OP indicative water quality, a baseline concentration of 0.0340 mg/l P, a cumulative load of 112 kg/yr, a baseline following dosing of 0.0342 mg/l P following dosing. The increase in orthophosphate following dosing does not exceed the 5% significance threshold (<0.00125 mg/l P) so there is no risk of significant deterioration in water quality for this RWB and the OP indicative water quality remains unchanged i.e. Good.

- Annalee_100 (IE_NW_36A021400) river waterbody has Poor OP indicative water quality, a baseline concentration of 0.0604 mg/l P, a cumulative load of 219.5 kg/yr, a baseline following dosing of 0.0607 mg/l P and a Poor OP status following dosing, i.e. no change in WFD indicative water quality. The modelled increase is below the 5% significance threshold for good/high status SW bodies (0.00125 mg/l P) and will not cause deterioration in the waterbody or prevent its restoration to High status. Therefore, there is no impact from the proposed project on this waterbody.

- Erne_80 (IE_NW_36E011300) river waterbody has Moderate OP indicative water quality, a baseline concentration of 0.0425 mg/l P, a cumulative load of 219.5 kg/yr, a baseline following dosing of 0.0427 mg/l P and a Moderate OP status following dosing, i.e. no change in WFD indicative water quality. The modelled increase is below the 5% significance threshold for good/high status SW bodies (0.00125 mg/l P) and will not cause deterioration in the waterbody or prevent its restoration to High status. Therefore, there is no impact from the proposed project on this waterbody.

- Erne_90 (IE_NW_36E011410) river waterbody has Moderate OP indicative water quality, a baseline concentration of 0.0506 mg/l P, a cumulative load of 258 kg/yr, a baseline following dosing of 0.0508 mg/l P and a Moderate OP status following dosing, i.e. no change in WFD indicative water quality. The modelled increase is below the 5% significance threshold for good/high status SW bodies (0.00125 mg/l P) and will not cause deterioration in the waterbody or prevent its restoration to High status. Therefore, there is no impact from the proposed project on this waterbody.

- Erne_100 (IE_NW_36E011440) river waterbody has Moderate OP indicative water quality, a baseline concentration of 0.0352 mg/l P, a cumulative load of 258 kg/yr, a baseline following dosing of 0.0354 mg/l P and a Moderate OP status following dosing, i.e. no change in WFD indicative water quality. The modelled increase is below the 5% significance threshold for good/high status SW bodies (0.00125 mg/l P) and will not cause deterioration in the waterbody or prevent its restoration to high status. Therefore, there is no impact from the proposed project on this waterbody.

- Erne_110 (UKGBNI1NW363604081) river waterbody has Moderate OP indicative water quality, a baseline concentration of 0.0391 mg/l P, a cumulative load of 258 kg/yr, a baseline following dosing of 0.0393 mg/l P and a Moderate OP status following dosing, i.e. no change in WFD indicative water quality. The modelled increase is below the 5% significance threshold for good/high status SW bodies (0.00125 mg/l P) and will not cause deterioration in the waterbody or prevent its restoration to high status. Therefore, there is no impact from the proposed project on this waterbody.

- Upper Lough Erne (UKGBNI1NW363602063) river waterbody has Moderate OP indicative water quality, a baseline concentration of 0.0455 mg/l P, a cumulative load of 258 kg/yr, a baseline following dosing of 0.0457 mg/l P and a Moderate OP status following dosing, i.e. no change in WFD indicative water quality. The modelled increase is below the 5% significance threshold for good/high status SW bodies (0.00125 mg/l P) and will not cause deterioration in the waterbody or prevent its restoration to high status. Therefore, there is no impact from the proposed project on this waterbody.

- Erne Upper (IE_NW_36_672) lake waterbody has Good OP indicative water quality, a baseline concentration of 0.0180 mg/l P, a cumulative load of 258 kg/yr, a baseline following dosing of 0.0182 mg/l P and a Good OP indicative water quality following dosing, i.e. no change in WFD indicative water quality status. The modelled increase is below the 5% significant threshold for good/high status for SW bodies (0.00125 mg/l P) and therefore there is no impact from the proposed project on this waterbody.

- Cavan (IE_NW_G_061) groundwater body has Good OP indicative water quality, a baseline concentration of 0.0175 mg/l P, a cumulative load of 3.3 kg/yr, a baseline following dosing of 0.0175 mg/l P and a Good OP status following dosing, i.e. no change in WFD indicative water quality. The modelled increase is below the 5% significant threshold for good/fail status for GW bodies (0.00175 mg/l P) and therefore there is no impact from the proposed project on this waterbody.

- Killashandra (IE_NW_G_062) groundwater body has Good OP indicative water quality, a baseline concentration of 0.0175 mg/l P, a cumulative load of 8.8 kg/yr, a baseline following dosing of 0.0182 mg/l P and a Good OP status following dosing, i.e. no change in WFD indicative water quality. The modelled increase is below the 5% significant threshold for good/fail status for GW bodies (0.00175 mg/l P) and therefore there is no impact from the proposed project on this waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Knockataggart WTP have demonstrated that there will be no change in the OP WFD indicative water quality of the aforementioned surface water and groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there is no potential for significant effects to natural eutrophic lakes in Lough Oughter and Associated Loughs SAC. Therefore, potential for significant effects on this habitat can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of eutrophic lakes/ no deterioration of its favourable conservation condition is identified.

6.1.3 (1355) Otter *Lutra lutra*

There are no SSCOs for this site (NPWS, 2018). Otter use the river, streams and associated riparian habitats for feeding, travelling, resting and breeding. The National Parks and Wildlife Service's Threat Response Plan for the Otter (NPWS, 2009), a review of and response to the pressures and threats to otters in Ireland, categorized three principal risks to otters: i) habitat destruction and degradation; ii) water pollution; and, iii) accidental death and/or persecution. There will be no interference with the terrestrial, marine or freshwater habitat of Otter as a result of this project. The diet of the species varies locally and seasonally; however, it is dominated by fish, in particular salmonids, eels and sticklebacks in freshwater. A nutrient quality target of 'good' status is adopted here, to align with that outlined for fish fauna that form part of the diet of otter in the Lough Oughter and Associated Loughs SAC.

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to otter in the Lough Oughter and Associated Loughs SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Annalee_90 (IE_NW_36A021150) river waterbody has Good OP indicative water quality, a baseline concentration of 0.0340 mg/l P, a cumulative load of 112 kg/yr, a baseline following dosing of 0.0342 mg/l P following dosing. The increase in orthophosphate following dosing does not exceed the 5% significance threshold (<0.00125 mg/l P) so there is no risk of significant deterioration in water quality for this RWB and the OP indicative water quality remains unchanged i.e. Good.

- Annalee_100 (IE_NW_36A021400) river waterbody has Poor OP indicative water quality, a baseline concentration of 0.0604 mg/l P, a cumulative load of 219.5 kg/yr, a baseline following dosing of 0.0607 mg/l P and a Poor OP status following dosing, i.e. no change in WFD indicative water quality. The modelled increase is below the 5% significance threshold for good/high status SW bodies (0.00125 mg/l P) and will not cause deterioration in the waterbody or prevent its restoration to High status. Therefore, there is no impact from the proposed project on this waterbody.

- Erne_80 (IE_NW_36E011300) river waterbody has Moderate OP indicative water quality, a baseline concentration of 0.0425 mg/l P, a cumulative load of 219.5 kg/yr, a baseline following dosing of 0.0427 mg/l P and a Moderate OP status following dosing, i.e. no change in WFD indicative water quality. The modelled increase is below the 5% significance threshold for good/high status SW bodies (0.00125 mg/l P) and will not cause deterioration in the waterbody or prevent its restoration to High status. Therefore, there is no impact from the proposed project on this waterbody.

- Erne_90 (IE_NW_36E011410) river waterbody has Moderate OP indicative water quality, a baseline concentration of 0.0506 mg/l P, a cumulative load of 258 kg/yr, a baseline following dosing of 0.0508 mg/l P and a Moderate OP status following dosing, i.e. no change in WFD indicative water quality. The modelled increase is below the 5% significance threshold for good/high status SW bodies (0.00125 mg/l P) and will not cause deterioration in the waterbody or prevent its restoration to High status. Therefore, there is no impact from the proposed project on this waterbody.

- Erne_100 (IE_NW_36E011440) river waterbody has Moderate OP indicative water quality, a baseline concentration of 0.0352 mg/l P, a cumulative load of 258 kg/yr, a baseline following dosing of 0.0354 mg/l P and a Moderate OP status following dosing, i.e. no change in WFD indicative water quality. The modelled increase is below the 5% significance threshold for good/high status SW bodies (0.00125 mg/l P) and will not cause deterioration in the waterbody or prevent its restoration to high status. Therefore, there is no impact from the proposed project on this waterbody.

- Erne_110 (UKGBNI1NW363604081) river waterbody has Moderate OP indicative water quality, a baseline concentration of 0.0391 mg/l P, a cumulative load of 258 kg/yr, a baseline following dosing of 0.0393 mg/l P and a Moderate OP status following dosing, i.e. no change in WFD indicative water quality. The modelled increase is below the 5% significance threshold for good/high status SW bodies (0.00125 mg/l P) and will not cause deterioration in the waterbody or prevent its restoration to high status. Therefore, there is no impact from the proposed project on this waterbody.

- Upper Lough Erne (UKGBNI1NW363602063) river waterbody has Moderate OP indicative water quality, a baseline concentration of 0.0455 mg/l P, a cumulative load of 258 kg/yr, a baseline following dosing of 0.0457 mg/l P and a Moderate OP status following dosing, i.e. no change in WFD indicative water quality. The modelled increase is below the 5% significance threshold for good/high status SW bodies (0.00125 mg/l P) and will not cause deterioration in the waterbody or prevent its restoration to high status. Therefore, there is no impact from the proposed project on this waterbody.

- Erne Upper (IE_NW_36_672) lake waterbody has Good OP indicative water quality, a baseline concentration of *0.0180* mg/l P, a cumulative load of 258 kg/yr, a baseline following dosing of 0.0182 mg/l P and a Good OP indicative water quality following dosing, i.e. no change in WFD indicative water quality status. The modelled increase is below the 5% significant threshold for good/high status for SW bodies (0.00125 mg/l P) and therefore there is no impact from the proposed project on this waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Knockataggart WTP have demonstrated that there will be no change in the OP WFD indicative water quality of the aforementioned surface water and groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there is no potential for significant effects to otter in Lough Oughter and Associated Loughs SAC. Therefore, potential for significant effects on this habitat can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of eutrophic lakes/ no deterioration of its favourable conservation condition is identified.

6.2 DONEGAL BAY (MURVAGH) SAC 000133

6.2.1 (1140) Mudflats and sandflats not covered by seawater at low tide

The site synopsis for the Donegal Bay (Murvagh) SAC describes that most of this site consists of intertidal habitats, including mud and sandflats as well as sea inlets and bays, tidal rivers, estuarine channels and sandy beaches. These areas are generally unvegetated but are obviously nutrient-rich, as extensive beds of shellfish occur in parts of the bay (NPWS, 2018)

The SSCO objective for mudflats and sandflats not covered by seawater at low tide, is to maintain its favourable conservation condition. Two attributes are listed: habitat area and community distribution together with associated targets. No water quality attributes are associated with this habitat under its SSCO.

The Article 17 Report on the Status of EU Protected Habitat and Species in Ireland (NPWS, 2013b) lists pollution to surface waters as one of the main pressures and threats on this habitat and it is ranked of high importance. This project may cause an increase in nutrients or P enrichment within surface waters connected to Donegal Bay and with potential effects on mudflat and sandflat habitats. Such enrichment can be associated with accelerated growth of macroalgae/phytoplankton or reduced concentrations of dissolved oxygen.

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to intertidal mudflat and sandflat habitat 1140 in Donegal Bay (Murvagh) (SAC). The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Donegal Bay (Erne) (IE_NW_010_0000) coastal waterbody has a High OP indicative water quality in Summer and *High* OP status in winter, a baseline concentration of 0.0025 mg/l P in summer and 0.0125 mg/l P in winter, a cumulative load of 219.5 kg/yr, a potential concentration following dosing of up to 0.0026 mg/l P in summer and 0.0126 mg/l P in winter and an unchanged WFD OP indicative water quality, i.e. High in summer and *High* in winter. The modelled increase is below the 5% significant threshold for good/high status for SW bodies (0.00125 mg/l P) and therefore there is no impact from the proposed project on this waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Knockataggart WTP have demonstrated that there will be no change in the WFD indicative water quality of coastal waterbodies, connected to intertidal mud and sand flats in Donegal Bay (Murvagh) SAC. Therefore, potential for significant effects on this habitat in Donegal Bay (Murvagh) SAC can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of the habitat. No deterioration in favourable conservation condition is identified as no change to the WFD status for these waterbodies has been demonstrated.

6.2.2 (1365) Harbour Seal *Phoca vitulina*

Donegal Bay supports a population of 209 Harbour (Common) Seals (maximum count, 2009). The harbour seal is the smaller of two species of true seal (Phocidae) that commonly breed around the coast of Ireland and inhabit its inshore and offshore waters. The Harbour Seal is notable by its preferential use of enclosed sheltered coastal bays and estuaries in which it occupies established intertidal/terrestrial resting sites known as haul-out sites (NPWS, 2013a). Principal sites for Harbour seals in inner Donegal Bay continue to be found within the estuary adjacent to Murvagh and Laghy.

The conservation objective for Harbour Seal in Donegal (Murvagh) SAC is to maintain the favourable conservation condition of the population and several attributes and targets are identified relating to habitat access, breeding, moulting and resting behaviour and disturbance. No water quality attributes are identified. The Article 17 Report on EU Habitats and Species list marine water pollution as a pressure and threat to Harbour Seal populations of low importance.

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to habitats used by Harbour Seal in Donegal Bay (Murvagh) (SAC). The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on the connected coastal water body:

- Donegal Bay (Erne) (IE_NW_010_0000) coastal waterbody has a High OP indicative water quality in Summer and *High* OP status in winter, a baseline concentration of 0.0025 mg/l P in summer and 0.0125 mg/l P in winter, a cumulative load of 219.5 kg/yr, a potential concentration following dosing of up to 0.0026 mg/l P in summer and 0.0126 mg/l P in winter and an unchanged WFD OP indicative water quality, i.e. High in summer and *High* in winter. The modelled increase is below the 5% significant threshold for good/high status for SW bodies (0.00125 mg/l P) and therefore there is no impact from the proposed project on this waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Knockataggart WTP have demonstrated that there will be no change in the WFD status of coastal waterbodies, connected to habitats used by Harbour Seal in Donegal Bay (Murvagh) SAC. Therefore, potential for significant effects on this species in Donegal Bay (Murvagh) SAC can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of the habitat. No deterioration of its favourable conservation condition is identified as no change to the WFD status for these waterbodies has been demonstrated.

6.2.3 (2130) *Fixed coastal dunes with herbaceous vegetation ('grey dunes'); (2190) Humid dune slacks; (2170) Fixed dunes with Creeping Willow.

Donegal Bay is dominated by a range of coastal habitats, with dunes habitats occurring mainly at Murvagh (Mullanasole) and Mountcharles. At present these habitats supports characteristic dune flora. The SSCO (NPWS, 2014a) for the dune habitats in Donegal Bay with specific relevance to the current project include the attributes 'Vegetation composition: typical species and sub-communities' and 'Vegetation composition: negative indicator species'. The nutrient-poor status is crucial for the survival of certain vegetation types and so the target for 'Vegetation composition' is to maintain 'a typical flora for the particular sand dune habitat'. Negative indicator species include species indicative of a change in nutrient status e.g. nettles (*Urtica dioica*). The target for this attribute is that 'negative indicators (including non-native species) should not represent less than 5% of the vegetation cover'.

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to fixed dune and humid dune slack habitats in Donegal Bay (Murvagh) (SAC). The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on the connected coastal water body:

- Donegal Bay (Erne) (IE_NW_010_0000) coastal waterbody has a High OP indicative water quality in Summer and Good OP status in winter, a baseline concentration of 0.0025 mg/l P in summer and 0.0125 mg/l P in winter, a cumulative load of 219.5 kg/yr, a potential concentration following dosing of up to 0.0026 mg/l P in summer and 0.0126 mg/l P in winter and an unchanged WFD OP indicative water quality, i.e. High in summer and Good in winter. The modelled increase is below the 5% significant threshold for good/high status for SW bodies (0.00125 mg/l P) and therefore there is no impact from the proposed project on this waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Knockataggart WTP have demonstrated that there will be no change in the WFD status of coastal waterbodies, connected to fixed coastal dunes with herbaceous vegetation ('grey dunes') (2130); humid dune slacks (2190) and fixed dunes with Creeping Willow (2170) within Donegal Bay (Murvagh) SAC. Therefore, potential for significant effects on these habitats in Donegal Bay (Murvagh) SAC can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of the habitat. No deterioration of its favourable conservation condition is identified as no change to the WFD status for these waterbodies has been demonstrated.

6.3 DURNESH LOUGH SAC 000138

6.3.1 (1150) Coastal lagoons*

"Coastal lagoons" is a priority habitat in Annex I of the Habitats Directive. A coastal lagoon is a lake or pond that is fully or partially separated from the sea by a permeable barrier that can be entirely natural such as shingle, or can be an artificial embankment. Salinity varies depending on such factors such as freshwater inputs and barrier permeability. Lagoons support unique assemblages of flora and fauna, particularly invertebrates. In Ireland, coastal lagoons are considered to be in bad conservation status due to issues such as drainage and water pollution (NPWS, 2013).

The SAC site synopsis describes Durnesh Lough as a large, sedimentary lagoon, which is separated from the sea by a barrier that is composed partly of drumlins and partly high sand dunes with the remains of a cobble barrier in places. The lagoon formerly had a natural outlet to the sea but the outlet is now an artificial channel and pipe running under the sand dunes which appears to allow a certain amount of seawater to enter.

The SSCO's for lagoon habitat within Durnesh Lough SAC includes a number of attributes which relate to water quality and one which sets out a specific target for Molybate reactive phosphorous (MRP). The target is for annual median MRP to be within natural ranges and less than 0.1mg/l MRP.

Table 3 identifies the surface, groundwater, lake and coastal waterbodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to coastal

habitats and Durnesh Lough (SAC). The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on the connected coastal water body:

- Donegal Bay (Erne) (IE_NW_010_0000) coastal waterbody has a High OP indicative water quality in Summer and *High* OP status in winter, a baseline concentration of 0.0025 mg/l P in summer and 0.0125 mg/l P in winter, a cumulative load of 219.5 kg/yr, a potential concentration following dosing of up to 0.0026 mg/l P in summer and 0.0126 mg/l P in winter and an unchanged WFD OP indicative water quality, i.e. High in summer and *High* in winter. The modelled increase is below the 5% significant threshold for good/high status for SW bodies (0.00125 mg/l P) and therefore there is no impact from the proposed project on this waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Knockataggart WTP have demonstrated that there will be no change in the WFD status of coastal waterbodies, connected to Durnesh Lough (SAC). Therefore, potential for significant effects on lagoon habitat (1150), specifically a deterioration in water quality to exceed the threshold specified in the SSCO (i.e. >0.1 mg/L MRP) in Durnesh Lough SAC can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of the habitat. No deterioration of its favourable conservation condition is identified as no change to the WFD status for these waterbodies has been demonstrated.

6.3.2 (6410) Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)

The Annex I habitat 6410 is represented in Ireland by both fen and grassland communities on nutrient poor soils. The 6410 habitat is either managed as traditional hay meadows (cut only once a year in late summer or autumn with the hay crop removed) or more usually by extensive pasture. Within Ireland *Molinia* meadows occur in lowland plains on neutral to calcareous gleys, sometimes with a Marl layer beneath the surface, or on peaty soils both in lowland and upland situations (NPWS, 2013)). Pressures on this habitat include agricultural intensification and fertilisation. Both listed as being of low importance, but are likely to be greater (NPWS, 2013; O'Neill *et al*, 2013). Durnesh Lough SAC supports large areas of wet grassland adjacent to the lagoon. Examples of wet grassland referable to *Molinia* Meadows are also present and are located away from the lagoon and adjacent to smaller wetland sites.

Molinia meadow habitat within Durnesh Lough SAC does not lie within the Donegal Bay (Erne) coastal waterbody. There is no connection between the proposed OP dosing at Knockataggart and this habitat, which can be excluded from further assessment.

6.4 ST. JOHN'S POINT SAC 000191

6.4.1 (1160) Large shallow inlets and bays; (1170) Reefs and (8330) Submerged or partially submerged sea caves

St John's Point SAC supports large shallow inlets and bay habitat with reefs and submerged or partially submerged caves. Large shallow inlets and bays are indentations of the coast where, in contrast to estuaries, the influence of freshwater is generally limited or reduced. These habitats are typically shallower and more sheltered than open coasts and can report a variety of different habitat forms. The shallow and sheltered nature of these habitats results in highly productive and frequently diverse areas in terms of both species and communities (NPWS, 2013). At St John's Point SAC, six community types are present:

- Intertidal coarse sediment with enchytraeid oligochaetes and *Scolelepis squamata* community complex;
- Maërl-dominated community;
- Sand to mixed sediment with polychaetes and *Edwardsia spp.* community complex;

- Intertidal reef community complex;
- Laminaria-dominated community complex;
- Subtidal reef with echinoderms and sponges community complex.

Pollution to surface waters (limnic and terrestrial, marine and brackish) is listed as a pressure and threat of low importance to the habitat types: large shallow inlets and bays and submerged or partially submerged caves and of medium importance for reefs (NPWS, 2013).

The Conservation objectives for this site state that the distribution, extent and structure of the habitats and communities should be maintained. Keystone communities should be afforded the highest degree of protection and any significant anthropogenic disturbance should be avoided. For constituent communities, significant anthropogenic disturbance may occur with such intensity and/or frequency as to effectively represent a continuous or ongoing source of disturbance over time and space (e.g. effluent discharge within a given area). Where this occurs licensing of activities likely to cause continuous disturbance of each community type should not exceed an approximate area of 15% (NPWS, 2015).

Table 3 identifies the surface, groundwater, lake and coastal waterbodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to large shallow inlet and bay, reef and cave habitats within St Johns Point (SAC). The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on the connected coastal water body:

- Donegal Bay (Erne) (IE_NW_010_0000) coastal waterbody has a High OP indicative water quality in Summer and *High* OP status in winter, a baseline concentration of 0.0025 mg/l P in summer and 0.0125 mg/l P in winter, a cumulative load of 219.5 kg/yr, a potential concentration following dosing of up to 0.0026 mg/l P in summer and 0.0126 mg/l P in winter and an unchanged WFD OP indicative water quality, i.e. High in summer and *High* in winter. The modelled increase is below the 5% significant threshold for good/high status for SW bodies (0.00125 mg/l P) and therefore there is no impact from the proposed project on this waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Knockataggart WTP have demonstrated that there will be no change in the WFD status of coastal waterbodies, connected to St Johns Point (SAC). Therefore, potential for significant effects on large shallow inlets and bay habitats (1160), reef habitat (1170) and submerged or partially submerged sea caves habitats (8330) in St John's Point SAC can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of the habitat. No deterioration of its favourable conservation condition is identified as no change to the WFD status for these waterbodies has been demonstrated.

6.4.2 (6410) Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) and (7230) Alkaline fens

The Annex I habitat 6410 is represented in Ireland by both fen and grassland communities on nutrient poor soils. The 6410 habitat is either managed as traditional hay meadows (cut only once a year in late summer or autumn with the hay crop removed) or more usually by extensive pasture. Within Ireland *Molinia* meadows occur in lowland plains on neutral to calcareous gleys, sometimes with a Marl layer beneath the surface, or on peaty soils both in lowland and upland situations (NPWS, 2013)). Pressures and threats on this habitat include agricultural intensification and fertilisation both which are listed as being of low importance, but likely to be greater (NPWS, 2013; O'Neill *et al.*, 2013).

The Annex I habitat 7230 are typically base-rich basin or flush fen systems with extensive areas of species-rich small sedge communities of the alliance *Caricion davallianae*. These fen systems are often a complex mosaic of habitats, with tall sedge beds, reedbeds, wet grasslands, springs and open-water often co-occurring at a given fen site. Alkaline fen habitat can occur beyond peat-forming fen systems,

such as in dune slacks and wet grasslands (Article 17 Report). Pressures and threats on this habitat include diffuse groundwater pollution due to agriculture and forestry rated of high importance, diffuse pollution to surface water due to agriculture and forestry rated of high importance, agricultural intensification rated of medium importance and disposal of household/recreational facility waste rated of low importance.

Molinia meadow and Alkaline fen habitat within St Johns Point SAC do not lie within the Donegal Bay (Erne) coastal waterbody. There is no connection between the proposed OP dosing at Knockataggart and these habitats, which can be excluded from further assessment.

6.5 BUNDUFF LOUGH AND MACHAIR/ TRAWALUA/ MULLAGHMORE SAC 000625

6.5.1 (1160) Large shallow inlets and bays, (1140) Mudflats and sandflats not covered by seawater at low tide and (1170) Reefs

Bunduff Lough and Machair/Trawalua/Mullaghmore SAC supports large shallow inlets and bay habitat intertidal mudflats and sandflat and with reef habitat. Large shallow inlets and bays are indentations of the coast where, in contrast to estuaries, the influence of freshwater is generally limited or reduced. These habitats are typically shallower and more sheltered than open coasts and can report a variety of different habitat forms. The shallow and sheltered nature of these habitats results in highly productive and frequently diverse areas in terms of both species and communities (NPWS, 2013). At Bunduff Lough and Machair/Trawalua/Mullaghmore SAC, three community types are present:

- Fine to very fine sand community complex
- Intertidal reef community complex
- Laminaria-dominated community complex

Pollution to surface waters (limnic and terrestrial, marine and brackish) is listed as a pressure and threat of low importance to the habitat type: large shallow inlets and bays, of high importance to mudflats and sandflats not covered by seawater at low tide and of medium importance for reefs (NPWS, 2013).

The Conservation objectives for this SAC states that the distribution, extent and structure of these habitats and communities should be maintained. Further that, keystone communities should be afforded the highest degree of protection and any significant anthropogenic disturbance should be avoided. For constituent communities, significant anthropogenic disturbance may occur with such intensity and/or frequency as to effectively represent a continuous or ongoing source of disturbance over time and space (e.g. effluent discharge within a given area). Where this occurs licensing of activities likely to cause continuous disturbance of each community type should not exceed an approximate area of 15% (NPWS, 2015).

Table 3 identifies the surface, groundwater, lake and coastal waterbodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to coastal habitats within Bunduff Lough and Machair/Trawalua/Mullaghmore SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on the connected coastal water body:

- Donegal Bay (Erne) (IE_NW_010_0000) coastal waterbody has a High OP indicative water quality in Summer and *High* OP status in winter, a baseline concentration of 0.0025 mg/l P in summer and 0.0125 mg/l P in winter, a cumulative load of 219.5 kg/yr, a potential concentration following dosing of up to 0.0026 mg/l P in summer and 0.0126 mg/l P in winter and an unchanged WFD OP indicative water quality, i.e. High in summer and *High* in winter. The modelled increase is below the 5% significant threshold for good/high status for SW bodies (0.00125 mg/l P) and therefore there is no impact from the proposed project on this waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Knockataggart WTP have demonstrated that there will be no change in the WFD status of coastal waterbodies, connected to Bunduff Lough and Machair/Trawalua/Mullaghmore SAC. Therefore, potential for significant effects on large shallow inlet and bay habitats (1160), mudflats and sandflats not covered by seawater at low tide (1140) and Reef habitat (1170) in Bunduff Lough and Machair/Trawalua/Mullaghmore SAC can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of the habitat. No deterioration of its favourable conservation condition is identified as no change to the WFD status for these waterbodies has been demonstrated.

6.5.2 (2120) Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) and (2130) *Fixed coastal dunes with herbaceous vegetation ('grey dunes'), (21A0) Machairs (*in Ireland) (7230) Alkaline fens and (1395) Petalwort *Petalophyllum ralfsii*

Mullaghmore Head on the south side of Donegal Bay supports a diversity of coastal habitats, including the Annex I habitats: shifting dunes, fixed dunes, machair and alkaline fen. The Annex I species Petalwort has been recorded from machair habitat within the site. At present these habitats supports characteristic dune flora. The SSCO (NPWS, 2014a) for the dune habitats in Bunduff Lough and Machair/Trawalua/Mullaghmore SAC with specific relevance to the current project include the attributes 'Vegetation composition: typical species and sub-communities' and 'Vegetation composition: negative indicator species'. The nutrient-poor status is crucial for the survival of certain vegetation types and so the target for 'Vegetation composition' is to maintain 'a typical flora for the particular sand dune habitat' for shifting dune, fixed coastal dune habitats and machair habitat. Negative indicator species include species indicative of a change in nutrient status e.g. nettles (*Urtica dioica*). The target for this attribute is that 'negative indicators (including non-native species) should not represent less than 5% of the vegetation cover'. For Petalwort, the attributes concern maintaining suitable habitat with the dune and machair coastal complex. Alkaline fen occurs within this complex of dune and machair habitat and an attribute for this habitat relates to water quality and maintaining nutrient levels to those that occur naturally (NPWS, 2015).

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to coastal shifting dune, fixed dunes, machair and alkaline fen habitats and the Annex II species Petalwort *Petalophyllum ralfsii* in Bunduff Lough and Machair/Trawalua/Mullaghmore SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on the connected coastal water body:

- Donegal Bay (Erne) (IE_NW_010_0000) coastal waterbody has a High OP indicative water quality in Summer and *High* OP status in winter, a baseline concentration of 0.0025 mg/l P in summer and 0.0125 mg/l P in winter, a cumulative load of 219.5 kg/yr, a potential concentration following dosing of up to 0.0026 mg/l P in summer and 0.0126 mg/l P in winter and an unchanged WFD OP indicative water quality, i.e. High in summer and *High* in winter. The modelled increase is below the 5% significant threshold for good/high status for SW bodies (0.00125 mg/l P) and therefore there is no impact from the proposed project on this waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing on Knockataggart WTP have demonstrated that there will be no change in the WFD status of coastal waterbodies, connected to: Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) (2120), *Fixed coastal dunes with herbaceous vegetation ('grey dunes') (2130), Machairs (*in Ireland) (21A0), Alkaline fens (7230) and the Annex II species: Petalwort *Petalophyllum ralfsii* (1395) in Bunduff Lough and Machair/Trawalua/Mullaghmore SAC. Therefore, potential for significant effects on these habitats and species in Bunduff Lough and Machair/Trawalua/Mullaghmore SAC can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of the habitat. No deterioration of its favourable conservation condition is identified as no change to the WFD status for these waterbodies has been demonstrated.

6.6 LOUGH OUGHTER SPA 004049

There are no SSCOs for the Lough Oughter SPA (NPWS, 2018). The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Great Crested Grebe, Whooper Swan, and Wigeon.

The SSCOs for Lough Ougheter SPA (NPWS, 2018) list targets for each species (**Table 2**), specifically:

- Population trend: long term population trends should be stable or increasing; and
- Distribution: there should be no significant decrease in the range, timing or intensity of use of areas by the listed species, other than that occurring from natural patterns of variation.

Table 3 identifies the surface and groundwater bodies that have the potential to be impacted by the OP dosing and which have hydrologically or hydrogeologically connectivity to this habitat in the Lough Oughter SPA:

- Erne_80 (IE_NW_36E011300) river waterbody has Moderate OP indicative water quality, a baseline concentration of 0.0425 mg/l P, a cumulative load of 219.5 kg/yr, a baseline following dosing of 0.0427 mg/l P and a Moderate OP status following dosing, i.e. no change in WFD indicative water quality. The modelled increase is below the 5% significance threshold for good/high status SW bodies (0.00125 mg/l P) and will not cause deterioration in the waterbody or prevent its restoration to High status. Therefore, there is no impact from the proposed project on this waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Knockataggart WTP has demonstrated that there will be no change in the OP WFD indicative water quality of the aforementioned surface water and groundwater bodies, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there is no potential for significant effects to the above listed bird species in Lough Oughter and Associated Loughs SPA. Therefore, potential for significant effects on this habitat can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of the above listed species/ no deterioration of its favourable conservation condition is identified.

6.7 DONEGAL BAY SPA 004151

6.7.1 (A003) Great Northern Diver (*Gavia immer*), (A046) Light-bellied Brent Goose (*Branta bernicla hrota)*, (A065) Common Scoter (*Melanitta nigra*), (A144) Sanderling (*Calidris alba*), (A999) Wetlands and Waterbirds

The SSCOs for Donegal Bay SPA (NPWS, 2012) list targets for each species (**Table 2**), specifically:

- Population trend: long term population trends should be stable or increasing; and
- Distribution: there should be no significant decrease in the range, timing or intensity of use of areas by the listed species, other than that occurring from natural patterns of variation.

Donegal Bay SPA is a large, marine dominated site extending from Doorin Point, Co. Donegal to Tullaghan Point, Co. Leitrim.

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to bird species in Donegal Bay SPA. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Erne Estuary (IE_NW_030_0100) transitional waterbody has a High OP indicative water quality in Summer and Good OP status in winter, a baseline concentration of 0.0230 mg/l P in

summer and 0.0290 mg/l P in winter, a cumulative load of 219.5 kg/yr, a potential concentration following dosing of up to 0.0231 mg/l P in summer and 0.0291 mg/l P in winter and an unchanged WFD OP indicative water quality, i.e. High in summer and Good in winter. The modelled increase is below the 5% significant threshold for good/high status for SW bodies (0.00125 mg/l P) and therefore there is no impact from the proposed project on this waterbody.

- Donegal Bay (Erne) (IE_NW_010_0000) coastal waterbody has a High OP indicative water quality in Summer and *High* OP status in winter, a baseline concentration of 0.0025 mg/l P in summer and 0.0125 mg/l P in winter, a cumulative load of 219.5 kg/yr, a potential concentration following dosing of up to 0.0026 mg/l P in summer and 0.0126 mg/l P in winter and an unchanged WFD OP indicative water quality, i.e. High in summer and *High* in winter. The modelled increase is below the 5% significant threshold for good/high status for SW bodies (0.00125 mg/l P) and therefore there is no impact from the proposed project on this waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Knockataggart WTP on WFD OP statuses have demonstrated that there will be no change in the OP WFD indicative water quality of the above-mentioned waterbodies, there is sufficient capacity within the status threshold, and there will be no alteration to water quality meaning there is no potential for significant effects to the above listed species in Donegal Bay SPA.

Furthermore, dosing will not prevent the maintenance/ restoration of the favourable conservation condition of the above species in Donegal Bay SPA/ no deterioration of its favourable conservation condition is identified.

6.8 UPPER LOUGH ERNE SAC UK0016614

6.8.1 (3150) Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* – type vegetation

Upper Lough Erne SAC is a very large natural eutrophic lake situated in a drumlin landscape and has a predominantly limestone catchment. The site is an example of a northern or western eutrophic lake of glacial origin. The lake has a very long shoreline and numerous associated satellite lakes, many of which are included in the site. Aquatic vegetation of the *Magnopotamion* and *Hydrocharition* types is extensively developed. Both club-rush / common reed *Scirpo– Phragmitetum* and reed canary-grass – shoreweed – spike-rush *Phalaris – Littorella – Eleocharis* associations are well-developed on the shore. There are transitions to swamp and fen vegetation.

The Site-Specific Conservation Objectives for this habitat type are to maintain (and enhance) water quality, hydrological regime, the extent of the existing community types and species diversity within each community including populations of rage and endangered species. Objectives further include to maintain the purity of the natural and characteristic species composition, sediment load, natural and characteristic substrate. There should be minimal environmental disturbance and cross border monitoring of water quality.

Nutrient Enrichment of the lake is identified as one of the main threats and pressures with impact on the site. Threats are as a result of increased nutrient loading from agricultural runoff, discharges from pleasure boats and domestic sewerage. It is a target of the site to ensure no increasing trend in TP concentrations with a target of <65µg/l at the lake outflow and no increasing trend in TP concentration from the Republic of Ireland.

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to natural eutrophic lakes in Upper Lough Erne SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Erne_110 (UKGBNI1NW363604081) river waterbody has Moderate OP indicative water quality, a baseline concentration of 0.0391 mg/l P, a cumulative load of 258kg/yr, a

baseline following dosing of 0.0393 mg/l P and a Moderate OP status following dosing, i.e. no change in WFD indicative water quality. The modelled increase is below the 5% significance threshold for good/high status SW bodies (0.00125 mg/l P) and will not cause deterioration in the waterbody or prevent its restoration to high status. Therefore, there is no impact from the proposed project on this waterbody.

- Upper Lough Erne (UKGBNI1NW363602063) river waterbody has Moderate OP indicative water quality, a baseline concentration of 0.0455 mg/l P, a cumulative load of 258 kg/yr, a baseline following dosing of 0.0457 mg/l P and a Moderate OP status following dosing, i.e. no change in WFD indicative water quality. The modelled increase is below the 5% significance threshold for good/high status SW bodies (0.00125 mg/l P) and will not cause deterioration in the waterbody or prevent its restoration to high status. Therefore, there is no impact from the proposed project on this waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Knockataggart WTP have demonstrated that there will be no change in the OP WFD indicative water quality of the above-mentioned water bodies, there is sufficient capacity within the status threshold, and no alteration to water quality within the receiving waterbodies connected to eutrophic lakes from the proposed project. Whilst some of the waterbodies identified are currently failing to meet 'good status' requirements, the modelled concentrations from the proposed orthophosphate dosing are significantly below the significant threshold (<0.00125 mg/l P). Therefore, potential for significant effects on the water quality which supports the Conservation Objectives for this species can be excluded. When compared to the SAC targets for water quality in Eutrophic lakes the target of ≤65µg/l TP at the outflow is not exceeded. On the basis of the EAM data, there will be potential for alteration to natural eutrophic lakes in Upper Lough Erne SAC. Therefore, potential for significant effects on this habitat can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of eutrophic lakes, no deterioration of its favourable conservation condition is identified.

6.8.2 (91AE0) Alluvial forest with *Alnu glultinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)

Upper Lough Erne is the most extensive area of **alluvial forests** in Northern Ireland. The woodland occurs in scattered stands around the edges of the lough, where the shoreline is ungrazed or only very lightly grazed. Fluctuating water levels and variations in exposure, substrate and management have resulted in the formation of a wide range of wet woodland communities. These are generally characterised by a canopy in which species such as willow *Salix* spp. and alder *Alnus glutinosa* are dominant, with more notable species such as aspen *Populus tremula*, guelder-rose *Viburnum opulus* and buckthorn *Rhamnus cathartica* scattered throughout. The ground flora is often similar to that of the swamp and fen zone, with a rich variety of sedges and herbs.

The Site-Specific Conservation Objectives for this habitat type include to maintain and expand the extent of existing alluvial forests (but not at the expense of other SAC features), Maintain and enhance Alluvial forests species diversity including the presence of notable or rare species; maintain forest structures, maintain diversity of habitats associated with alluvial forests (fen , meadow grassland heat, wet woodland and scrub especially transition habitats).

The COs for the site, state that Alluvial forests *with Alnus glutinosa* and *Fraxinus excelsior* for Upper Lough Erne SAC are not considered sensitive to eutrophication. Therefore, this habitat can be excluded from further assessment.

6.8.3 (1355) Otter *Lutra lutra*

Upper Lough Erne consists of a large eutrophic lake with very extensive associated wetland habitats that holds a dense and large population of otters. In addition, the surrounding countryside is rich in

relatively unpolluted rivers and lakes and has a high density of semi-natural habitats, especially wetlands, supporting the otter population within the site.

The Site-Specific Conservation Objectives for Otter include maintaining populations numbers and distribution and if possible expanding on this, maintain the extent and quality of suitable habitat in particular chemical and biological water quality. Targets for water quality include that it should be at least category A or B, according to EP guidelines with no pollution incidents.

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to otter in the Lough Oughter and Associated Loughs SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Erne_110 (UKGBNI1NW363604081) river waterbody has Moderate OP indicative water quality, a baseline concentration of 0.0391 mg/l P, a cumulative load of 258kg/yr, a baseline following dosing of 0.0393 mg/l P and a Moderate OP status following dosing, i.e. no change in WFD indicative water quality. The modelled increase is below the 5% significance threshold for good/high status SW bodies (0.00125 mg/l P) and will not cause deterioration in the waterbody or prevent its restoration to high status. Therefore, there is no impact from the proposed project on this waterbody.

- Upper Lough Erne (UKGBNI1NW363602063) river waterbody has Moderate OP indicative water quality, a baseline concentration of 0.0455 mg/l P, a cumulative load of 258 kg/yr, a baseline following dosing of 0.0457 mg/l P and a Moderate OP status following dosing, i.e. no change in WFD indicative water quality. The modelled increase is below the 5% significance threshold for good/high status SW bodies (0.00125 mg/l P) and will not cause deterioration in the waterbody or prevent its restoration to high status. Therefore, there is no impact from the proposed project on this waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Knockataggart WTP have demonstrated that there will be no change in the OP WFD indicative water quality of the above-mentioned water bodies, connected to otter from the proposed project. Whilst some of the waterbodies identified are currently failing to meet 'good status' requirements, the modelled concentrations from the proposed orthophosphate dosing are significantly below the significant threshold (<0.00125 mg/l P). Therefore potential for significant effects on the water quality which supports the Conservation Objectives for this species can be excluded, no alteration to water quality meaning that there is no potential for significant effects to the nutrient condition supporting 'natural eutrophic lakes' and (3120) habitat in the SAC. When compared to the SAC targets for water quality in Eutrophic lakes the target of ≤65µg/l TP at the outflow is not exceeded. On the basis of the EAM data, there will be potential for alteration to natural eutrophic lakes in Upper Lough Erne SAC. Therefore, potential for significant effects on this habitat can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of eutrophic lakes, no deterioration of its favourable conservation condition is identified.

6.9 UPPER LOUGH ERNE SPA UK9020071

Upper Lough Erne is a very large and complex freshwater system within the catchment of the River Erne. A series of flooded drumlins in the course of the River Erne give rise to a complex of islands, bays and many lakes bordered by damp pastures, fens, reedswamp, Alder *Alnus glutinosa*-willow *Salix* sp. carr, and Oak *Quercus* sp. woodland. The site supports a wide range of breeding and wintering waterbirds, and is designated for wintering Whooper Swan *Cygnus cygnus*.

The SSCOs for Upper Lough Erne SPA (NIEA, 2015) list targets for each species (**Table 2**), specifically:

- For whooper Swan wintering population, no significant decrease in population against national trends

- To maintain the extend of the main habitat components used by or potentially usable by whooper swan subject to natural processes.

Table 3 identifies the surface and groundwater bodies that have the potential to be impacted by the OP dosing and which have hydrologically or hydrogeologically connectivity to Whooper Swan populations and habitat in Upper Lough Erne SPA:

- Erne_110 (UKGBNI1NW363604081) river waterbody has Moderate OP indicative water quality, a baseline concentration of 0.0391 mg/l P, a cumulative load of 258kg/yr, a baseline following dosing of 0.0393 mg/l P and a Moderate OP status following dosing, i.e. no change in WFD indicative water quality. The modelled increase is below the 5% significance threshold for good/high status SW bodies (0.00125 mg/l P) and will not cause deterioration in the waterbody or prevent its restoration to high status. Therefore, there is no impact from the proposed project on this waterbody.

- Upper Lough Erne (UKGBNI1NW363602063) river waterbody has Moderate OP indicative water quality, a baseline concentration of 0.0455 mg/l P, a cumulative load of 258 kg/yr, a baseline following dosing of 0.0457 mg/l P and a Moderate OP status following dosing, i.e. no change in WFD indicative water quality. The modelled increase is below the 5% significance threshold for good/high status SW bodies (0.00125 mg/l P) and will not cause deterioration in the waterbody or prevent its restoration to high status. Therefore, there is no impact from the proposed project on this waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Knockataggart WTP has demonstrated that there will be no change in the OP WFD indicative water quality of the aforementioned surface water and groundwater bodies, connected to whooper swans from the proposed project. Whilst some of the waterbodies identified are currently failing to meet 'good status' requirements, the modelled concentrations from the proposed orthophosphate dosing are significantly below the significant threshold (<0.00125 mg/l P). Therefore potential for significant effects on the water quality which supports the Conservation Objectives for this species can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of whooper swans/ no deterioration of its favourable conservation condition is identified.

6.10 ASSESSMENT OF IN-COMBINATION EFFECTS WITH OTHER PLANS OR PROJECTS

In order to ensure all potential effects upon European sites within the project's ZoI were considered, including those direct and indirect impact pathways that are a result of cumulative or in-combination effects, the following steps were completed:

1. Identify projects/ plans which might act in combination: identify all possible sources of effects from the project or plan under consideration, together with all other sources in the existing environment and any other effects likely to arise from other proposed projects or plans;

2. Impact identification: identify the types of impacts that are likely to affect aspects of the structure and functions of the site vulnerable to change;

3. Define the boundaries for assessment: define boundaries for examination of cumulative effects; these will be different for different types of impact and may include remote locations;

4. Pathway identification: identify potential cumulative pathways (e.g., via water, air, etc.; accumulations of effects in time or space);

5. Prediction: prediction of magnitude/ extent of identified likely cumulative effects, and

6. Assessment: comment on whether or not the potential cumulative effects are likely to be significant.

A search of the relevant Local Authority planning enquiry systems was conducted for developments that may have in-combination effects on European Sites with the ZoI. Plans relevant to the area were searched in order to identify any elements of the plans that may act cumulatively or in-combination with the proposed development.

Based on this search and the Project Teams knowledge of the study area a list of those projects and Plans which may potentially contribute to cumulative or in-combination effects with the proposed project was generated and listed in **Table 5** below.

Table 5: In-Combination Impacts with Other Plans, Programmes and Policies

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects
Cavan County Development Plan 2022 – 2028. The policies of relevance in the Cavan County Development Plan include under Chapter 4: Infrastructure and Environmental Strategy: **PIO71**-To support the implementation of measures to address deficiencies in existing water and wastewater infrastructure in order to ensure compliance with regulatory requirements and the objectives of the 'Water Framework Directive.' **PIO72-**To preserve and further develop water and wastewater infrastructure in order to facilitate the growth of settlements at an appropriate rate, which is consistent with the Core Strategy and Settlement Framework. **PIO88-**To ensure the protection and improvement of all drinking water, surface water and ground waters throughout the county by implementing the EU 'Water Framework Directive,' and any other associated legislation.	▪ N/A	The Cavan County Development Plan 2022 – 2028 outlines the importance of compliance with the Eastern River Basin Management Plan (now replaced by the national River Basin Management Plan 2022-2027), and emphasises compliance with environmental objectives. There is no potential for cumulative effects with these plans.
River Basin Management Plan for Ireland 2022 – 2027 The document (Chapter 4) sets out the condition of Irish waters, and a summary of statuses for all monitored waters in the 2013 – 2015 period, including a description of the changes since 2007 – 2009. Nationally, both monitored river waterbodies and lakes at 'high' or 'good' ecological status, appear to have declined by 3% since 2007 – 2009; nevertheless, this figure does not reflect a significant number of improvements and dis-improvements across these waters since 2009. Provisional figures from the EPA suggest that approximately 900 river waterbodies and lakes have either improved or dis-improved. In addition, the previously observed long term trend of decline in the number of high status river sites has continued. Chapter 5 of the RBMP presents results of the catchment characterisation process, which identifies the significant pressures on each waterbody that is *At Risk* of not meeting the environmental objectives of the WFD. Importantly, the assessment includes a review of trends over time to see if conditions were likely to remain stable, improve or deteriorate by 2021. This work was presented in the RBMP for 81% of waterbodies nationally, which had been characterised at the time. 1,517 waterbodies were classed *At Risk* out of a total of 4,775, or 32%. An assessment of significant environmental pressures found that agriculture was the most significant pressure in 729 river and lake waterbodies that are *At Risk*. Urban waste water, hydromorphology and forestry were also significant pressures amongst others.	▪ N/A	The objectives of the RBMP are to: ▪ Prevent deterioration; ▪ Restore good status; ▪ Reduce chemical pollution; and ▪ Achieve water related protected areas objectives. The implementation of the RBMP seeks compliance with the environmental objectives set under the plan, which will be documented for each waterbody. This includes compliance with the European Communities (Surface Waters) Regulations S.I. No. 272 of 2009 (as amended). The implementation of this plan will have a positive impact on biodiversity and the Project will not affect the achievement of the RBMP objectives.
Northern Ireland Environment Agency. North Western River Basin Management Plan 2015-2021 The North-Western River Basin District (NW RBD) covers an area of around 4900km2. It	▪ N/A	The Objectives include: Provide at least good status for all water bodies; Prevent deterioration in status;

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects
takes in large parts of Counties Fermanagh, Londonderry and Tyrone. The principle river systems are the Foyle (with its tributaries the Mourne, Derg, Strule and Finn Rivers) and the River Erne which drains the uplands of Cavan, Fermanagh and Monaghan. Lough Foyle is the main coastal water and Upper and Lower Lough Erne, Lough Melvin and Lough MacNean the main lakes.		Promote sustainable development; and achieve specific standards for protected areas. The objectives set the water status to be achieved for all surface and groundwater bodies. They should provide an appropriate balance between protecting and improving the water environment and ensuring that sustainable activities can continue and flourish.
Catchment based Flood Risk Assessment and Management (CFRAM) Programme, under the Floods Directive The Office of Public Works (OPW) is responsible for the implementation of the Floods Directive 2007/60/EC which is being carried out through a Catchment based Flood Risk Assessment and Management (CFRAM) Programme. As part of the directive Ireland is required to undertake a Preliminary Flood Risk Assessment, to identify areas of existing or potentially significant future flood risk and to prepare flood hazard and risk maps for these areas. Following this, flood risk management plans are developed for these areas setting objectives for managing the flood risk and setting out a prioritised set of measures to achieve the objectives. The CFRAM programme is currently being rolled out and Draft Flood Risk Management Plans have been prepared. These plans have been subject AA.	Habitat loss or destruction; Habitat fragmentation or degradation; Alterations to water quality and/or water movement; Disturbance; and In-combination impacts within the same scheme	CFRAM Studies and their product Flood Risk Management Plans, will each undergo appropriate assessment. Any future flood plans will have to take into account the design and implementation of water management infrastructure as it has the potential to impact on hydromorphology and potentially on the ecological status and favourable conservation status of waterbodies. The establishment of how flooding may be contributing to deterioration in water quality in areas where other relevant pressures are absent is a significant consideration in terms of achieving the objectives of the WFD. The AA of the plans will need to consider the potential for impacts from hard engineering solutions and how they might affect hydrological connectivity and hydromorphological supporting conditions for protected habitats and species. There is no potential for cumulative effects with the CFRAMS programme as no infrastructure is proposed as part of this project.
Foodwise 2025 Foodwise 2025 strategy identifies significant growth opportunities across all subsectors of the Irish agri-food industry. Growth Projection includes increasing the value added in the agri-food, fisheries and wood products sector by 70% to in excess of €13 billion.	Land use change or intensification; Water pollution; Nitrogen deposition; and Disturbance to habitats / species	Foodwise 2025 was subject to its own AA[1]. Growth is to be achieved through sustainable intensification to maximise production efficiency whilst minimising the effects on the environment however there is increased risk of nutrient discharge to receiving waters and in turn a potential risk to biodiversity and Europe Sites if not controlled. With the required mitigation in the Food Wise Plan, no significant in-combination impacts are predicted. Mitigation measures

[1] http://www.agriculture.gov.ie/media/migration/foodindustrydevelopmenttrademarkets/agri-foodandtheeconomy/foodwise2025/environmentalanalysis/AgriFoodStrategy2025NISDRAFT300615.pdf

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects
		included cross compliance with 13 Statutory Management Requirements, EIA Agricultural Regulations 2011, GLAS, and AA Screening of licencing and permitting in the forestry and seafood sectors.
Rural Development Programme 2021 – 2025 The agricultural sector is actively enhancing competitiveness whilst trying to achieve more sustainable management of natural resources. The common set of objectives, principles and rules through which the European Union co-ordinates support for European agriculture is outlined in the Rural Development Programme (RDP) 2014-2020 under the Common Agricultural Policy. The focus of the programme is to assist with the sustainable development of rural communities and while improvements are sought in relation to water management. Within the RDP are two targeted agri-environment schemes; Green Low Carbon Agri-Environment Scheme (GLAS) and Targeted Agriculture Modernisation Scheme (TAMS). They provide the role of a supportive measure to improve water quality and thus provide direct benefits in achieving the measures within the RBMP. The achievement of the objectives outlined within GLAS, to improve water quality, mitigate against climate change and promote biodiversity will be of direct positive benefit in achieving the measures within the RBMP and the goals of the Natura Directives. The scheme has an expected participation for 2021-2025 of 50,000 farmers which have to engage in specific training and tasks in order to receive full payment. Farmers within the scheme must have a nutrient management plan which is a strategy for maximising the return from on and off-farm chemical and organic fertilizer resources. This has a direct positive contribution towards protecting waterbodies from pollution through limiting the amount of fertiliser that is placed on the land. The scheme prioritises farms in vulnerable catchments with 'high status' waterbodies and also focuses on educating farmers on best practices to try and improve efficiency along with environmental outcomes. The TAMS scheme is open to all farmers and is focused on supporting productive investment for modernisation. This financial grant for farmers is focused on the pig and poultry sectors, dairy equipment and the storage of slurry and other farmyard manures. Within the TAMS scheme are two further schemes; the Animal Welfare, Safety and Nutrient Storage Scheme and the Low Emission Slurry Spreading Scheme. Both schemes	▪ Overgrazing; ▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition; and ▪ Disturbance to habitats / species;	The RDP for 2021 – 2025 has been subject to SEA[1], and AA[2]. The AA assessed the potential for impacts from the RDP measures e.g. for the GLAS scheme to result in inappropriate management prescriptions; minimum stocking rates under the Areas of Natural Constraints measure leading to overgrazing in sensitive habitats with dependent species, and TAMS supporting intensification. Mitigation included project specific AA for individual building, tourism or agricultural reclamation projects, consultations with key stakeholders during detailed measure development, and site-based monitoring of the effects of RDP measures. With such measures in place, it was concluded that there would be no significant in-combination effects on Natura 2000 sites.

[1] https://www.agriculture.gov.ie/media/migration/ruralenvironment/ruraldevelopment/ruraldevelopmentprogramme2014-2020/StrategEnvironmAssessSumState090615.pdf
[2] https://www.agriculture.gov.ie/media/migration/agarchive/ruralenvironment/preparatoryworkfortherdp2014-2020/RDP20142020DraftAppropriateAssessmentReport160514.pdf

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects
are focused on productivity for farmers but have the ability to contribute towards a reduction in point and diffuse source pollution through improved nutrient management.		
National Nitrates Action Programme Ireland is obliged under the Nitrates Directive 91/676/EEC to prepare a National Nitrates Action Programme which is designed to prevent pollution of surface and ground waters from agricultural sources. This will directly contribute to the improvement of water quality and thus the objectives within the RBMP. Ireland's third Nitrates Action Programme came into operation in 2014 and has a timescale up to 2017. The Agricultural Catchments Programme is an ongoing programme that monitors the efficiency of various measures within the nitrate regulations. It is spread across six catchments and encompasses approximately 300 farmers.	▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition; and ▪ Disturbance to habitats / species	This programme has been subject to a Screening for Appropriate Assessment and it concluded that the NAP will not have a significant effect on the Natura 2000 network and a Stage 2 AA was not required[1]. It concluded that the NAP was an environmental programme which imposes environmental constraints on all agricultural systems in the state. It therefore benefits Natura 2000 sites and their species. In terms of in-combination effects, it stated that the Food Wise 2025 strategy would have to operate within the constraints of the NAP.
Northern Ireland Nitrates Action Programme (NAP) and Phosphorus Regulations 2019 – 2022 Implementation of the Nitrates Directive (91/676/EEC) which aims to improve water quality by protecting water against pollution caused by nitrates from agriculture sources. In particular, it is about promoting better management of animal manures, chemical nitrogen fertilisers and other nitrogen-containing materials spread onto the land.	▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition; and ▪ Disturbance to habitats / species	The action programme has been subject to a 'test of likely significance' as part of the screening procedure under Article 6 of the Habitats Directive. From the consideration of all the potential effects it has been objectively concluded that the 2014 NAP Regulations are not likely to give rise to any significant effects on Natura 2000 sites and no further assessment under Article 6 is not required.
Forest Policy Review: Forests, Products and People – A Renewed Vision (2014) / Forestry Programme 2014 – 2020 (Extended to End 2022) Ireland's forestry sector is striving to increase forestry cover and one of the recommended policy actions in the Forest Policy Review: Forests, Products and People – A Renewed Vision (2014) is to increase the level of afforestation annually over time and support afforestation and mobilisation measures under the Forestry Programme 2014-2020. Two key objectives within the Forestry Programme 2014-2020 that will influence the RBMP are to increase Ireland's forest cover to 18% and to establish 10,000 ha of new forests and woodlands per annum. As part of this programme there are a number of schemes that promote sustainable forest management and they include the Afforestation Scheme, the Woodland Improvement Scheme, the Forest Road Scheme and the Native Woodland Conservation Scheme. Under the Native Woodland Conservation Scheme funding is provided to restore existing native woodland which	▪ Habitat loss or destruction; ▪ Habitat fragmentation or degradation; ▪ Water quality changes; and ▪ Disturbance to species.	Ireland's Forestry Programme 2014 – 2020 has undergone AA[2]. A key recommendation is that all proposed forestry projects should be subject to an assessment of their impacts and the proximity of Natura 2000 habitats and species should be taken into account when proposals are generated. In-combination effects will therefore be assessed at the project specific scale. Adherence to this recommendation will ensure that there is no potential for cumulative effects with the proposed project.

[1] http://www.housing.gov.ie/sites/default/files/migrated-files/en/Publications/Environment/Water/FileDownLoad,35218,en.PDF
[2] https://www.agriculture.gov.ie/media/migration/forestry/publicconsultation/newforestryprogramme2014-2020/nis/ForestryProgrammeNaturalImpactStatement290914.pdf

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects
promotes Ireland's native woodland resource and associated biodiversity. Native woodlands provide wider ecosystem functions and services which once restored can contribute to the protection and enhancement of water quality and aquatic habitats. New guidance and plans are also being developed to address forestry adjacent to waterbodies, Freshwater Pearl Mussel Plans for 8 priority catchments and a Hen Harrier Threat Response Plan (NPWS). The mitigation measures within these plans will be particularly important in terms of protecting sensitive habitats and species from such forestry increases.		
Water Services Strategic Plan (WSSP, 2015) Irish Water has prepared a Water Services Strategic Plan (WSSP, 2015), under Section 33 of the Water Service No. 2 Act of 2013 to address the delivery of strategic objectives which will contribute towards improved water quality and WFD requirements. 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 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 WSSP also sets out the strategic objectives against which the Irish Water Capital Investment Programme is developed. The current version of the CAP outlines the proposals for capital expenditure in terms of upgrades and new builds within the Irish Water owned asset and this is a significant piece of the puzzle in terms of the expected improvements from the RBMP.	▪ Habitat loss and disturbance from new / upgraded infrastructure; ▪ Species disturbance; ▪ Changes to water quality or quantity; and ▪ Nutrient enrichment /eutrophication.	The overarching strategy was subject to AA and highlighted the need for additional plan/project environmental assessments to be carried out at the tier 2 and tier 3 level. Therefore, no likely significant in-combination effects are envisaged.
National Wastewater Sludge Management Plan (2016) The National Wastewater Sludge Management Plan was prepared in 2015, outlining the measures needed to improve the management of wastewater sludge.	▪ Habitat loss and disturbance from new / upgraded infrastructure; ▪ Species disturbance; ▪ Changes to water quality or quantity; and ▪ Nutrient enrichment /eutrophication.	The plan was subject to both AA and SEA and includes a number of mitigation measures which were identified in relation to transport of materials, land spreading of sludge and additional education and research requirements. This plan does not specifically address domestic wastewater loads, only those relating to Irish Water facilities. In relation to the plan as it stands, no in-combination effects are expected with the implementation of proposed mitigation measures.
Northern Ireland Water Resource Management Plan 2012 Explains how it is intended 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	▪ Increased abstractions leading to changes /	A HRA (Appropriate Assessment) of Options proposed in the WRMP has been carried out. A HRA for Leakage reduction, strategic transfers and abstractions has been carried out with a HRA plan in place. In relation to the

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects
changes to our climate.	pressure on existing hydrology / hydrogeological regimes.	plan no in-combination effects are expected with the implementation of proposed mitigation measures.
Lead Mitigation Plan (2016) Included in the WSSP (2015) is the strategy WS1e – Prepare and implement a "Lead in Drinking Water Mitigation Plan" to effectively address the risk of failure to comply with the drinking water quality standard for lead due to lead pipework. This strategy has been realised in the 2016 Lead Mitigation Plan.	▪ Changes to water quality or quantity; and ▪ Nutrient enrichment /eutrophication.	The plan is subject to SEA and AA which have also been published and are available at http://www.water.ie. Upstream dosing areas have been considered in the EAM and the cumulative effect of dosing has been taken into account in the EAMs model.

7. SCREENING CONCLUSION STATEMENT

This Screening for AA has considered the potential for significant effects on European Sites arising from the proposed OP dosing at Knockataggart WTP, within the Cavan Regional Water Supply Scheme WSZ and the ZoI. The potential for significant effects are evaluated with regard to the qualifying interests/species of conservation interests and associated conservation status.

The potential for direct, indirect and cumulative impacts affecting **Lough Oughter and Associated Lakes SAC (000007)**, **Lough Oughter Complex SPA (004049)**, **Donegal Bay SPA (004151)**, **Donegal Bay (Murvagh) SAC (000133)**, **Durnesth Lough SAC (000138)**, **St. John's Point SAC (000191)**, **Bunduff Lough and Machair/Trawalua/Mullaghmore SAC (000625)**, **Upper Lough Erne SAC (UK0016614)** and **Upper Lough Erne SPA (UK9020071)** have been assessed. The appraisal undertaken in this Screening report has been informed by an EAM (see **Appendix C**) with reference to the ecological communities and habitats potentially affected by the proposed project, in order to provide a scientific basis for the evaluations. The Screening for AA has determined that there is not potential for significant direct, indirect or cumulative impacts which could affect the qualifying interests/special conservation interests of the European sites within the study area. It is therefore concluded, beyond reasonable scientific doubt, that the proposed project will not give rise to significant effects, either individually or in combination with other plans and projects, within the identified European Site(s).

On the basis of objective scientific information, this Screening has therefore excluded the potential for the proposed project, individually or in combination with other plans or projects, to give rise to any significant effect on a European Site. It is concluded that an AA is therefore not required.

8. REFERENCES

Burton, N.H.K., Paipai, E., Armitage, M.J.S., Maskell, J.M., Jones, E.T., Struve, J., Hutchings, C.J. & Rehfisch, M.M. (2002) Effects of reductions in organic and nutrient loading on bird populations in estuaries and coastal waters of England and Wales. Phase 1 Report. BTO Research Report, No. 267 to English Nature, the Countryside Council for Wales and the Environment Agency. BTO. Thetford, UK.

Council Directive 2009/147/ EC on the Conservation of Wild Birds. Assessment of the distribution and abundance of Kingfisher *Alcedo atthis* and other riparian birds on six SAC river systems in Ireland [

Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora.

Cummins, S.; Fisher, J.; Gaj McKeever, R.; McNaghten, L.; Crowe, O (2010) Assessment of the distribution and abundance of Kingfisher *Alcedo atthis* and other riparian birds on six SAC river systems in Ireland Produced by the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

DCHG (2017). National Biodiversity Action Plan 2017 – 2021. Produced by the National Parks and Wildlife Service, Department of the

DEHLG (2010). Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities. Produced by the National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

DECLG (2015). National Strategy to reduce exposure to Lead in Drinking Water. http://www.housing.gov.ie/sites/default/files/migrated-files/en/Publications/Environment/Water/FileDownLoad%2C41733%2Cen.pdf

Environment Agency (2006). Use and design of oil separators in surface water drainage systems: PPG 3.https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/290142/pmho0406biyl-e-e.pdf.

EPA (2010) Methodology for establishing groundwater threshold values and the assessment of chemical and quantitative status of groundwater, including an assessment of pollution trends and trend reversal. 57 pp.

http://www.epa.ie/pubs/reports/water/ground/Methodology%20for%20Groundwater%20Chemical%20&%20Quantitative%20Status%20Methology,%20TVs%20and%20Trends.pdf

European Commission (2000a) Communication from the Commission on the Precautionary Principle, Office for Official Publications of the European Communities, Luxembourg.

European Commission (2000b). Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC. Office for Official Publications of the European Communities, Luxembourg.

European Commission (2002). Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC. Office for Official Publications of the European Communities, Luxembourg.

European Commission (2011). Guidelines on the Implementation of the Birds and Habitats Directives in Estuaries and Coastal Zones, with particular attention to port development and dredging. European Communities (Natural Habitats) Regulations (S.I. No. 477 of 2011)

European Communities (Birds and Natural Habitats) Regulations 2011 to 2015

European Union (Drinking Water) Regulations 2014

Hunt, J., Heffernan, M.L., McLoughlin, D., Benson, C. & Huxley, C. (2013) The breeding status of Common Scoter, *Melanitta nigra* in Ireland, 2012. Irish Wildlife Manuals, No. 66. National Parks and Wildlife Service, Department of the Arts, Heritage and the Gaeltacht, Ireland.

Irish Water (IW) (2016) Lead in Drinking Water Mitigation Plan. https://www.water.ie/projects-plans/lead-mitigation-plan/Lead-in-Drinking-Water-Mitigation-Plan.pdf

Killeen, I., Moorkens, E. & Seddon, M.B.2011. *Vertigo geyeri*. The IUCN Red List of Threatened Species 2011: e.T22940A9400082. http://dx.doi.org/10.2305/IUCN.UK.2011-2.RLTS.T22940A9400082.en.

King, J.L.; Marnell, F.; Kingston, N.; Rosell, R.; Boylan, P.; Caffrey, J.M.; FitzPatrick, Ú.; Gargan, P.G.; Kelly, F.L.; O'Grady, M.F.; Poole, R.; Roche, W.K.; Cassidy, D. (2011). Red Lists Ireland Red List No. 5: Amphibians, Reptiles & Freshwater Fish. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.

Moorkens, E., Killeen, I., Seddon, M. (2012). *Vertigo angustior*. The IUCN Red List of Threatened Species 2012: e.T22935A16658012.

NIEA (2015) Fardrum & Roosky Turloughs SAC UK0030068 Conservation Objectives V2. Norther Ireland Environmental Agency

NIEA (2015) Upper Lough Erne SAC UK0016614 Conservation Objectives V2. Norther Ireland Environmental Agency

NIEA (2015) Upper Lough Erne SPA UK9020071 Conservation Objectives V3. Norther Ireland Environmental Agency

NPWS (2009) Threat response plan: Otter (2009 - 2011). National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland. NPWS (2013a) Article 17 Overview Report (Vol. 1) The Status of EU Protected Habitats and Species in Ireland.

NPWS (2012) Conservation Objectives: Donegal Bay SPA 004151. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NPWS (2012) Donegal Bay SPA (004151) Conservation objectives supporting document. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NPWS (2013b) Article 17 Habitat Conservation Assessments (Vol. 2) Version 1.1. The Status of EU Protected Habitats and Species in Ireland.

NPWS (2013c) Article 17 Species Conservation Assessments (Vol. 3) Version 1.1. The Status of EU Protected Habitats and Species in Ireland.

NPWS (2013) Ireland's Summary Report for the period 2008 – 2012 under Article 12 of the Birds Directive. https://circabc.europa.eu/sd/a/a211d525-ff4d-44f5-a360-e82c6b4d3367/IE_A12NatSum_20141031.pdf

NPWS (2015) Water Framework Directive Annex IV Protected Areas: Water Dependent Habitats and Species and High Status Sites.

NPWS (2018) Conservation objectives for Lough Oughter and Associated Loughs SAC [000007]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.

NPWS (2018) Conservation objectives for Lough Oughter Complex SPA [004049]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.

UKTAG (2009) Reporting confidence in groundwater status assessments. 4pp.

http://www.wfduk.org/resources%20/reporting-confidence-groundwater-status-ssessments

Appendix A

European Sites - Conservation Objectives

Conservation objectives for Lough Oughter and Associated Loughs SAC [000007]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

Code	Description
3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation
91D0	Bog woodland*

* denotes a priority habitat

Code	Common Name	Scientific Name
1355	Otter	*Lutra lutra*

Citation: *NPWS (2020) Conservation objectives for Lough Oughter and Associated Loughs SAC [000007]. Generic Version 7.0. Department of Culture, Heritage and the Gaeltacht.*

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Donegal Bay (Murvagh) SAC 000133

An Roinn
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Citation:
NPWS (2012) Conservation Objectives: Donegal Bay (Murvagh) SAC 000133. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

Series Editors: Rebecca Jeffrey & Naomi Kingston
ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

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Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

000133	Donegal Bay (Murvagh) SAC
1140	Mudflats and sandflats not covered by seawater at low tide
1365	Harbour Seal *Phoca vitulina*
2130	*Fixed coastal dunes with herbaceous vegetation ('grey dunes')
2190	Humid dune slacks

Please note that this SAC overlaps with Donegal Bay SPA (004151) and is adjacent to Lough Eske and Ardnamona Wood SAC (000163). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping and adjacent sites as appropriate.

Supporting documents, relevant reports & publications (listed by date)

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

Title: Donegal Bay (Murvagh) SAC (000133). Conservation objectives supporting document - marine habitats and species [Version 1]

Year: 2011

Author: NPWS

Series: Unpublished Report to NPWS

Title: Donegal Bay (Murvagh) SAC (000133). Conservation objectives supporting document - coastal habitats [Version 1]

Year: 2011

Author: NPWS

Series: Unpublished Report to NPWS

Title: Donegal Bay Baseline Intertidal Survey Report

Year: 2011

Author: RPS

Series: Unpublished Report to NPWS & MI

Title: Subtidal Benthic Investigations in Donegal Bay SPA (Site Code:IE004151) and Donegal Bay cSAC (Site Code: IE000133) Co. Donegal

Year: 2010

Author: Aquafact

Series: Unpublished Report to NPWS & MI

Title: Saltmarsh Monitoring Report 2007-2008

Year: 2009

Author: McCorry, M.; Ryle, T.

Series: Unpublished Report to NPWS

Title: Coastal Monitoring Project 2004-2006

Year: 2009

Author: Ryle, T.; Murray, A.; Connolly, C.; Swann, M.

Series: Unpublished Report to NPWS

Title: The phytosociology and conservation value of Irish sand dunes

Year: 2008

Author: Gaynor, K.

Series: Unpublished PhD thesis, National University of Ireland, Dublin

---

Title: Harbour seal population assessment in the Republic of Ireland: August 2003

Year: 2004

Author: Cronin, M.; Duck, C.; Ó Cadhla, O.; Nairn, R.; Strong, D.; O'Keeffe, C.

Series: Irish Wildlife Manuals No. 11

Title: Summary of National Parks & Wildlife Service surveys for common (harbour) seals (*Phoca vitulina*) and grey seals (*Halichoerus grypus*), 1978 to 2003

Year: 2004

Author: Lyons, D.O.

Series: Irish Wildlife Manuals No. 13

Title: A Survey of Irish Links Golf Courses

Year: 1999

Author: Gaynor, K.; Browne, A.

Series: Unpublished Report to NPWS

Title: National Shingle Beach Survey of Ireland 1999

Year: 1999

Author: Moore, D.; Wilson, F.

Series: Unpublished Report to NPWS

Title: 1989 survey of breeding herds of common seal *Phoca vitulina* with reference to previous surveys

Year: 1990

Author: Harrington, R.

Series: Unpublished Report to Wildlife Service

Title: An assessment of the breeding populations of common seals (*Phoca vitulina vitulina* L.) in the Republic of Ireland during 1979

Year: 1983

Author: Warner, P.J

Series: Irish Naturalists' Journal 21: 24-26

Title: An assessment of the status of the common seal *Phoca vitulina vitulina* in Ireland

Year: 1980

Author: Summers, C.F.; Warner, P.J; Nairn, R.G.W.; Curry, M.G.; Flynn, J.

Series: Biological Conservation 17: 115-123

Spatial data sources

Year:	Interpolated 2011
Title:	Intertidal surveys 2009, 2010
GIS operations:	Polygon feature classes from marine community types base data sub-divided based on interpolation of marine survey data. Expert opinion used as necessary to resolve any issues arising
Used for:	Marine community types, 1140 (maps 3 and 4)
Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	High water mark (HWM) and low water mark (LWM) polyline feature classes converted into polygon feature classes and combined; EU Annex I Saltmarsh and Coastal data erased out if present
Used for:	Marine community types base data (map 4)
Year:	2009
Title:	Coastal Monitoring Project 2004-2006. Version 1
GIS operations:	QIs selected; clipped to SAC boundary; overlapping regions with Saltmarsh CO data investigated and resolved with expert opinion used
Used for:	2130, 2190 (map 5)
Year:	2011
Title:	NPWS rare and threatened species database
GIS operations:	Dataset created from spatial references in database records. Expert opinion used as necessary to resolve any issues arising
Used for:	1365 (map 6)
Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	High Water Mark (HWM) polyline feature class converted into polygon feature class; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	1365 (map 6)

1140 Mudflats and sandflats not covered by seawater at low tide

To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in Donegal Bay (Murvagh) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 3	Habitat area was estimated as 1069ha using OSi data. See marine suporting document for further details
Community distribution	Hectares	Conserve the following community types in a natural condition: Estuarine fine sands dominated by polychaetes and oligochaetes community complex; and Intertidal muddy sand to sand dominated by polychaetes, bivalves and crustaceans community complex. See map 4	The likely area of the sediment communities was derived from intertidal surveys undertaken in 2009 and 2010 (Aquafact, 2010; RPS, 2011)

1365 Harbour Seal *Phoca vitulina*

To maintain the favourable conservation condition of Harbour Seal in Donegal Bay (Murvagh) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Access to suitable habitat	Number of artificial barriers	Species range within the site should not be restricted by artificial barriers to site use. See map 6	See marine supporting document for further details
Breeding behaviour	Breeding sites	The breeding sites should be maintained in a natural condition. See map 6	Attribute and target based on background knowledge of Irish breeding populations, review of data summarised by Summers et al. (1980), Warner (1983), Harrington (1990), Lyons (2004) and unpublished National Parks & Wildlife Service records. See marine supporting document for further details
Moulting behaviour	Moult haul-out sites	The moult haul-out sites should be maintained in a natural condition. See map 6	Attribute and target based on background knowledge of Irish populations, review of data from Lyons (2004), Cronin et al. (2004) and unpublished National Parks & Wildlife Service records. See marine supporting document for further details
Resting behaviour	Resting haul-out sites	The resting haul-out sites should be maintained in a natural condition. See map 6	Attribute and target based on background knowledge of Irish populations, review of data from Lyons (2004) and unpublished National Parks & Wildlife Service records. See marine supporting document for further details
Disturbance	Level of impact	Human activities should occur at levels that do not adversely affect the harbour seal population at the site	See marine supporting document for further details

2130 *Fixed coastal dunes with herbaceous vegetation ('grey dunes')

To restore the favourable conservation condition of Fixed coastal dunes with herbaceous vegetation (grey dunes) in Donegal Bay (Murvagh) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area increasing, subject to natural processes including erosion and succession. For sub-sites mapped: Mullanasole - 19.19ha and Mountcharles - 7.82ha. See map 5	Based on data from the Coastal Monitoring Project (Ryle et al., 2009). Two sub-sites (Mullanasole and Mountcharles) were mapped, giving a total estimated area of 27.01ha. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 5 for known distribution	Based on data from the Coastal Monitoring Project (Ryle et al., 2009). Fixed dunes known to occur at Mullanasole and Mountcharles. See coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation resulting in increased rates of erosion. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	A range of coastal habitats form a dynamic mosaic at this site according to Ryle et al. (2009); McCorry and Ryle (2009) and Moore and Wilson (1999). See coastal habitats supporting document for further details
Vegetation structure: bare ground	Percentage cover	Bare ground should not exceed 10% of fixed dune habitat, subject to natural processes	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation structure: sward height	Centimeters	Maintain structural variation within sward	30-70% of sward should be maintained between 5 and 20cm. Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in Ryle et al. (2009)	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from Ryle et al. (2009). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. See coastal habitats supporting document for further details

2130 *Fixed coastal dunes with herbaceous vegetation ('grey dunes')

To restore the favourable conservation condition of Fixed coastal dunes with herbaceous vegetation (grey dunes) in Donegal Bay (Murvagh) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation composition: scrub/trees	Percentage cover	No more than 5% cover or under control	Based on data from Ryle et al. (2009). The spread of blackthorn (*Prunus spinosa*) scrub needs to be controlled at Mountcharles. See coastal habitats supporting document for further details

2190 Humid dune slacks

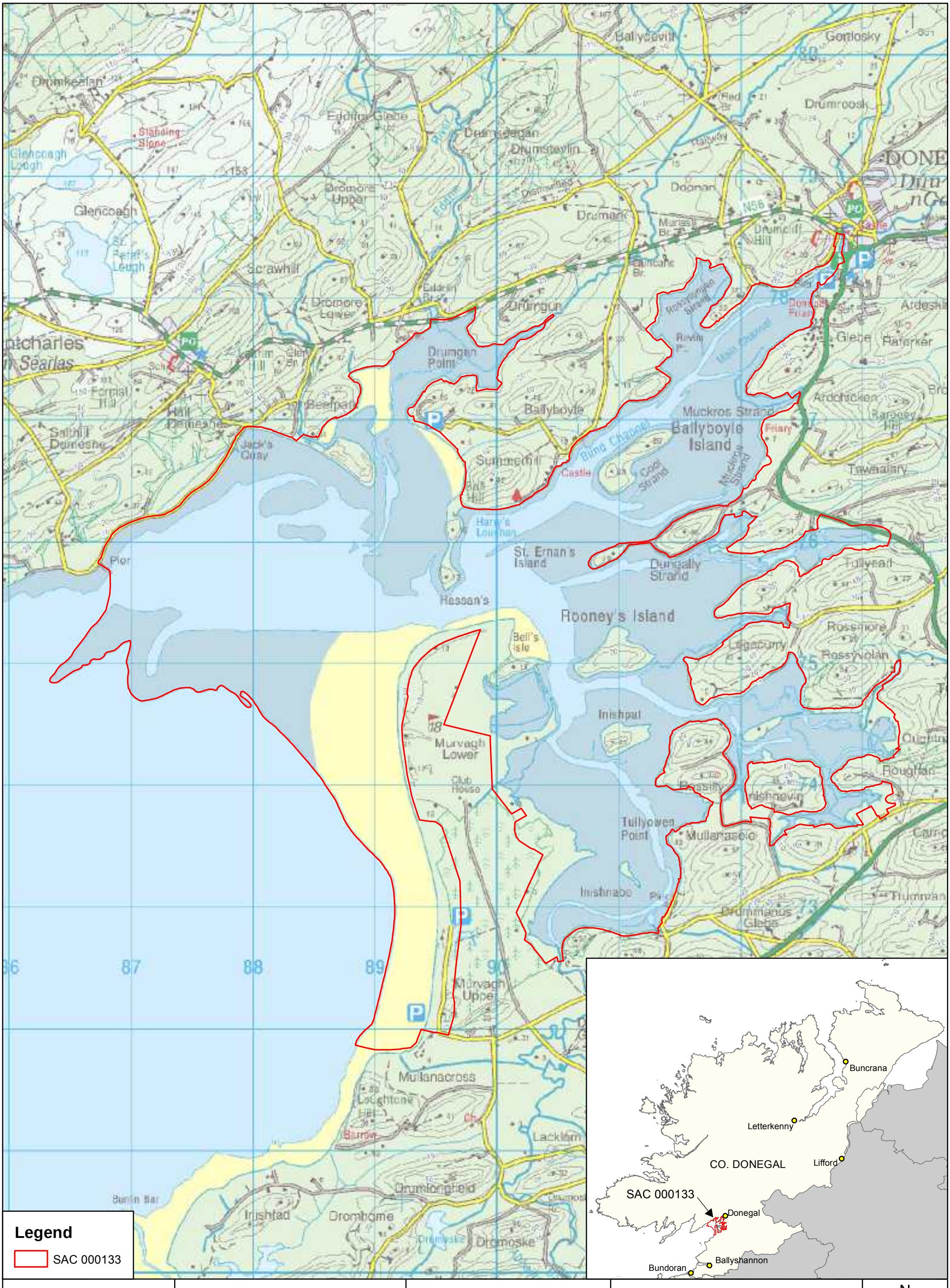
To restore the favourable conservation condition of Humid dune slacks in Donegal Bay (Murvagh) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area increasing, subject to natural processes including erosion and succession. For site mapped: Mullanasole - 0.12ha See map 5	Based on data from the Coastal Monitoring Project (Ryle et al., 2009). Habitat was mapped at Mullanasole, giving a total estimated area of 0.12ha. See coastal habitats supporting document for further details.
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 5 for known distribution	Based on data from the Coastal Monitoring Project (Ryle et al., 2009). Slacks known to occur at Mullanasole. They provide habitat for round-leaved wintergreen (*Pyrola rotundifolia* ssp. *maritima*). See coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation, resulting in increased rates of erosion. See coastal habitats supporting document for further details
Physical structure: hydrological and flooding regime	Water table levels: groundwater fluctuations (metres)	Maintain natural hydrological regime	Based on data from Ryle et al. (2009). Some slacks at Mullanasole are believed to have dried up due to afforestation. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	A range of coastal habitats form a dynamic mosaic at this site according to Ryle et al. (2009); McCorry and Ryle (2009) and Moore and Wilson (1999). See coastal habitats supporting document for further details
Vegetation structure: bare ground	Percentage cover	Bare ground should not exceed 5% of dune slack habitat, with the exception of pioneer slacks which can have up to 20% bare ground	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimeters	Maintain structural variation within sward	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in Ryle et al. (2009)	Based on data from Gaynor (2008) and Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: cover of Salix repens	% cover; centimeters	Maintain <40% cover of creeping willow (*Salix repens*)	Cover of creeping willow (*Salix repens*) needs to be controlled (e.g. through an appropriate grazing regime) to prevent the development of a coarse, rank vegetation cover. Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details

2190 Humid dune slacks

To restore the favourable conservation condition of Humid dune slacks in Donegal Bay (Murvagh) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from Ryle et al. (2009). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. See coastal habitats supporting document for further details
Vegetation composition: scrub/trees	Percentage cover	No more than 5% cover or under control	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details



Legend

SAC 000133

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 1:
DONEGAL BAY (MURVAGH) SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000133 Version 1

0 0.5 1 km

N

Map Version 1
Date: Dec 2011

000163

000133

004151

Legend

- SAC 000133
- SAC 000163
- SPA 004151
- OSi Discovery Series County Boundary

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 2:
DONEGAL BAY (MURVAGH) SAC CONSERVATION OBJECTIVES ADJOINING / OVERLAPPING DESIGNATIONS

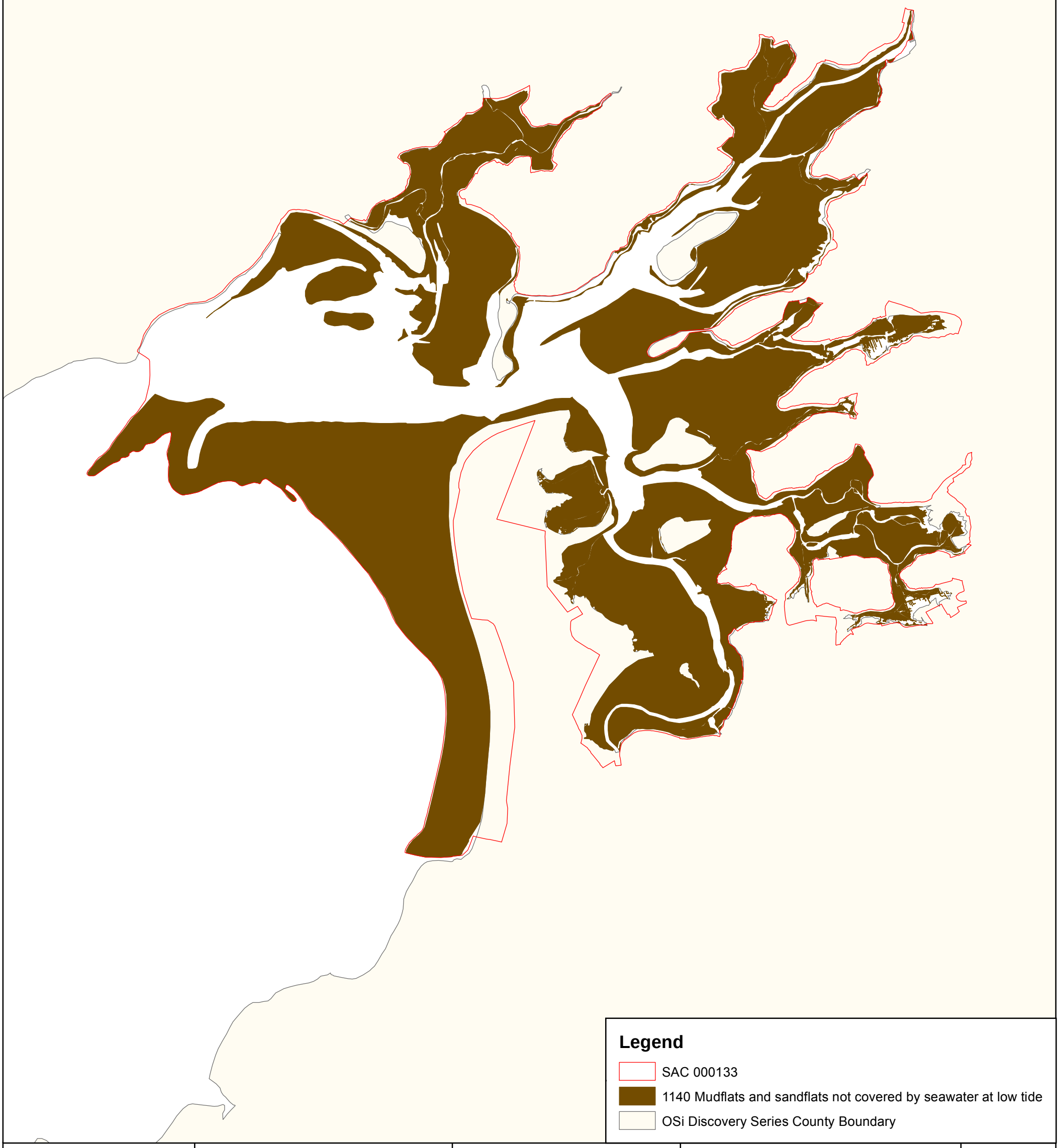
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000133 Version 1
SAC 000163 Version 1.02
SPA 004151 Version 2.01

0 1.5 3 km

N

Map Version 1
Date: Dec 2011



An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 3:
DONEGAL BAY (MURVAGH) SAC
CONSERVATION OBJECTIVES
TIDAL MUDFLATS & SANDFLATS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

COUNTY DONEGAL

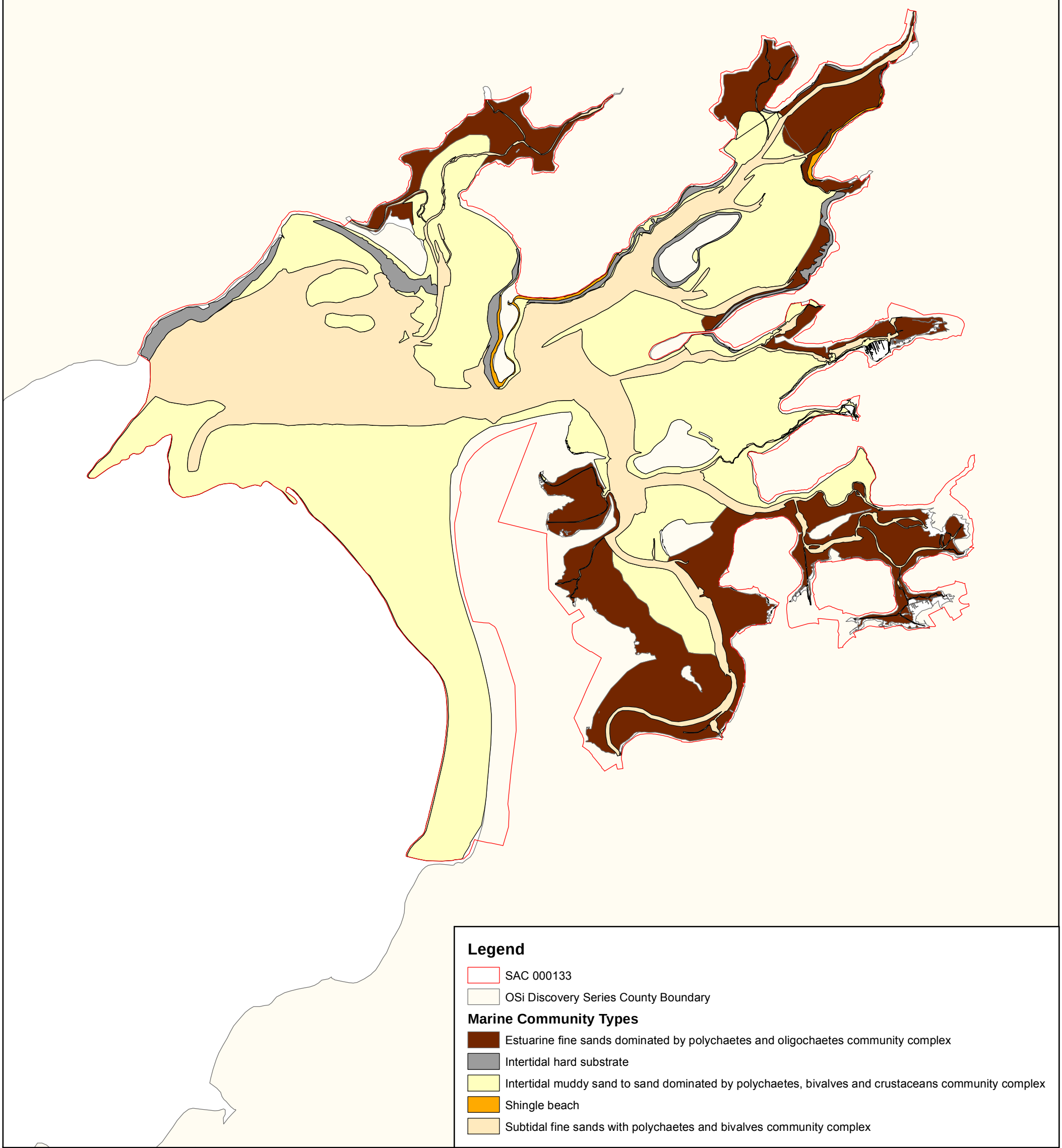
0 0.5 1 km

N

SITE CODE

SAC 000133
Version 1

Map Version 1
Date: Dec 2011



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Department of Arts, Heritage and the Gaeltacht

MAP 4:
DONEGAL BAY (MURVAGH) SAC
CONSERVATION OBJECTIVES
MARINE COMMUNITY TYPES

Map to be read in conjunction with the NPWS Conservation Objectives Document.

COUNTY DONEGAL

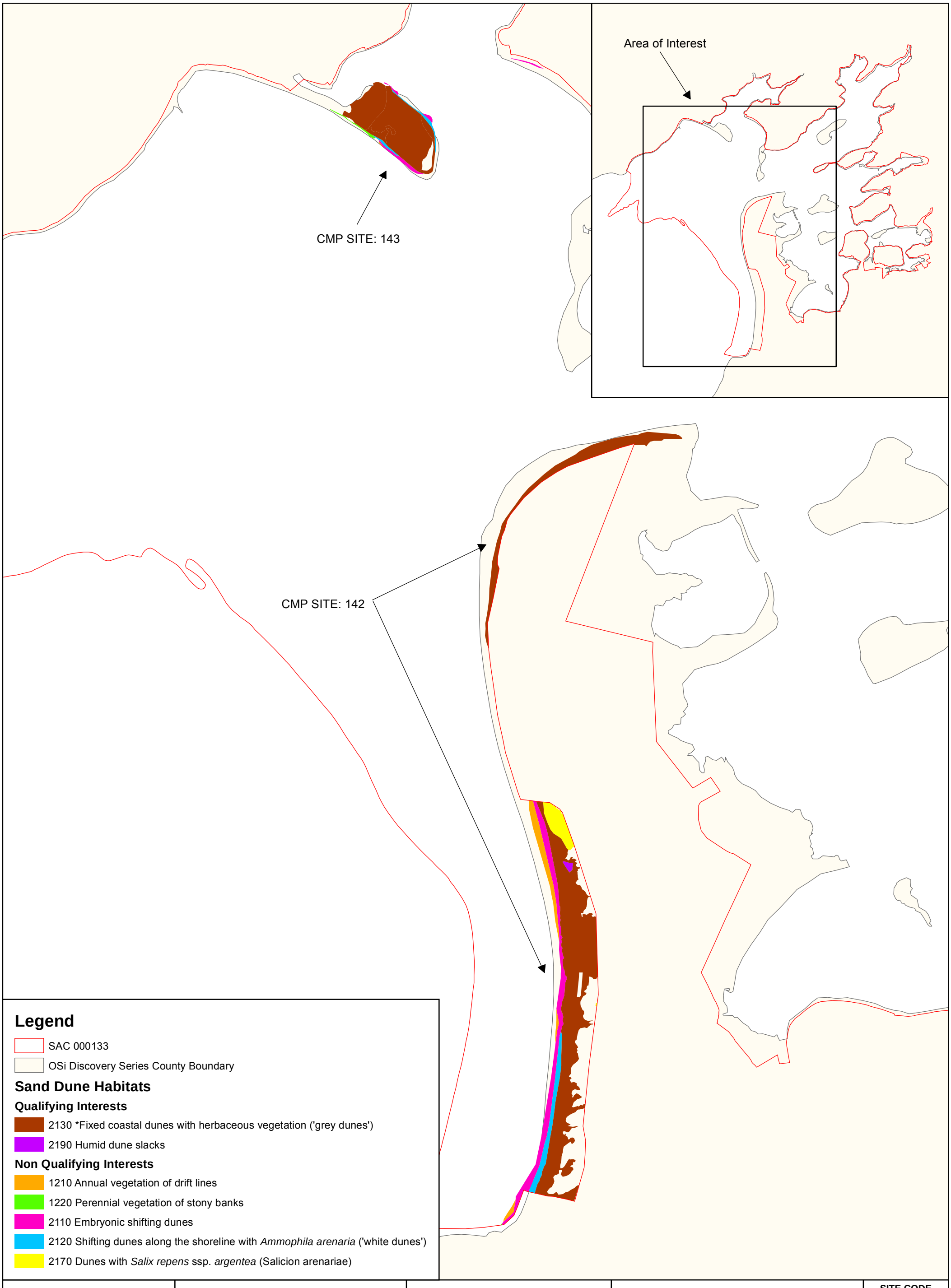
0 0.5 1 km

N

SITE CODE

SAC 000133
Version 1

Map Version 1
Date: Dec 2011



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Department of Arts, Heritage and the Gaeltacht

MAP 5:
DONEGAL BAY (MURVAGH) SAC
CONSERVATION OBJECTIVES
SAND DUNE HABITATS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

COUNTY DONEGAL

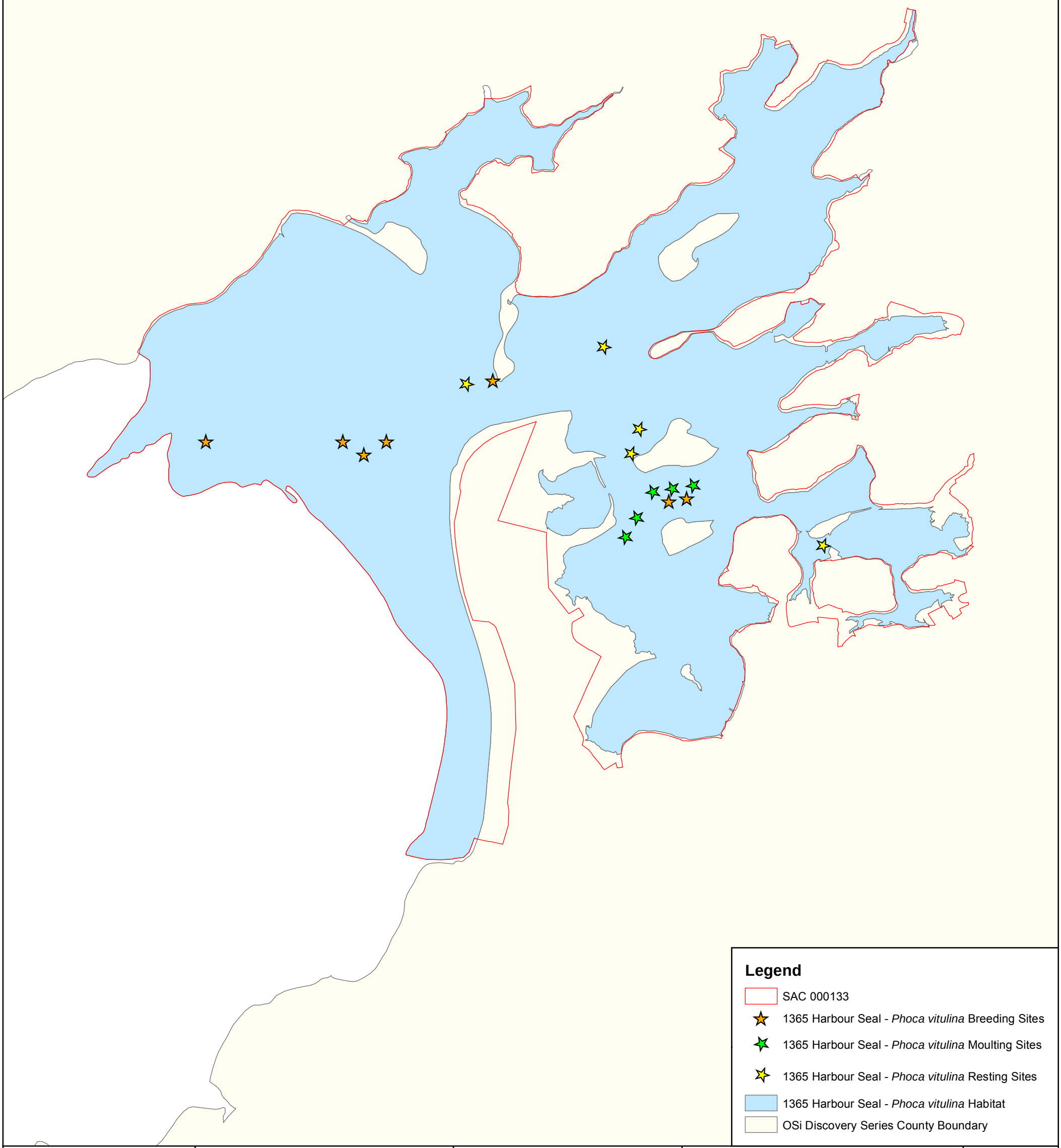
0 0.25 0.5 km

N

SITE CODE

SAC 000133
Version 1

Map Version 1
Date: Dec 2011



An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 6:
DONEGAL BAY (MURVAGH) SAC
CONSERVATION OBJECTIVES
HARBOUR SEAL

Map to be read in conjunction with the NPWS Conservation Objectives Document.

COUNTY DONEGAL

0 0.5 1 km

N

SITE CODE

SAC 000133
Version 1

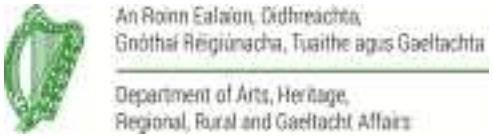
Map Version 1
Date: Dec 2011

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Durnesh Lough SAC 000138



National Parks and Wildlife Service,
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs,

7 Ely Place, Dublin 2, Ireland.

Web: www.npws.ie
E-mail: nature.conservation@ahg.gov.ie

Citation:

NPWS (2016) Conservation Objectives: Durnesh Lough SAC 000138. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

Series Editor: Rebecca Jeffrey
ISSN 2009-4086

Introduction

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Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

000138	Durnesh Lough SAC
1150	Coastal lagoons*
6410	*Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)

Please note that this SAC overlaps Durnesh Lough SPA (004145) and Donegal Bay SPA (004151). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping sites as appropriate.

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	2007
Title :	Inventory of Irish coastal lagoons (version 2)
Author :	Oliver, G.
Series :	Unpublished report to NPWS
Year :	2013
Title :	Irish semi-natural grasslands survey 2007-2012
Author :	O'Neill, F.H.; Martin, J.R.; Devaney, F.M.; Perrin, P.M.
Series :	Irish Wildlife Manual No. 78
Year :	2016
Title :	Durnesh Lough SAC (site code: 138) Conservation objectives supporting document- coastal lagoons V1
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	2013
Title :	Monitoring and assessment of Irish lagoons for the purposes of the EU Water Framework Directive, 2009-2011. Parts 1 and 2
Author :	Roden, C.M; Oliver, G.A.
Series :	Unpublished report to the Environmental Protection Agency

Spatial data sources

Year :	Revision 2011
Title :	Inventory of Irish Coastal Lagoons. Version 3
GIS Operations :	Clipped to SAC boundary
Used For :	1150 (map 3)
Year :	2013
Title :	Irish Semi-Natural Grassland Survey
GIS Operations :	Dataset clipped to the SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	6410 (map 4)

1150 Coastal lagoons

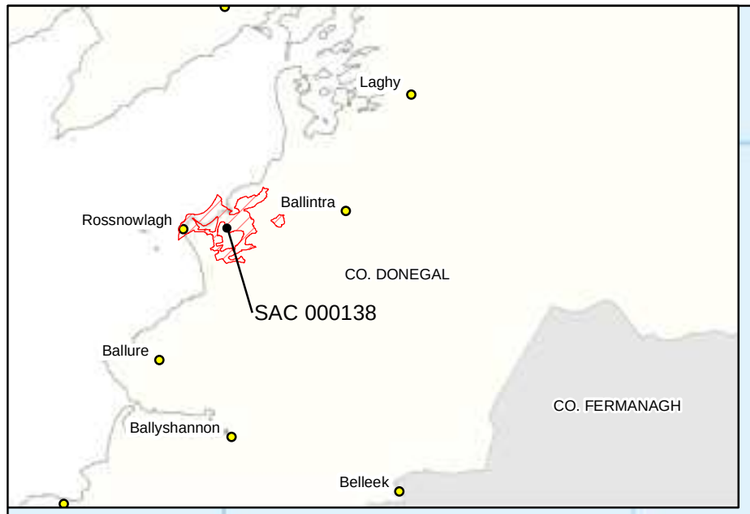
To restore the favourable conservation condition of Coastal lagoons in Durnesh Lough SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable, subject to slight natural variation. Favourable reference area 73.8ha. See map 3	Area calculated from spatial data derived from Oliver (2007). Site code IL079 (Durnesh Lough). See lagoons supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 3	Site IL079 in Oliver (2007). See lagoons supporting document for further details
Salinity regime	Practical salinity units (psu)	Median annual salinity and temporal variation within natural ranges	Durnesh Lough is recorded as an oligohaline lagoon. See lagoons supporting document for further details
Hydrological regime	Metres	Annual water level fluctuations and minima within natural ranges	Maximum depth of Durnesh Lough is recorded as less than 2m. See lagoons supporting document for further details
Barrier: connectivity between lagoon and sea	Permeability	Appropriate hydrological connections between lagoon and sea, including where necessary, appropriate management	Drongawn Lough is a natural sedimentary lagoon with a sand dune barrier and artificial outlet. See lagoons supporting document for further details
Water quality: Chlorophyll *a*	µg/L	Annual median chlorophyll *a* within natural range and less than 5µg/L	Target based on Roden and Oliver (2013). See lagoons supporting document for further details
Water quality: Molybdate Reactive Phosphorus (MRP)	mg/L	Annual median MRP within natural ranges 0.1mg/L	Target based on Roden and Oliver (2013). See lagoons supporting document for further details
Water quality: Dissolved Inorganic Nitrogen (DIN)	mg/L	Annual median DIN within natural ranges and less than 0.15mg/L.	Target based on Roden and Oliver (2013). See lagoons supporting document for further details
Depth of macrophyte colonisation	Metres	Macrophyte colonisation to full depth of lagoon	As the lagoon is less than 2m deep, it is expected that macrophyte colonisation would extend to its full depth. See lagoons supporting document for further details
Typical plant species	Number and m^2	Maintain number and extent of listed lagoonal specialists, subject to natural variation	Species listed in Oliver (2007). See lagoons supporting document for further details
Typical animal species	Number	Maintain listed lagoon specialists, subject to natural variation	Species listed in Oliver (2007). See lagoons supporting document for further details
Negative indicator species	Number and percentage cover	Negative indicator species absent or under control	Low salinity, shallow water and elevated nutrient levels increase the threat of unnatural encroachment by reedbeds. See lagoons supporting document for further details

6410 Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)

To restore the favourable conservation condition of *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) in Durnesh Lough SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	*Molinia* meadows occurs in close association with other grassland habitats as well as wetland habitats including swamp and fen. The Irish semi-natural grasslands survey (ISGS) (O'Neill et al., 2013) recorded 1.02ha of this Annex I habitat at site 1249 (see map 3). Other semi-natural grassland types occur in the SAC and there may be more, as yet unmapped, areas of the Annex I habitat type present
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 3 for mapped area	See note for area above
Vegetation composition: typical species	Number at a representative number of monitoring stops	At least seven positive indicator species present, including one "high quality" species as listed in O'Neill et al. (2013)	List of positive indicator species, including high quality species, identified by O'Neill et al. (2013). Note that purple moor-grass (*Molinia caerulea*) is a positive indicator species, but not necessarily an essential component of the habitat
Vegetation composition: negative indicator species	Percentage at a representative number of monitoring stops	Negative indicator species collectively not more than 20% cover, with cover by an individual species less than 10%	Attribute and target based on O'Neill et al. (2013)
Vegetation composition: non-native species	Percentage at a representative number of monitoring stops	Cover of non-native species not more than 1%	Attribute and target based on O'Neill et al. (2013)
Vegetation composition: moss species	Percentage at a representative number of monitoring stops	Hair mosses (*Polytrichum* spp.) not more than 25% cover	Attribute and target based on O'Neill et al. (2013)
Vegetation structure: woody species and bracken	Percentage at a representative number of monitoring stops	Cover of woody species and bracken (*Pteridium aquilinum*) not more than 5% cover	Attribute and target based on O'Neill et al. (2010)
Vegetation structure: broadleaf herb: grass ratio	Percentage at a representative number of monitoring stops	Broadleaf herb component of vegetation between 40 and 90%	Attribute and target based on O'Neill et al. (2013)
Vegetation structure: sward height	Percentage at a representative number of monitoring stops	At least 30% of sward between 10 and 80cm tall	Attribute and target based on O'Neill et al. (2013)
Physical structure: bare soil	Percentage at a representative number of monitoring stops	Not more than 10% bare soil	Attribute and target based on O'Neill et al. (2013)



Legend

Durnesh Lough SAC 000138

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Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 1:
DURNESH LOUGH SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

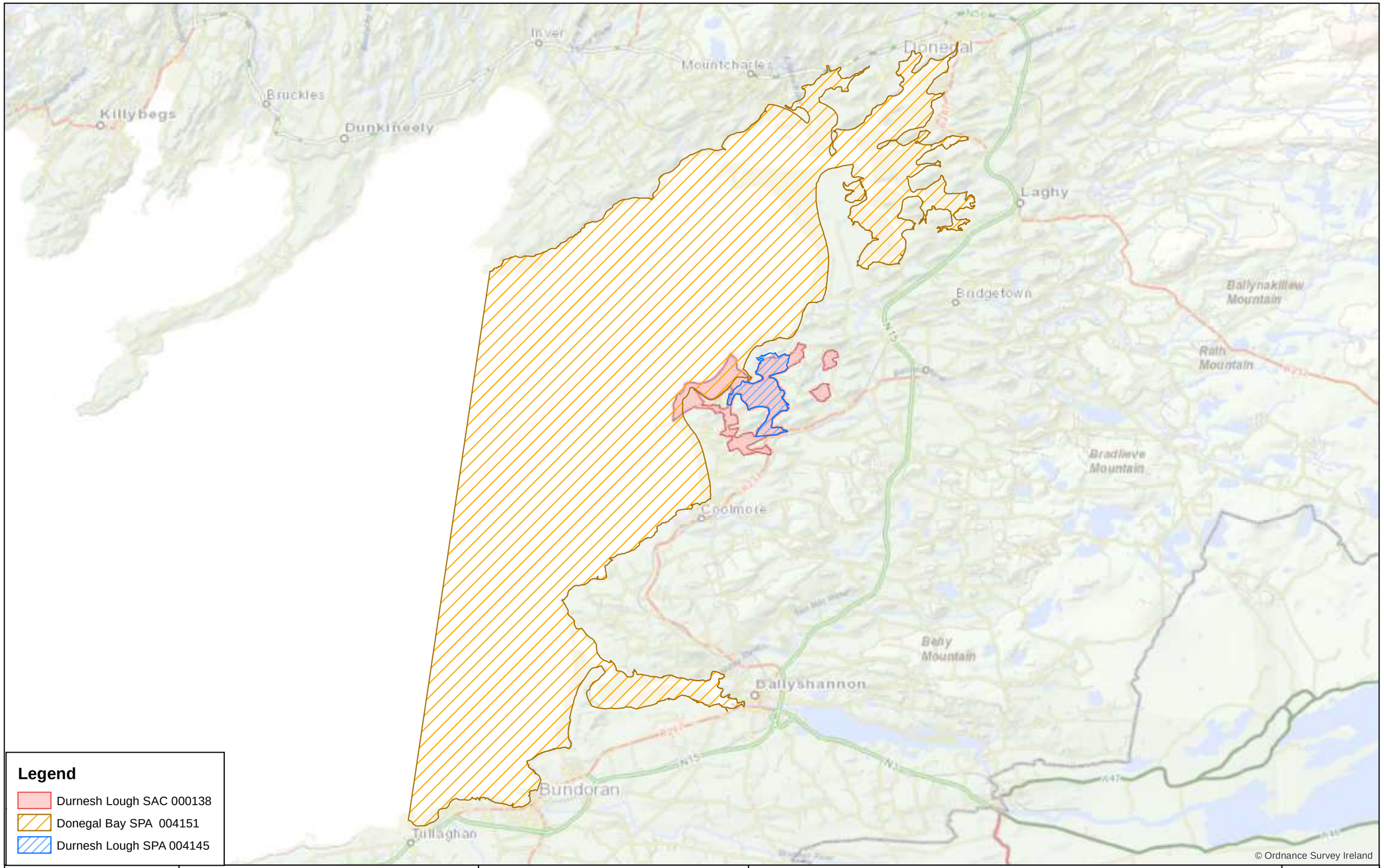
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000138; version 3.
CO. DONEGAL

0 0.15 0.3 0.45 0.6 0.75 km

N

Map Version 1
Date: Aug 2016



An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 2:
DURNESH LOUGH SAC
CONSERVATION OBJECTIVES
ADJACENT / ADJOINING AND
OVERLAPPING DESIGNATIONS
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000138; version 3. SPA 004145; version 3.
SAC 004151; version 3. CO. DONEGAL

0 1 2 3 4 5 km

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision.
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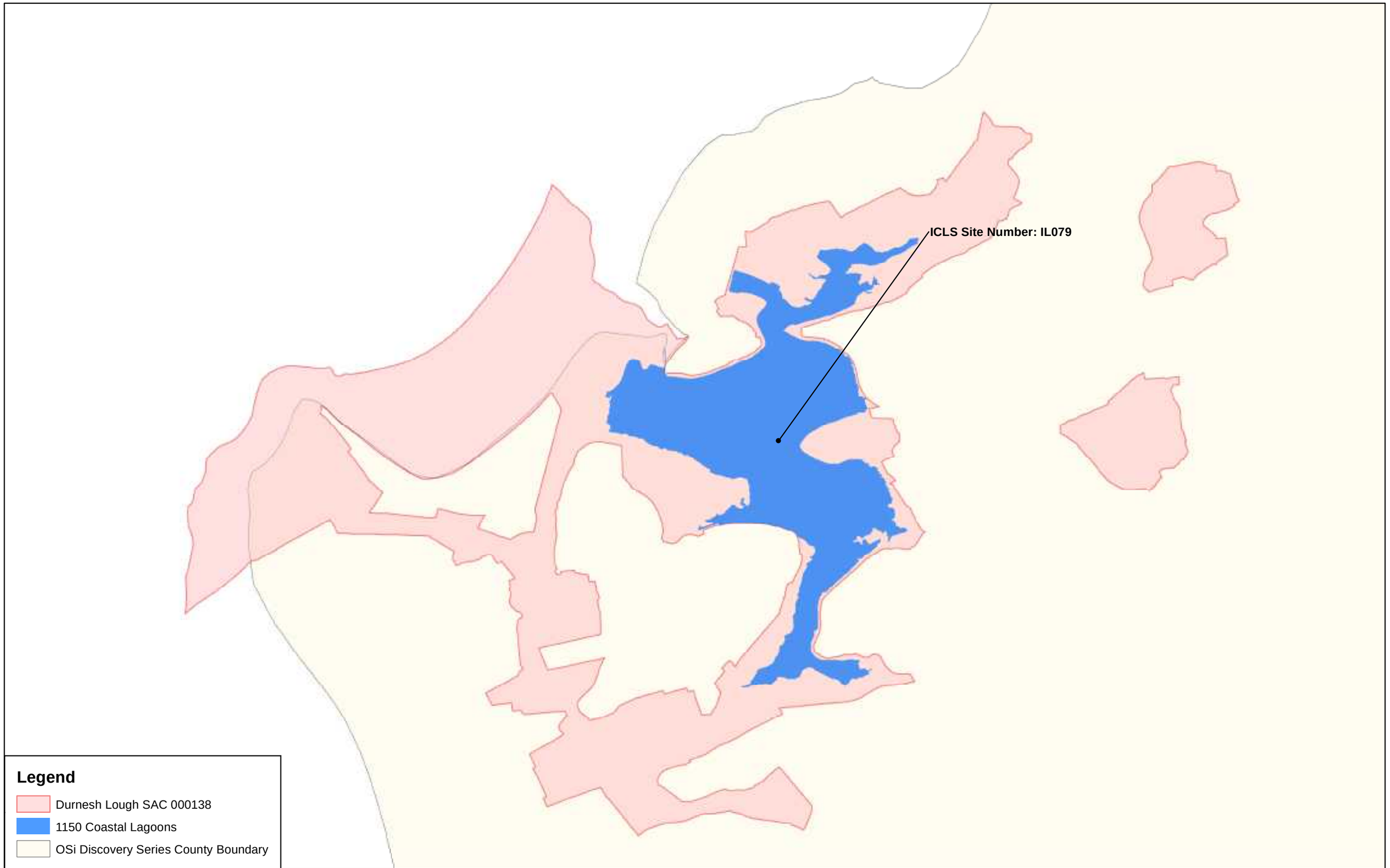
Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Suirbhéarachta Ordonáis na hÉireann Ceadúnas

N

Map Version 1
Date: Aug 2016



Legend

- Durnesh Lough SAC 000138
- 1150 Coastal Lagoons
- OSi Discovery Series County Boundary

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 3:
DURNESH LOUGH SAC
CONSERVATION OBJECTIVES
COASTAL LAGOON HABITAT

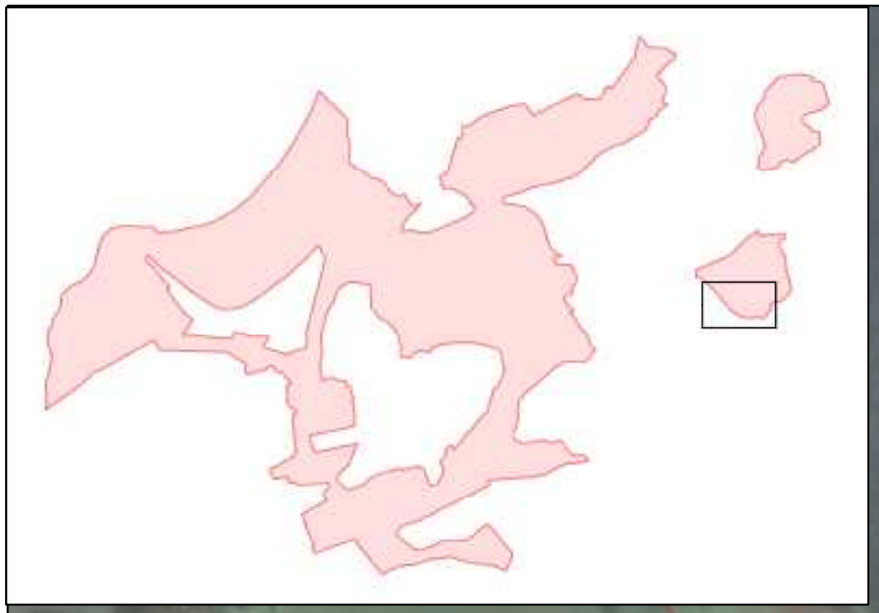
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000138; version 3.
CO. DONEGAL

0 0.15 0.3 0.45 0.6 0.75 km

N

Map Version 1
Date: Aug 2016



ISGS Site ID:1249

Legend

Durnesh Lough SAC 000138

Annex I Grassland Habitats

6410 6410 Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)

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Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 4:
DURNESH LOUGH SAC
CONSERVATION OBJECTIVES
GRASSLAND HABITAT

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000138; version 3.
CO. DONEGAL

0 0.01 0.02 0.03 0.04 0.05 km

N

Map Version 1
Date: Aug 2016

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

St. John's Point SAC 000191

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Arts, Heritage and the Gaeltacht

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Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

000191	St. John's Point SAC
1160	Large shallow inlets and bays
1170	Reefs
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)
6410	*Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)
7230	Alkaline fens
8240	Limestone pavements*
8330	Submerged or partially submerged sea caves

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	2013
Title :	Irish semi-natural grasslands survey 2007-2012
Author :	O'Neill, F.H.; Martin, J.R.; Devaney, F.M.; Perrin, P.M.
Series :	Irish Wildlife Manual No. 78
Year :	2013
Title :	National survey of limestone pavement and associated habitats in Ireland
Author :	Wilson, F.; Fernandez, F.
Series :	Irish Wildlife Manual No. 73
Year :	2014
Title :	Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland, Version 2.0
Author :	Perrin, P.M.; Barron, S.J.; Roche, J.R.; O'Hanrahan, B.
Series :	Irish Wildlife Manual No. 79
Year :	2015
Title :	St. John's Point SAC (site code: 191) Conservation objectives supporting document- marine habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	1988
Title :	The Irish red data book 1. Vascular plants
Author :	Curtis, T.G.F; McGough, H.N.
Series :	Wildlife Service, Dublin
Year :	1997
Title :	The BioMar biotope viewer: a guide to marine habitats, fauna and flora in Britain and Ireland
Author :	Picton, B.E.; Costello, M.J.
Series :	Environmental Science Unit, Trinity College Dublin
Year :	2012
Title :	Intertidal benthic survey and intertidal reef survey of St John's Point SAC
Author :	MERC
Series :	Unpublished report to the Marine Institute and NPWS
Year :	2012
Title :	Subtidal sediment, maerl and subtidal reef survey of St John's Point SAC
Author :	MERC
Series :	Unpublished report to the Marine Institute and NPWS

Spatial data sources

Year :	2005
Title :	OSi Discovery series vector data
GIS Operations :	High Water Mark (HWM) polyline feature class converted into polygon feature class; clipped to SAC boundary. EPA WFD transitional waterbody data erased from extent. Expert opinion used as necessary to resolve any issues arising
Used For :	1160 (map 2)
Year :	Derived 2014
Title :	Coast of Ireland Oblique Imagery Survey 2003
GIS Operations :	Point dataset created from visual inspection of survey
Used For :	8330 (map 2)
Year :	Interpolated 2014
Title :	1994 BioMar Survey; 2012 intertidal and subtidal surveys
GIS Operations :	Polygon feature classes from marine community types base data sub-divided based on interpolation of marine survey data. Expert opinion used as necessary to resolve any issues arising
Used For :	1170, marine community types (maps 3 and 4)
Year :	2005
Title :	OSi Discovery series vector data
GIS Operations :	High water mark (HWM) and low water mark (LWM) polyline feature classes converted into polygon feature classes and combined; EU Annex I Saltmarsh and Coastal data erased out if present
Used For :	Marine community types base data (map 4)
Year :	2013
Title :	Irish Semi-Natural Grassland Survey
GIS Operations :	Dataset clipped to the SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	6210, 6410 (map 5)
Year :	2013
Title :	National Survey of Limestone Pavement and Associated Habitats in Ireland distribution data
GIS Operations :	Dataset clipped to the SAC boundary. EU Annex I grassland data erased out. Expert opinion used as necessary to resolve any issues arising
Used For :	8240 (map 6)

1160 Large shallow inlets and bays

To maintain the favourable conservation condition of Large shallow inlets and bays in St. John's Point SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 2	Habitat area was estimated as 228ha using OSi data and the Transitional Water Body area as defined under the Water Framework Directive
Community extent	Hectares	Maintain the extent of the Maërl-dominated community, subject to natural processes. See map 4	Based on a 1994 BioMar survey (Picton and Costello, 1997) and subtidal survey undertaken in 2012 (MERC, 2012). See marine supporting document for further details
Community structure	Biological composition	Conserve the high quality of the Maërl-dominated community, subject to natural processes	Based on a 1994 BioMar survey (Picton and Costello, 1997) and subtidal survey undertaken in 2012 (MERC, 2012). See marine supporting document for further details
Community distribution	Hectares	Conserve the following community types in a natural condition: Intertidal coarse sediment with enchytraeid oligochaetes and *Scolelepis squamata* community complex; Sand to mixed sediment with polychaetes and *Edwardsia* spp. community complex; Intertidal reef community complex; *Laminaria*-dominated community complex; Subtidal reef with echinoderms and sponges community complex. See map 4	Based on a 1994 BioMar survey (Picton and Costello, 1997) and intertidal and subtidal surveys undertaken in 2012 (MERC, 2012). See marine supporting document for further information

1170 Reefs

To maintain the favourable conservation condition of Reefs in St. John's Point SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 3	Habitat area estimated as 869ha from a 1994 BioMar survey (Picton and Costello, 1997) and subtidal and intertidal surveys undertaken in 2012 (MERC, 2012)
Habitat distribution	Occurrence	The distribution of reefs remains stable, subject to natural processes. See map 3 for mapped distribution	Based on information from a 1994 BioMar survey (Picton and Costello, 1997) and subtidal and intertidal surveys undertaken in 2012 (MERC, 2012). See marine supporting document for further details
Community structure	Biological composition	Conserve the following community types in a natural condition: intertidal reef community complex; *Laminaria*-dominated community complex; Subtidal reef with echinoderms and sponges community complex. See map 4	Reef mapping based on information from a 1994 BioMar survey (Picton and Costello, 1997) and subtidal and intertidal surveys undertaken in 2012 (MERC, 2012). See marine supporting document for further details

6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)

To restore the favourable conservation condition of Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) in St. John's Point SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habital area	Hectares	Area stable or increasing, subject to natural processes	Semi-natural dry grasslands and scrubland facies on calcareous substrates occurs in intimate association with other habitats including limestone pavements and other grassland habitats. The Irish semi-natural grasslands survey (O'Neill et al., 2013) surveyed semi-natural grasslands at St. John's Point and mapped 16.7ha of this habitat within the SAC. See map 5
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 5 for known distribution	See notes for area above
Vegetation composition: typical species	Number at a representative number of monitoring stops	At least seven positive indicator species present, including two "high quality" species	List of positive indicator species, including high quality species, identified by the Irish semi-natural grasslands survey (O'Neill et al., 2013). This document should be consulted for further details
Vegetation composition: negative indicator species	Percentage at a representative number of monitoring stops	Negative indicator species collectively not more than 20% cover, with cover by an individual species not more than 10%	List of negative indicator species identified by O'Neill et al. (2013)
Vegetation composition: non-native species	Percentage at a representative number of monitoring stops	Cover of non-native species not more than 1%	Attribute and target based on O'Neill et al. (2013)
Vegetation composition: woody species and bracken	Percentage at a representative number of monitoring stops	Cover of woody species (except certain listed species) and bracken (*Pteridium aquilinum*) not more than 5% cover	Woody species that can occur above 5% cover include juniper (*Juniperus communis*) and burnet rose (*Rosa spinosissima*). Attribute and target based on O'Neill et al. (2013)
Vegetation structure: broadleaf herb: grass ratio	Percentage at a representative number of monitoring stops	Broadleaf herb component of vegetation between 40 and 90%	Attribute and target based on O'Neill et al. (2013)
Vegetation structure: sward height	Percentage at a representative number of monitoring stops	At least 30% of sward between 5cm and 40cm tall	Attribute and target based on O'Neill et al. (2013)
Vegetation structure: litter	Percentage at a representative number of monitoring stops	Litter cover not more than 25%	Attribute and target based on O'Neill et al. (2013)
Physical structure: bare soil	Percentage at a representative number of monitoring stops	Not more than 10% bare soil	Attribute and target based on O'Neill et al. (2013)
Physical structure: disturbance	Square metres	Area showing signs of serious grazing or other disturbance less than 20m²	Attribute and target based on O'Neill et al. (2013)

6410 Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)

To restore the favourable conservation condition of *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) in St. John's Point SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	*Molinia* meadows on calcareous, peaty or clayey-silt-laden soils occurs in intimate association with other habitats including other grassland habitats and fens. The Irish semi-natural grasslands survey (O'Neill et al., 2013) surveyed semi-natural grasslands at St. John's Point and mapped 13.6ha of this habitat within the SAC. See map 5
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 5 for known distribution	See note for area above
Vegetation composition: typical species	Number at a representative number of monitoring stops	At least seven positive indicator species present, including one "high quality" species as listed in O'Neill et al. (2013)	List of positive indicator species, including high quality species, identified by O'Neill et al. (2013). Note that purple moor-grass (*Molinia caerulea*) is a positive indicator species, but not necessarily an essential component of the habitat
Vegetation composition: negative indicator species	Percentage at a representative number of monitoring stops	Negative indicator species collectively not more than 20% cover, with cover by an individual species less than 10%	List of negative indicator species identified by O'Neill et al. (2013)
Vegetation composition: non-native species	Percentage at a representative number of monitoring stops	Cover of non-native species not more than 1%	List of negative indicator species identified by O'Neill et al. (2013)
Vegetation composition: moss species	Percentage at a representative number of monitoring stops	Hair mosses (*Polytrichum* spp.) not more than 25% cover	Attribute and target based on O'Neill et al. (2013)
Vegetation composition: woody species and bracken	Percentage at a representative number of monitoring stops	Cover of woody species and bracken (*Pteridium aquilinum*) not more than 5% cover	Attribute and target based on O'Neill et al. (2013)
Vegetation structure: broadleaf herb: grass ratio	Percentage at a representative number of monitoring stops	Broadleaf herb component of vegetation between 40 and 90%	Attribute and target based on O'Neill et al. (2013)
Vegetation structure: sward height	Percentage at a representative number of monitoring stops	At least 30% of sward between 10 and 80cm tall	Attribute and target based on O'Neill et al. (2010)
Vegetation structure: litter	Percentage at a representative number of monitoring stops	Litter cover not more than 25%	Attribute and target based on O'Neill et al. (2013)
Physical structure: bare soil	Percentage at a representative number of monitoring stops	Not more than 10% bare soil	Attribute and target based on O'Neill et al. (2013)
Physical structure: disturbance	Square metres	Area showing signs of serious grazing or other disturbance less than 20m²	Attribute and target based on O'Neill et al. (2013)

7230 Alkaline fens

To maintain the favourable conservation condition of Alkaline fens in St. John's Point SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	The extent of this habitat within the SAC is currently unknown. It occurs in association with with wet grasslands (O'Neill et al., 2013) and at lake margins (NPWS internal files)
Habitat distribution	Occurrence	No decline, subject to natural processes	Full distribution of this habitat in this SAC is currently unknown- see note above
Hydrological regime	Metres	Appropriate natural hydrological regimes necessary to support the natural structure and functioning of the habitat	Maintenance of groundwater, surface water flows and water table levels within natural ranges is essential for this wetland habitat
Peat formation	Flood duration	Active peat formation, where appropriate	In order for peat to form, water levels need to be slightly below or above the soil surface for c.90% of the time (Jim Ryan, pers. comm.)
Water quality: nutrients	Water chemistry measures	Appropriate water quality to support the natural structure and functioning of the habitat	Fens receive natural levels of nutrients (e.g. iron, magnesium and calcium) from water sources. However, they are generally poor in nitrogen and phosphorus with the latter tending to be the limiting nutrient
Vegetation structure: typical species	Percentage at a representative number of monitoring stops	Maintain vegetation cover of typical species including brown mosses and vascular plants	
Vegetation composition: trees and shrubs	Percentage in local vicinity	Cover of scattered native trees and shrubs less than 10%	Scrub and trees will tend to invade if fen conditions become drier. Attribute and target based on alkaline fen conservation assessment criteria in Perrin et al. (2014)
Physical structure: disturbed bare ground	Percentage at a representative number of monitoring stops and in local vicinity	Cover of disturbed bare ground less than 10%. Where tufa is present, disturbed bare ground less than 1%	While grazing may be appropriate in this habitat, excessive area of disturbed bare ground may develop due to unsuitable grazing regimes. Attribute and target based on alkaline fen conservation assessment criteria in Perrin et al. (2014)
Physical structure: drainage	Percentage in local vicinity	Area showing signs of drainage as a result of drainage ditches or heavy trampling less than 10%	Attribute and target based on alkaline fen conservation assessment criteria in Perrin et al. (2014)

8240 Limestone pavements

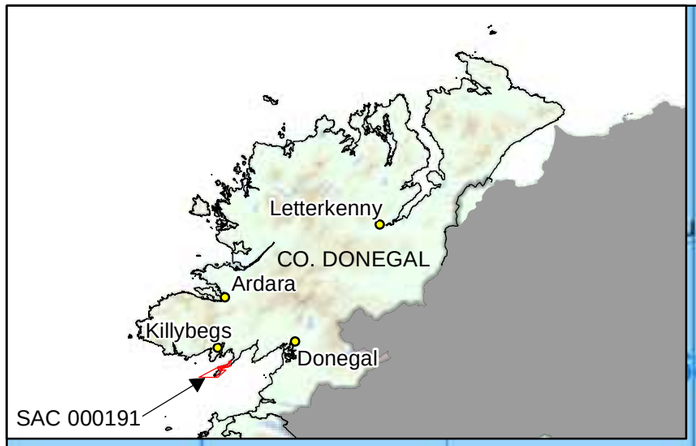
To maintain the favourable conservation condition of Limestone pavements in St. John's Point SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Limestone pavements occurs in intimate association with other habitats in this SAC, particularly grassland habitats (O'Neill et al., 2013). Wilson and Fernandez (2013) mapped the indicative area of limestone pavement, including mosaics with other habitats as 12.7ha (map 6)
Habitat distribution	Occurrence	No decline. Map 6 shows indicative distribution, including mosaics with other habitats	See notes for area above. This SAC is one of the most north-westerly locations for limestone pavements in Ireland
Vegetation composition: typical species	Number at a representative number of monitoring stops	At least seven positive indicator species present	Positive indicator species for exposed and wooded pavement listed in Wilson and Fernandez (2013)
Vegetation composition: bryophyte layer	Percentage at a representative number of monitoring stops	Bryophyte cover at least 50% on wooded pavement	Attribute and target based on Wilson and Fernandez (2013)
Vegetation composition: negative indicator species	Percentage at a representative number of monitoring stops	Collective cover of negative indicator species on exposed pavement not more than 1%	Negative indicator species listed in Wilson and Fernandez (2013). Negative indicator species for wooded pavement overlap with non-native species (below)
Vegetation composition: non-native species	Percentage at a representative number of monitoring stops	Cover of non-native species not more than 1% on exposed pavement; on wooded pavement not more than 10% with no regeneration	Attribute and target based on Wilson and Fernandez (2013)
Vegetation composition: scrub	Percentage at a representative number of monitoring stops	Scrub cover no more than 25% on exposed pavement	Attribute and target based on Wilson and Fernandez (2013)
Vegetation composition: bracken cover	Percentage at a representative number of monitoring stops	Bracken (*Pteridium aquilinum*) cover no more than 10% on exposed pavement	Attribute and target based on Wilson and Fernandez (2013)
Vegetation structure: woodland canopy	Percentage at a representative number of monitoring stops	Canopy cover on wooded pavement at least 30%	Wooded limestone pavement is usually low-growing hazel (*Corylus avellana*) woodland. Atlantic hazel woodland is an internationally rare woodland type. Despite its low stature it is nonetheless an important habitat for woodland species. Attribute and target based on Wilson and Fernandez (2013)
Vegetation structure: dead wood	Occurrence in a representative number of monitoring stops	Sufficient quantity of dead wood on wooded pavement to provide habitat for saproxylic organisms	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem
Physical structure: disturbance	Occurrence in a representative number of monitoring stops	No evidence of grazing pressure on wooded pavement	Attribute and target based on Wilson and Fernandez (2013)
Indicators of local distinctiveness	Occurrence	Indicators of local distinctiveness are maintained	Includes red-data (Curtis and McGough, 1988) and other rare or localised species as well as archaeological and geological features, which often support distinctive species

8330 Submerged or partially submerged sea caves

To maintain the favourable conservation condition of Submerged or partially submerged sea caves in St. John's Point SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Occurrence	The distribution of sea caves occurring in the SAC should remain stable, subject to natural processes. See map 2 for known caves	Sea cave distribution at this site was derived from an oblique aerial survey and therefore only detects the presence of sea caves visible intertidally in the flight path. NB other sea caves may occur within the SAC
Community structure	Biological composition	Conserve the following community type in a natural condition: *Laminaria*-dominated community complex	The presence of this community in some sea caves in the SAC was confirmed during a 1994 BioMar survey (Picton and Costello, 1997)
Community structure	Biological composition	Human activities should occur at levels that do not adversely affect the ecology of sea caves in the SAC	See marine supporting document for further details



Carntuliagh Head
Drumbanan Is.
Drumbanan Hill
Carrickadurris
umanoo Head
Portnoo Island
Portnoo
Newtown
Bally
Pulldugh
Stranahar
Ballysaggart
Friary
Ackle Back
Horse Sound
Ballycroy Hill
Ballycroy
Pound Point
Killultan
Slipway
Cassan Sound
Barley Hill
Point
Connellagh
Lackboy
Saint John's Point
Pointe Charraig an Rois
68
69
70
71
72
73
74
75
78

Legend

St. John's Point SAC 000191

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Department of Arts, Heritage and the Gaeltacht

MAP 1:
ST. JOHN'S POINT SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000191; version 3.01. CO. DONEGAL

0 0.25 0.5 0.75 1 km

N

Map Version 1
Date: Feb 2015

Legend

- St. John's Point SAC 000191
- 1160 Large shallow inlets and bays
- 8330 Submerged or partially submerged sea caves
- OSi Discovery Series County Boundary

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Department of
Arts, Heritage and the Gaeltacht

MAP 2:
ST. JOHN'S POINT SAC
CONSERVATION OBJECTIVES
LARGE SHALLOW INLETS AND BAYS & SEA CAVES

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000191; version 3.01. CO. DONEGAL

0 0.25 0.5 0.75 1 km

N

Map Version 1
Date: Feb 2015

Legend

- St. John's Point SAC 000191
- 1170 Reefs
- OSi Discovery Series County Boundary

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 3:
ST. JOHN'S POINT SAC
CONSERVATION OBJECTIVES
REEFS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000191; version 3.01. CO. DONEGAL

0 0.25 0.5 0.75 1 km

N

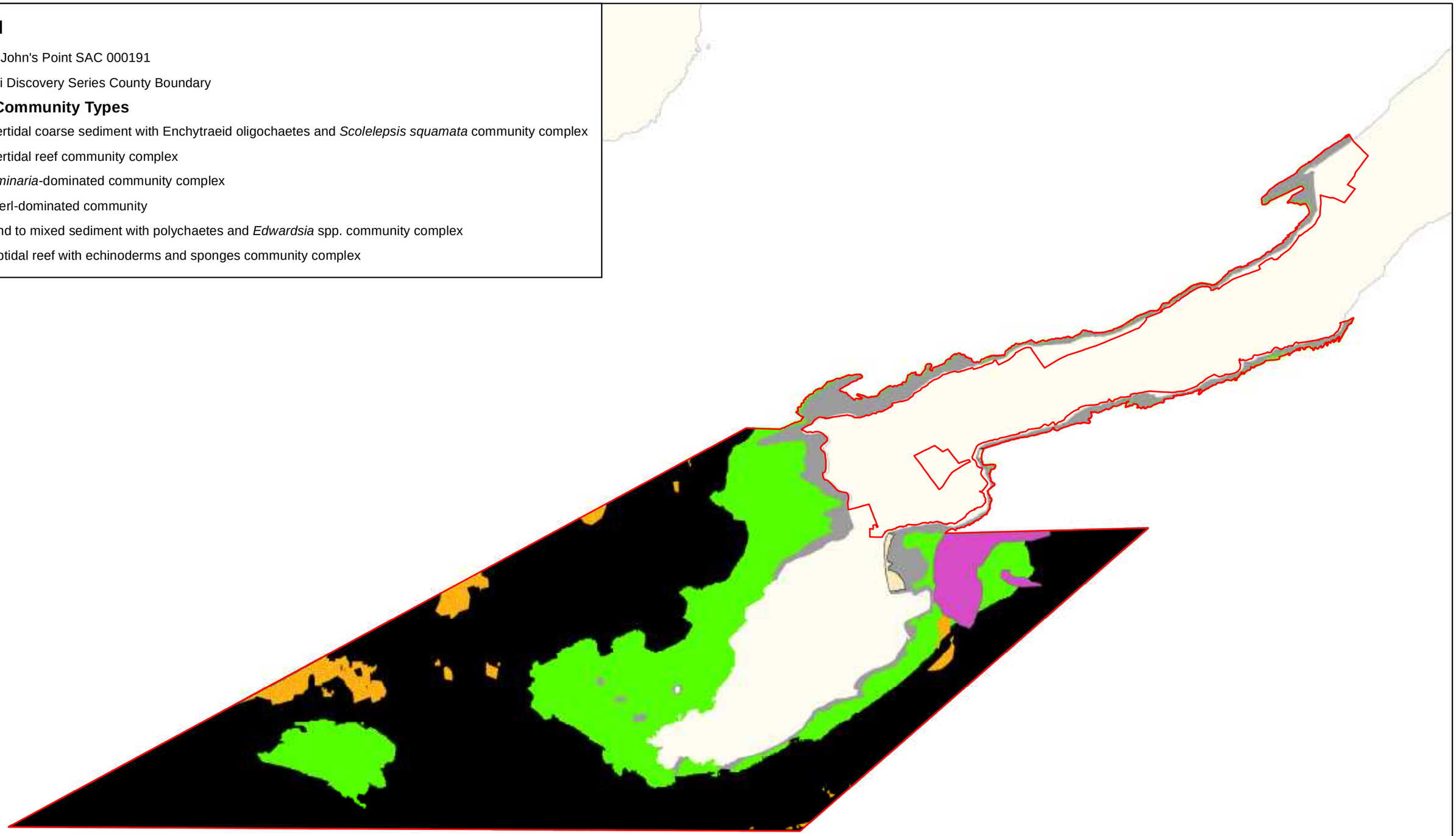
Map Version 1
Date: Feb 2015

Legend

- St. John's Point SAC 000191
- OSi Discovery Series County Boundary

Marine Community Types

- Intertidal coarse sediment with Enchytraeid oligochaetes and *Scolelepsis squamata* community complex
- Intertidal reef community complex
- *Laminaria*-dominated community complex
- Maerl-dominated community
- Sand to mixed sediment with polychaetes and *Edwardsia* spp. community complex
- Subtidal reef with echinoderms and sponges community complex



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MAP 4:
ST. JOHN'S POINT SAC
CONSERVATION OBJECTIVES
MARINE COMMUNITY TYPES

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000191; version 3.01. CO. DONEGAL

0 0.25 0.5 0.75 1 km

N

Map Version 1
Date: Feb 2015

Legend

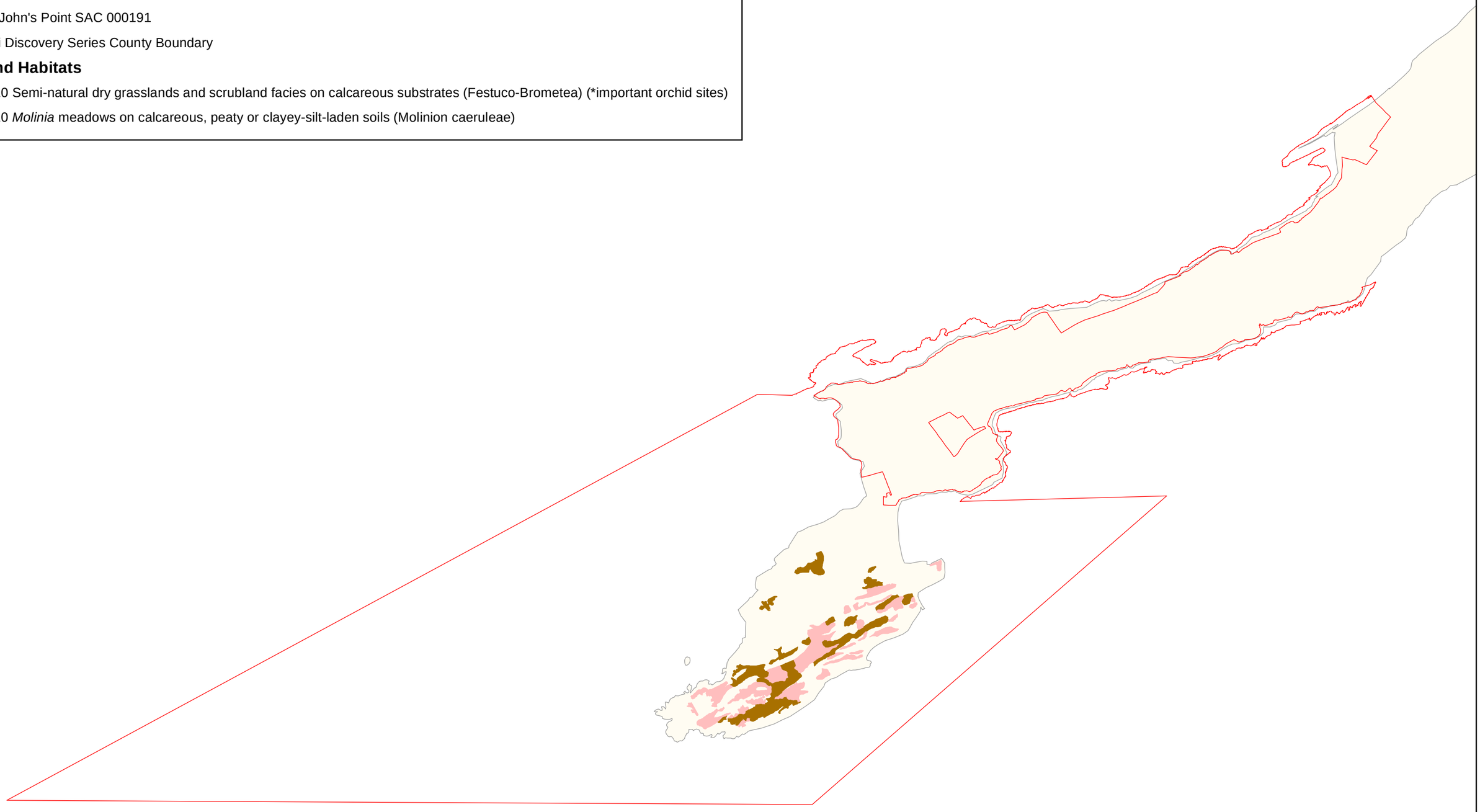
St. John's Point SAC 000191

OSi Discovery Series County Boundary

Grassland Habitats

6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometea) (*important orchid sites)

6410 *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)



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MAP 5:
ST. JOHN'S POINT SAC
CONSERVATION OBJECTIVES
GRASSLAND HABITATS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000191; version 3.01. CO. DONEGAL

0 0.25 0.5 0.75 1 km

N

Map Version 1
Date: Feb 2015

Legend

- St. John's Point SAC 000191
- Potential 8240 *Limestone pavements including associated habitats
- OSi Discovery Series County Boundary

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Department of Arts, Heritage and the Gaeltacht

MAP 6:
ST. JOHN'S POINT SAC
CONSERVATION OBJECTIVES
LIMESTONE PAVEMENTS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000191; version 3.01. CO. DONEGAL

0 0.25 0.5 0.75 1 km

N

Map Version 1
Date: Feb 2015

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Bunduff Lough and Machair/Trawalua/Mullaghmore SAC 000625

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht

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Series Editor: Rebecca Jeffrey
ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

000625	Bunduff Lough and Machair/Trawalua/Mullaghmore SAC
1140	Mudflats and sandflats not covered by seawater at low tide
1160	Large shallow inlets and bays
1170	Reefs
1395	Petalwort *Petalophyllum ralfsii*
2120	Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)
2130	Fixed coastal dunes with herbaceous vegetation (grey dunes)*
21A0	Machairs (* in Ireland)
5130	*Juniperus communis* formations on heaths or calcareous grasslands
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)
7230	Alkaline fens

Please note that this SAC adjoins Streedagh Point Dunes SAC (001680). See map 2. The conservation objectives for this site should be used in conjunction with those for the adjoining site as appropriate.

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	1996
Title :	Biomar survey of Irish machair sites
Author :	Crawford, I.; Bleasdale, A.; Conaghan, J.
Series :	Irish Wildlife Manual No. 3
Year :	2009
Title :	Coastal Monitoring Project 2004-2006
Author :	Ryle, T.; Murray, A.; Connolly, K.; Swann, M.
Series :	Unpublished report to NPWS
Year :	2012
Title :	The Conservation Status of Juniper Formations in Ireland
Author :	Cooper, F.; Stone, R.E.; McEvoy, P.; Wilkins, T.; Reid, N.
Series :	Irish Wildlife Manual No. 63
Year :	2013
Title :	Irish semi-natural grasslands survey 2007-2012
Author :	O'Neill, F.H.; Martin, J.R.; Devaney, F.M.; Perrin, P.M.
Series :	Irish Wildlife Manual No. 78
Year :	2014
Title :	Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland, Version 2.0
Author :	Perrin, P.M.; Barron, S.J.; Roche, J.R.; O'Hanrahan, B.
Series :	Irish Wildlife Manual No. 79
Year :	2015
Title :	Bunduff Lough and Machair/Trawalua/Mullaghmore SAC (site code: 625) Conservation objectives supporting document- coastal habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document
Year :	2015
Title :	Bunduff Lough and Machair/Trawalua/Mullaghmore SAC (site code: 625) Conservation objectives supporting document- marine habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	1997
Title :	The BioMar biotope viewer: a guide to marine habitats, fauna and flora in Britain and Ireland
Author :	Picton, B.E.; Costello, M.J.
Series :	Environmental Science Unit, Trinity College Dublin
Year :	2006
Title :	The vegetation of Irish machair
Author :	Gaynor, K.
Series :	Biology and Environment: Proceedings of the Royal Irish Academy, vol 106B, No. 3: 311-321

Year :	2008
Title :	The phytosociology and conservation value of Irish sand dunes
Author :	Gaynor, K.
Series :	Unpublished PhD thesis, National University of Ireland, Dublin
Year :	2012
Title :	Subtidal sediment and subtidal reef survey of Bunduff Lough and Machair/Trawalua/Mullaghmore SAC
Author :	MERC
Series :	Unpublished report to the Marine Institute and NPWS
Year :	2012
Title :	Intertidal benthic survey and intertidal reef survey of Bunduff Lough and Machair/Trawalua/Mullaghmore SAC
Author :	MERC
Series :	Unpublished report to the Marine Institute and NPWS
Year :	2013
Title :	Conservation of selected legally protected and Red Listed bryophytes in Ireland
Author :	Campbell, C.
Series :	Unpublished Ph.D. Thesis, Trinity College Dublin

Spatial data sources

Year :	Interpolated 2014
Title :	1994 BioMar survey; 2011 subtidal survey; 2012 intertidal survey
GIS Operations :	Polygon feature classes from marine community types base data sub-divided based on interpolation of marine survey data. Expert opinion used as necessary to resolve any issues arising
Used For :	1140, 1170, marine community types (maps 3, 5 and 6)
Year :	2005
Title :	OSi Discovery series vector data
GIS Operations :	High Water Mark (HWM) polyline feature class converted into polygon feature class; clipped to SAC boundary. EPA WFD transitional waterbody data erased from extent. Expert opinion used as necessary to resolve any issues arising
Used For :	1160 (map 4)
Year :	2005
Title :	OSi Discovery series vector data
GIS Operations :	High water mark (HWM) and low water mark (LWM) polyline feature classes converted into polygon feature classes and combined; EU Annex I Saltmarsh and Coastal data erased out if present
Used For :	Marine community types base data (map 6)
Year :	2009
Title :	Coastal Monitoring Project 2004-2006. Version 1
GIS Operations :	QIs selected; clipped to SAC boundary; overlapping regions with Saltmarsh CO data investigated and resolved with expert opinion used
Used For :	2120, 2130, 21A0 (map 7)
Year :	2012
Title :	The conservation status of juniper formations in Ireland
GIS Operations :	Juniper formations polygons clipped to SAC boundary
Used For :	5130 (map 8)
Year :	2015
Title :	NPWS rare and threatened species database
GIS Operations :	Dataset created from spatial references in database records. Expert opinion used as necessary to resolve any issues arising
Used For :	1395 (map 8)

Conservation Objectives for : Bunduff Lough and Machair/Trawalua/Mullaghmore SAC [000625]

1140 Mudflats and sandflats not covered by seawater at low tide

To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in Bunduff Lough and Machair/Trawalua/Mullaghmore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 3	Habitat area was estimated as 144ha using OSi data
Community distribution	Hectares	Conserve the following community type in a natural condition: Fine to very fine sand community complex. See map 6	Based on an intertidal survey undertaken in 2012 (MERC, 2012). See marine supporting document for further information

1160 Large shallow inlets and bays

To maintain the favourable conservation condition of Large shallow inlets and bays in Bunduff Lough and Machair/Trawalua/Mullaghmore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 4	Habitat area was estimated as 3,782ha using OSi data and the Transitional Water Body area as defined under the Water Framework Directive
Community distribution	Hectares	Conserve the following community types in a natural condition: Fine to very fine sand community complex; Intertidal reef community complex; *Laminaria*-dominated community complex. See map 6	Based on a 1994 BioMar survey (Picton and Costello, 1997), 2011 subtidal survey (MERC, 2012) and 2012 intertidal survey (MERC, 2012) and InfoMar data. See marine supporting document for further details

1170 Reefs

To maintain the favourable conservation condition of Reefs in Bunduff Lough and Machair/Trawalua/Mullaghmore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 5	Habitat area estimated as 1,203ha from a 1994 BioMar survey (Picton and Costello, 1997), 2011 subtidal survey (MERC, 2012) and 2012 intertidal survey (MERC, 2012) and InfoMar data
Distribution	Occurrence	The distribution of reefs remains stable, subject to natural processes. See map 5 for mapped distribution	Based on information from a 1994 BioMar survey (Picton and Costello, 1997), 2011 subtidal survey (MERC, 2012) and 2012 intertidal survey (MERC, 2012) and InfoMar data
Community structure	Biological composition	Conserve the following community types in a natural condition: Intertidal reef community complex; *Laminaria*-dominated community complex. See map 6	Reef mapping based on information from a 1994 BioMar survey (Picton and Costello, 1997), 2011 subtidal survey (MERC, 2012) and 2012 intertidal survey (MERC, 2012) and InfoMar data. See marine supporting document for further details

2120 Shifting dunes along the shoreline with Ammophila arenaria (white dunes)

To restore the favourable conservation condition of Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes') in Bunduff Lough and Machair/Trawalua/Mullaghmore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes including erosion and succession. For sub-sites mapped: Bunduff - 5.10ha; Trawalua - 5.03ha. See map 7	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al. 2009). Habitat was mapped at two sub-sites to give a total estimated area of 10.13ha. Habitat is very difficult to measure in view of its dynamic nature. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 7 for known distribution	Based on data from Ryle et al. (2009). This habitat accounts for approximately 4% of the sand dune habitat at Trawalua and 5% at Bunduff. See coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Based on data from Ryle et al. (2009). Dunes are naturally dynamic systems that require continuous supply and circulation of sand. Marram grass (*Ammophila arenaria*) reproduces vegetatively and requires constant accretion of fresh sand to maintain active growth encouraging further accretion. At Bunduff, the mobile dunes are affected by natural erosion, which has been compounded by recreational pressure. A dune management project was implemented at this site and involved the erection sand trap fences (chestnut paling) at the front of the mobile dunes in one area. At Trawalua, the mobile dunes are mainly intact, however in some areas the habitat is eroded. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation composition: plant health of dune grasses	Percentage cover	More than 95% of marram grass (*Ammophila arenaria*) and/or lyme-grass (*Leymus arenarius*) should be healthy (i.e. green plant parts above ground and flowering heads present)	Based on data from Ryle et al. (2009). The CMP noted unhealthy marram grass (*Ammophila arenaria*) patches in eroding mobile dunes at Trawalua. At Bunduff this species had lost condition in places where the natural erosion was compounded by trampling pressure. See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain the presence of species-poor communities dominated by marram grass (*Ammophila arenaria*) and/or lyme-grass (*Leymus arenarius*)	Based on data from Ryle et al. (2009). Both sub-sites support a typical species complement for mobile dunes. See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from Ryle et al. (2009). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. Sea-buckthorn (*Hippophae rhamnoides*) should be absent or effectively controlled. Creeping thistle (*Cirsium arevense*) was recorded in mobile dune at Bunduff. See coastal habitats supporting document for further details

2130 Fixed coastal dunes with herbaceous vegetation (grey dunes)

To restore the favourable conservation condition of Fixed coastal dunes with herbaceous vegetation ('grey dunes') in Bunduff Lough and Machair/Trawalua/Mullaghmore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes including erosion and succession. For sub-sites mapped: Trawalua - 75.18ha; Bunduff - 36.66ha; Mullaghmore - 68.48ha. See map 7	Based on data from Coastal Monitoring Project (CMP) (Ryle et al. 2009). Habitat was surveyed and mapped at two sub-sites and data for the Mullaghmore sub-site was derived from aerial photos (2000) and internal NPWS files to give a total estimated area of 180.32ha. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 7 for known distribution	Based on data from Ryle et al. (2009). Fixed dune habitat is well represented at all sub-sites, with large areas at Trawalua, Mullaghmore and a smaller area at Bunduff. See coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Based on data from Ryle et al. (2009). Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation resulting in increased rates of erosion. At Bunduff, there are some coastal protection measures in the form of sand-trap fencing and marram grass (*Ammophila arenaria*) planting as part of a dune management project. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation structure: bare ground	Percentage cover	Bare ground should not exceed 10% of fixed dune habitat, subject to natural processes	Based on data from Gaynor (2008) and Ryle et al. (2009). At Trawalua, there are a significant number of tracks throughout the fixed dune habitat. The fixed dunes at Bunduff are naturally eroded in some areas particularly on the seaward side. Some small blowouts at the southwestern part of the site were revegetating at the time of the CMP survey. See coastal habitats supporting document for further details
Vegetation structure: sward height	Centimetres	Maintain structural variation within sward	Based on data from Gaynor (2008) and Ryle et al. (2009). All of the sub-sites are grazed to varying extents. At Bunduff the main land use is light to moderate grazing by sheep, cattle and horses. At Trawalua, the fixed dune habitat is lighly grazed and even undergrazed in places. See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain range of sub-communities with typical species listed in Ryle et al. (2009)	Based on data from Gaynor (2008) and Ryle et al. (2009). The fixed dunes at Trawalua support a typical complement of species. At Bunduff, the CMP noted an abundance of orchids (bee orchid (*Ophrys apifera*) and frog orchid (*Coeloglossum viride*)) in the fixed dunes. The parasitic species dodder (*Cuscuta epithymum*) was also abundant at the time of survey. See coastal habitats supporting document for further details

Vegetation composition: negative indicator species (including *Hippophae rhamnoides*)	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from Ryle et al. (2009). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. Sea-buckthorn (*Hippophae rhamnoides*) has never been recorded from this SAC and should remain absent. At Bunduff, ragwort (*Senecio jacobaea*), creeping thistle (*Cirsium arvense*), perennial rye-grass (*Lolium perenne*) and bramble (*Rubus fruticosus*) were recorded by the CMP in fixed dune habitat. At Trawalua, ragwort (*Senecio jacobaea*), perennial rye-grass (*Lolium perenne*) and nettle (*Urtica dioica*) were recorded in fixed dunes. See coastal habitats supporting document for further details
Vegetation composition: scrub/trees	Percentage cover	No more than 5% cover or under control	Based on data from Ryle et al. (2009). At Bunduff, burnet rose (*Rosa pimpinellifolia*) and low-growing juniper (*Juniperus communis*) was recorded in the fixed dune. See coastal habitats supporting document for further details

21A0 Machairs (* in Ireland)

To maintain the favourable conservation condition of Machairs in Bunduff Lough and Machair/Trawalua/Mullaghmore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes including erosion and succession. For sub-sites mapped: Bunduff - 48.82ha; Trawalua - 33.39ha; Mullaghmore - 4.18ha. See map 7	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009). Habitat was surveyed and mapped at two sub-sites and data for the Mullaghmore sub-site was derived from aerial photos (2000) and internal NPWS files to give a total estimated area of 86.38ha. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 7 for known distribution	Based on data from Ryle et al. (2009). Both Bunduff and Trawalua have extensive areas of machair that mostly occur in the flat areas between fixed dune ridges and areas of alkaline marsh/fen. At Bunduff, machair accounts for approximately 50% of the total sand dune habitat. At Trawalua, machair accounts for approximately 30% of the total sand dune resource. See coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation resulting in increased rates of erosion. See coastal habitats supporting document for further details
Physical structure: hydrological and flooding regime	Water table levels; groundwater fluctuations	Maintain natural hydrological regime	Based on data from Ryle et al. (2009), Crawford et al. (1996) and Gaynor (2006). See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details
Vegetation structure: bare ground	Percentage cover	Bare ground should not exceed 10% of machair habitat, subject to natural processes	Based on data from Ryle et al. (2009). At Trawalua there are a significant numbers of tracks through the machair habitat. See coastal habitats supporting document for further details
Vegetation structure: sward height	Centimeters	Maintain structural variation within sward	Based on data from Gaynor (2006, 2008) and Ryle et al. (2009). All of the sub-sites are grazed to varying extents. At Bunduff, the main land use is light to moderate grazing by sheep, cattle and horses. Rabbits (*Oryctolagus cuniculus*) also graze the machair at this site. At Trawalua, the machair habitat is grazed by cattle, sheep and horses and the sward is kept low. See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain range of sub-communities with typical species listed in Ryle et al. (2009)	Based on data from Crawford et al (1996), Gaynor (2006) and Ryle et al. (2009). Notable species include the Annex II liverwort species petalwort (*Petalophyllum ralfsii*), which has been recorded at Bunduff. The areas of wet machair/alkaline fen are very species-rich, often containing 40-50 plant species in an area of 4m². See coastal habitats supporting document for further details as well as the conservation objectives for Alkaline fens (7230) and *Petalophyllum ralfsii* (1395)

Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from Ryle et al. (2009). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. At Bunduff, the CMP recorded ragwort (*Senecio jacobaea*). This species was also recorded at Trawalua, along with perennial rye-grass (*Lolium perenne*). See coastal habitats supporting document for further details
Vegetation composition: scrub/trees	Percentage cover	No more than 5% cover or under control	Based on data from Ryle et al. (2009). At Bunduff, gorse (*Ulex europaeus*) was recorded in the machair as were heath species such as ling (*Calluna vulgaris*). See coastal habitats supporting document for further details
Vegetation composition: bryophytes	Percentage cover	Should always be at least an occasional component of the vegetation	Based on data from Ryle et al. (2009). See coastal habitats supporting document for further details

5130 Juniperus communis formations on heaths or calcareous grasslands

To restore the favourable conservation condition of *Juniperus communis* formations on heaths or calcareous grasslands in Bunduff Lough and Machair/Trawalua/Mullaghmore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Extent of this habitat within the SAC is unknown. Cooper et al. (2012), O'Neill et al. (2013) and NPWS internal files record the habitat at the eastern end of the SAC; however, there may be other formations present. See map 8 for location of sub-site (SO14) surveyed and mapped by Cooper et al. (2012). Juniper plants have been recorded elsewhere, but at least some populations will not be large enough to be classified as formations
Habitat distribution	Occurrence	No decline, subject to natural processes	See notes for area above
Juniper population size	Number per formation	At least 50 plants per formation	To classify as a juniper formation, at least 50 plants should be present (Cooper et al., 2012)
Vegetation composition: typical species	Number per formation	At least 50% of the listed positive indicator species for the relevant vegetation group present	Cooper et al. (2012) lists positive indicator species for five vegetation groups. The formation described by Cooper et al. (2012) falls into vegetation group 4 (*Calluna vulgaris/Erica cinerea* group). See Cooper et al. (2012) for positive indicator species
Vegetation composition: negative indicator species	Occurrence per formation	Negative indicator species, particularly non-native invasive species, absent or under control	Negative indicator species listed by Cooper et al. (2012)
Vegetation structure: cone-bearing plants	Percentage per formation	At least 10% of juniper plants are bearing cones	Attribute and target based on Cooper et al. (2012)
Vegetation structure: seedling recruitment	Percentage per formation	At least 10% of juniper plants are seedlings	Attribute and target based on Cooper et al. (2012)
Vegetation structure: dead juniper	Percentage per formation	Mean percentage of each juniper plant dead less than 10%	Attribute and target based on Cooper et al. (2012)

6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)

To maintain the favourable conservation condition of Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco Brometalia) in Bunduff Lough and Machair/Trawalua/Mullaghmore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Extent of this habitat within the SAC is unknown. It generally occurs in rather small fragmented areas in mosaic with other habitats such as dune and heath habitats (NPWS internal files; Ryle et al. (2009); O'Neill et al. (2013))
Habitat distribution	Occurrence	No decline, subject to natural processes	See note for area above
Vegetation composition: typical species	Number at a representative number of monitoring stops	At least seven positive indicator species present, including two "high quality" species	List of positive indicator species, including high quality species, identified by the Irish semi-natural grasslands survey (O'Neill et al., 2013). This document should be consulted for further details
Vegetation composition: negative indicator species	Percentage at a representative number of monitoring stops	Negative indicator species collectively not more than 20% cover, with cover by an individual species not more than 10%	List of negative indicator species identified by O'Neill et al. (2013)
Vegetation composition: non-native species	Percentage at a representative number of monitoring stops	Cover of non-native species not more than 1%	Attribute and target based on O'Neill et al. (2013)
Vegetation composition: woody species and bracken (*Pteridium aquilinum*)	Percentage at a representative number of monitoring stops	Cover of woody species (except certain listed species) and bracken (*Pteridium aquilinum*) not more than 5% cover	Woody species that can occur above 5% cover includes juniper (*Juniperus communis*). However, cover of this species above 25% may indicate transition to another Annex I habitat: *Juniperus communis* formations (5130). Attribute and target based on O'Neill et al. (2013)
Vegetation structure: broadleaf herb: grass ratio	Percentage at a representative number of monitoring stops	Broadleaf herb component of vegetation between 40 and 90%	Attribute and target based on O'Neill et al. (2013)
Vegetation structure: sward height	Percentage at a representative number of monitoring stops	At least 30% of sward between 5cm and 40cm tall	Attribute and target based on O'Neill et al. (2013)
Vegetation structure: litter	Percentage at a representative number of monitoring stops	Litter cover not more than 25%	Attribute and target based on O'Neill et al. (2013)
Physical structure: bare soil	Percentage at a representative number of monitoring stops	Not more than 10% bare soil	Attribute and target based on O'Neill et al. (2013)
Physical structure: disturbance	Square metres	Area showing signs of serious grazing or other disturbance less than 20m²	Attribute and target based on O'Neill et al. (2013)

7230 Alkaline fens

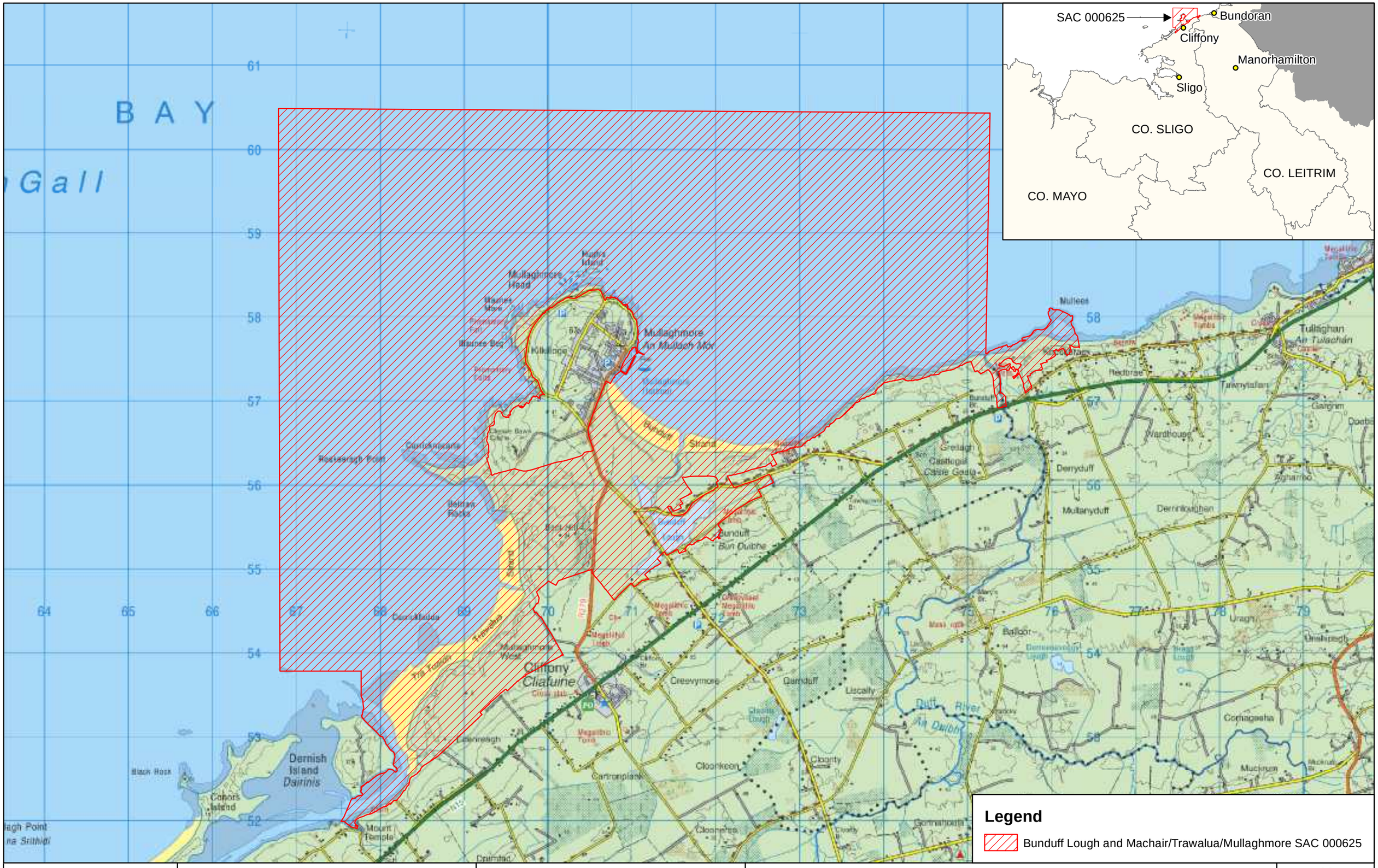
To maintain the favourable conservation condition of Alkaline fens in Bunduff Lough and Machair/Trawalua/Mullaghmore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Extent of this habitat within the SAC is unknown. It occurs in complex mosaic with other habitats, including Annex I habitats such as Machairs (21A0) (Ryle et al., 2009; O'Neill et al., 2013, NPWS internal files)
Habitat distribution	Occurrence	No decline, subject to natural processes	See note for area above. The main area of fen within the SAC occurs immediately to the west and north of Bunduff Lough (NPWS internal files)
Hydrological regime	Metres	Appropriate natural hydrological regimes necessary to support the natural structure and functioning of the habitat	Maintenance of groundwater, surface water flows and water table levels within natural ranges is essential for this wetland habitat
Peat formation	Flood duration	Active peat formation, where appropriate	In order for peat to form, water levels need to be slightly below or above the soil surface for c.90% of the time (Jim Ryan, pers. comm.)
Water quality: nutrients	Water chemistry measures	Appropriate water quality to support the natural structure and functioning of the habitat	Fens receive natural levels of nutrients (e.g. iron, magnesium and calcium) from water sources. However, they are generally poor in nitrogen and phosphorus with the latter tending to be tbe limiting nutrient
Vegetation composition: typical species	Percentage cover	Maintain vegetation cover of typical species including brown mosses and vascular plants	Mosses listed for fen at this SAC include *Campylium stellatum, Scorpidium revolvens, Ctenidium molluscum, Calliergonella cuspidata and Philonotis fontana*. Common vascular plant species include water horsetail (*Equisetum fluviatile*), jointed rush (*Juncus articulatus*), devil's-bit scabious (*Succisa pratensis*), marsh pennywort (*Hydrocotyle vulgaris*), ragged-robin (*Lychnis flos-cuculi*), creeping bent (*Agrostis stolonifera*), grass of parnassus (*Parnassia palustris*), bog pimpernel (*Anagallis tenella*), long-stalked yellow sedge (*Carex lepidocarpa*), black sedge (*C. nigra*), flea sedge (*C. pulicaris*) and dioecious sedge (*C. dioica*). Orchid species are also frequent with common twayblade (*Listera ovata*), common spotted orchid (*Dactylorhiza fuchsii*) and marsh helleborine (*Epipactis palustris*) (NPWS internal files)
Vegetation composition: trees and shrubs	Percentage cover in local vicinity	Cover of scattered native trees and shrubs less than 10%	Scrub and trees will tend to invade if fen conditions become drier. NPWS internal files report scattered multi-stemmed trees over much of the habitat. Attribute and target based on alkaline fen conservation assessment criteria in Perrin et al. (2014)
Physical structure: disturbed bare ground	Percentage cover at a representative number of monitoring stops and in local vicinity	Cover of disturbed bare ground less than 10%. Where tufa is present, disturbed bare ground less than 1%	While grazing may be appropriate in this habitat, excessive area of disturbed bare ground may develop due to unsuitable grazing regimes. Attribute and target based on alkaline fen conservation assessment criteria in Perrin et al. (2014)
Physical structure: drainage	Percentage cover in local vicinity	Areas showing signs of drainage as a result of drainage ditches or heavy trampling less than 10%	Attribute and target based on alkaline fen conservation assessment criteria in Perrin et al. (2014)

1395 Petalwort *Petalophyllum ralfsii*

To maintain the favourable conservation condition of Petalwort in Bunduff Lough and Machair/Trawalua/Mullaghmore SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution of populations	Number and geographical spread of populations	No decline. See map 8 for recorded location	The population at Bunduff occurs on a track at edge of dune slack in slightly blown-out area. Data from NPWS surveys and Campbell (2013)
Population size	Number of individuals	No decline. The population is estimated to be c.210 thalli	Counts of thalli: from mean of number of thalli in three 1 x 1m plots, from three counts between early April 2009 and April 2011: 4.67 thalli per m^2 in 45m^2 = c.210 thalli (Campbell, 2013)
Area of suitable habitat	Hectares	No decline. Area of suitable habitat at Bunduff estimated to be c.0.0045ha	Main area of occupancy, recorded along the track, measured by GPS, is c.55m^2 (Campbell, 2013). Only about 80% of this area is actually suitable habitat for *Petalophyllum ralfsii* i.e. c.44m^2. Two outlying records (0.25m^2 each) from Bunduff were also reported by Lockhart in 1998 and Hodgetts in 2003 giving a total of c.45m^2 of suitable habitat
Hydrological conditions: soil moisture	Occurrence of damp soil conditions	Maintain hydrological conditions so that substrate is kept moist and damp throughout the year, but not subject to prolonged inundation by flooding in winter	*Petalophyllum ralfsii* grows in damp sand. Based on Campbell (2013).
Vegetation: open structure	Height and percentage cover of vegetation	Maintain open, low vegetation, with a high percentage cover of bryophytes (small acrocarps and liverwort turf) and bare ground	*Petalophyllum ralfsii* grows in compacted, sandy ground, maintained by rabbit (*Oryctolagus cuniculus*) and cattle grazing and some occasional vehicle use. Campbell (2013) recorded a mean height of vegetation of 2.9cm, with bryophyte cover c.51-90% and bare ground c.2-10% (based on three 1 x 1m plots measured between 2009 and 2011)



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MAP 1:
BUNDUFF LOUGH AND MACHAIR / TRAWALUA / MULLAGHMORE SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

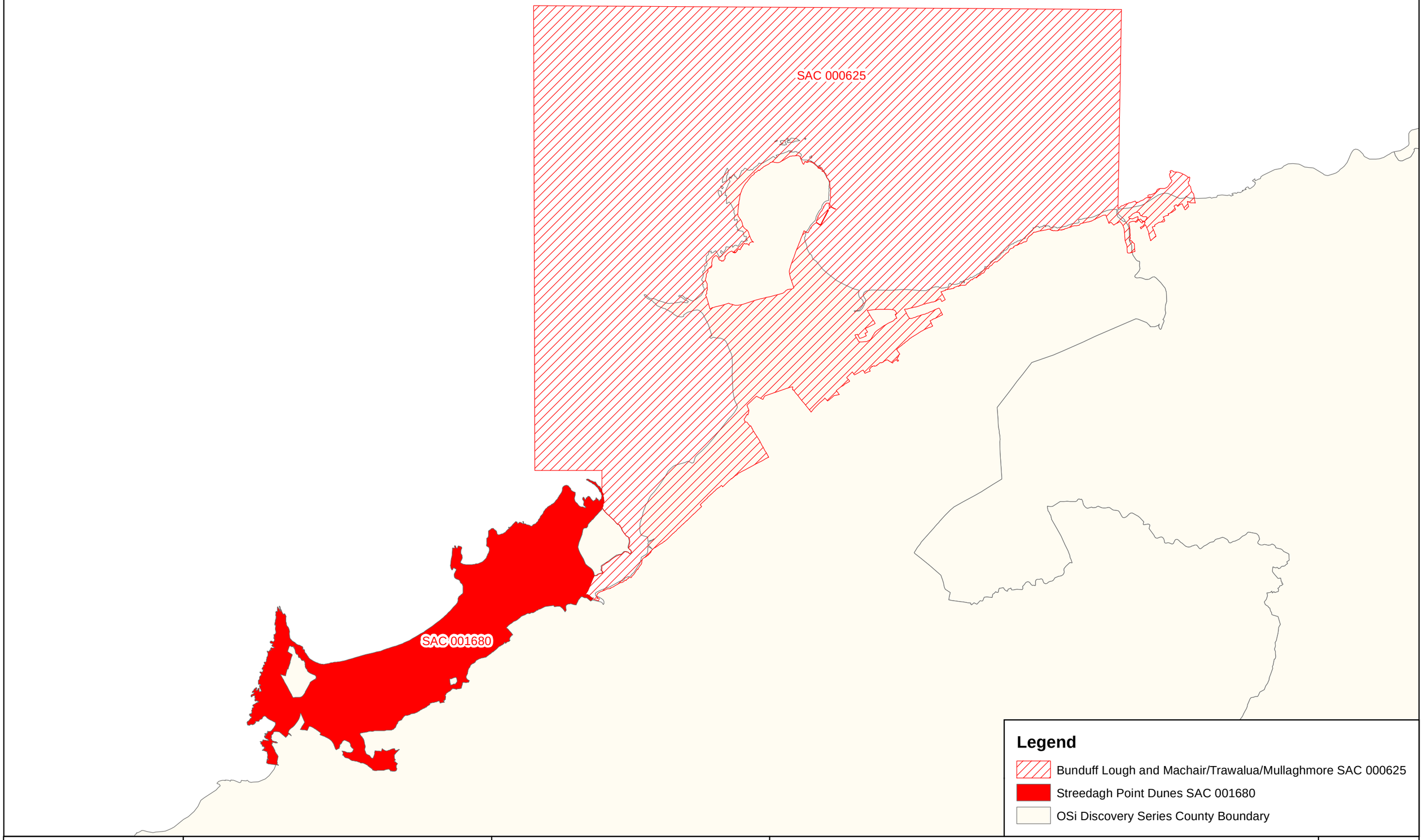
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000625; version 3.01. CO. SLIGO / CO. LEITRIM

0 0.5 1 1.5 2 km

N

Map Version 1
Date: Feb 2015



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Department of Arts, Heritage and the Gaeltacht

MAP 2:
BUNDUFF LOUGH AND MACHAIR / TRAWALUA / MULLAGHMORE SAC
CONSERVATION OBJECTIVES
ADJOINING DESIGNATIONS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000625; version 3.01.
SAC 001680; version 3. CO. SLIGO / CO. LEITRIM

0 1 2 3 km

N

Map Version 1
Date: Feb 2015

Legend

- Bunduff Lough and Machair/Trawalua/Mullaghmore SAC 000625
- 1140 Mudflats and sandflats not covered by sea water at low tide
- OSi Discovery Series County Boundary

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MAP 3:
BUNDUFF LOUGH AND MACHAIR / TRAWALUA / MULLAGHMORE SAC
CONSERVATION OBJECTIVES
TIDAL MUDFLATS AND SANDFLATS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000625; version 3.01. CO. SLIGO / CO. LEITRIM

0 0.5 1 1.5 2 km

N

Map Version 1
Date: Feb 2015

Legend

- Bunduff Lough and Machair/Trawalua/Mullaghmore SAC 000625
- 1160 Large shallow inlets and bays
- OSi Discovery Series County Boundary

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MAP 4:
BUNDUFF LOUGH AND MACHAIR / TRAWALUA / MULLAGHMORE SAC
CONSERVATION OBJECTIVES
LARGE SHALLOW INLETS AND BAYS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000625; version 3.01. CO. SLIGO / CO. LEITRIM

0 0.5 1 1.5 2 km

N

Map Version 1
Date: Feb 2015

Legend

- Bunduff Lough and Machair/Trawalua/Mullaghmore SAC 000625
- 1170 Reefs
- OSi Discovery Series County Boundary

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MAP 5:
BUNDUFF LOUGH AND MACHAIR / TRAWALUA / MULLAGHMORE SAC
CONSERVATION OBJECTIVES
REEFS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000625; version 3.01. CO. SLIGO / CO. LEITRIM

0 0.5 1 1.5 2 km

N

Map Version 1
Date: Feb 2015

Legend

Bunduff Lough and Machair/Trawalua/Mullaghmore SAC 000625

OSi Discovery Series County Boundary

Marine Community Types

Fine to very fine sand community complex

Intertidal reef community complex

Laminaria-dominated community complex

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MAP 6:
BUNDUFF LOUGH AND MACHAIR / TRAWALUA / MULLAGHMORE SAC
CONSERVATION OBJECTIVES
MARINE COMMUNITY TYPES

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000625; version 3.01. CO. SLIGO / CO. LEITRIM

0 0.5 1 1.5 2 km

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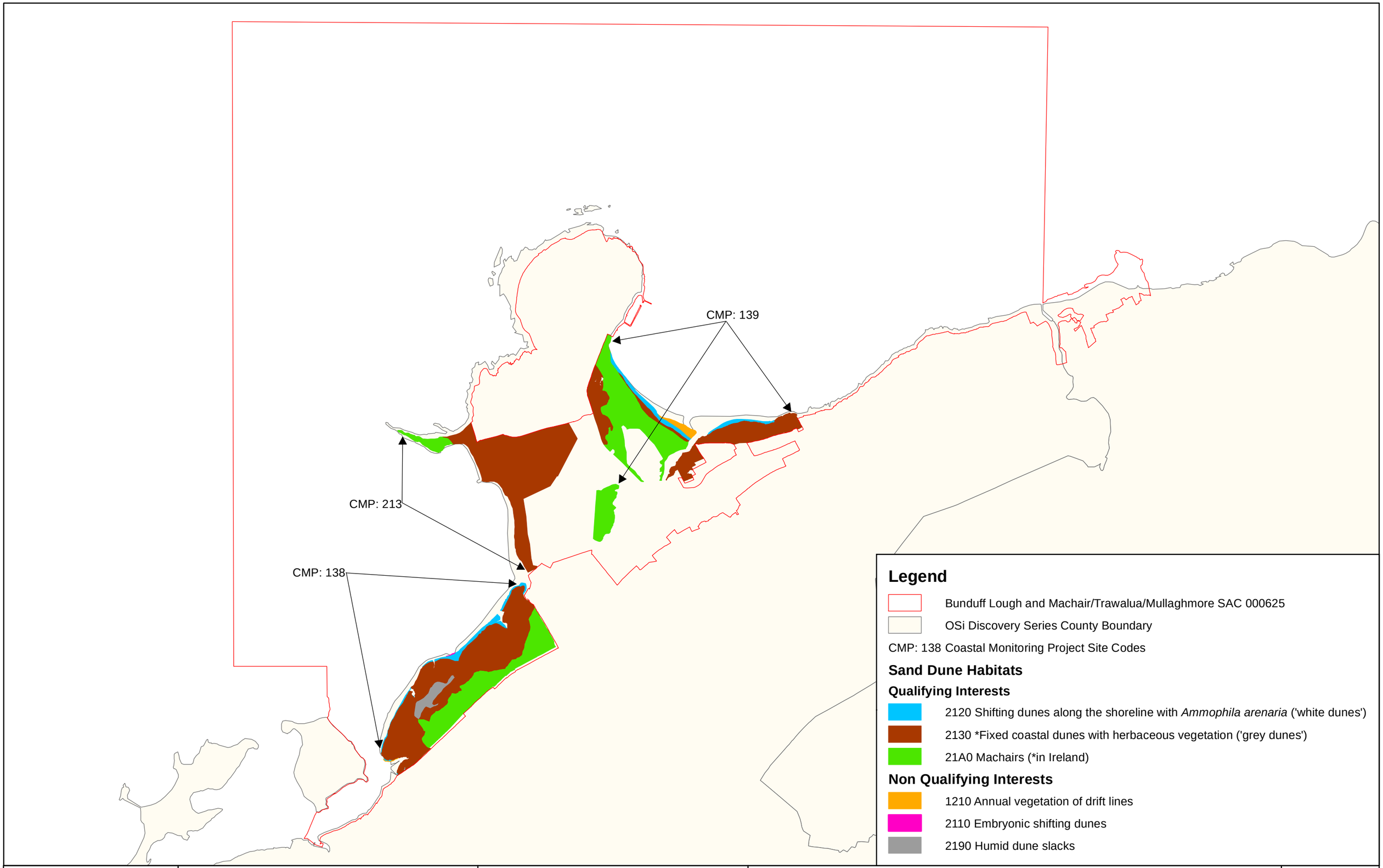
Map Version 1
Date: Feb 2015



Legend

- Bunduff Lough and Machair/Trawalua/Mullaghmore SAC 000625
- OSi Discovery Series County Boundary

CMP: 138 Coastal Monitoring Project Site Codes

Sand Dune Habitats

Qualifying Interests

- 2120 Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes')
- 2130 *Fixed coastal dunes with herbaceous vegetation ('grey dunes')
- 21A0 Machairs (*in Ireland)

Non Qualifying Interests

- 1210 Annual vegetation of drift lines
- 2110 Embryonic shifting dunes
- 2190 Humid dune slacks

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MAP 7:
BUNDUFF LOUGH AND MACHAIR / TRAWALUA / MULLAGHMORE SAC
CONSERVATION OBJECTIVES
SAND DUNE HABITATS

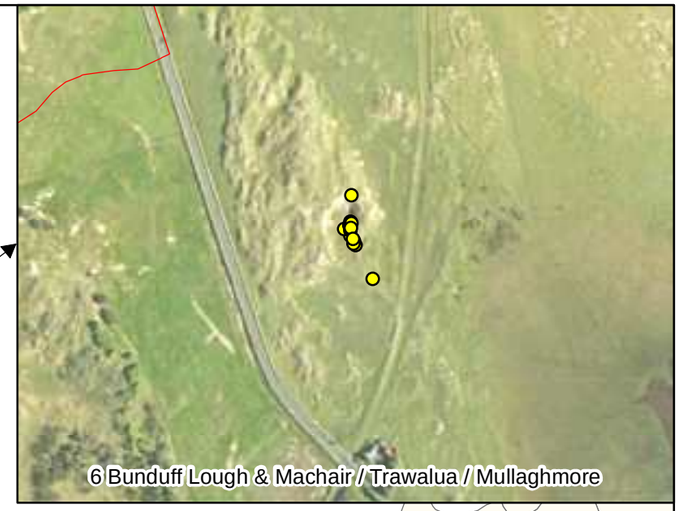
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000625; version 3.01. CO. SLIGO / CO. LEITRIM

0 0.5 1 1.5 2 km

N

Map Version 1
Date: Feb 2015



SO14

Legend

- Bunduff Lough and Machair/Trawalua/Mullaghmore SAC 000625
- 1395 Petalwort - *Petalophyllum ralfsii*
- 5130 *Juniperus communis* formations on heaths or calcareous grasslands
- OSi Discovery Series County Boundary

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Department of Arts, Heritage and the Gaeltacht

MAP 8:
BUNDUFF LOUGH AND MACHAIR / TRAWALUA / MULLAGHMORE SAC
CONSERVATION OBJECTIVES
JUNIPER FORMATIONS & PETALWORT

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000625; version 3.01. CO. SLIGO / CO. LEITRIM

0 0.5 1 1.5 2 km

N

Map Version 1
Date: Feb 2015

Conservation objectives for Lough Oughter Complex SPA [004049]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Objective: To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:

Bird Code	Common Name	Scientific Name
A005	Great Crested Grebe	*Podiceps cristatus*
A038	Whooper Swan	*Cygnus cygnus*
A050	Wigeon	*Anas penelope*

To acknowledge the importance of Ireland's wetlands to wintering waterbirds, “Wetland and Waterbirds” may be included as a Special Conservation Interest for some SPAs that have been designated for wintering waterbirds and that contain a wetland site of significant importance to one

or more of the species of Special Conservation Interest. Thus, a second objective is included as follows:

Objective: To maintain or restore the favourable conservation condition of the wetland habitat at Lough Oughter Complex SPA as a resource for the regularly-occurring migratory waterbirds that utilise it.

Citation: *NPWS (2020) Conservation objectives for Lough Oughter Complex SPA [004049]. Generic Version 7.0. Department of Culture, Heritage and the Gaeltacht.*

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Donegal Bay SPA 004151

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht

National Parks and Wildlife Service,
Department of Arts, Heritage and the Gaeltacht,

7 Ely Place, Dublin 2, Ireland.

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E-mail: nature.conservation@ahg.gov.ie

Citation:
NPWS (2012) Conservation Objectives: Donegal Bay SPA 004151. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

Series Editors: Rebecca Jeffrey & Naomi Kingston
ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

004151 Donegal Bay SPA

A003	Great Northern Diver *Gavia immer*	wintering
A046	Light-bellied Brent Goose *Branta bernicla hrota*	wintering
A065	Common Scoter *Melanitta nigra*	wintering
A144	Sanderling *Calidris alba*	wintering
A999	Wetlands	

Please note that this SPA overlaps with Donegal Bay (Murvagh) SAC (000133), Durnesh Lough SAC (000138) and Lough Melvin SAC (000428) and is adjacent to Lough Eske and Ardnamona Wood SAC (000163). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping and adjacent sites as appropriate.

Supporting documents, relevant reports & publications (listed by date)

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

Title:	Donegal Bay SPA (004151). Conservation objectives supporting document [Version 1]
Year:	2012
Author:	NPWS
Series:	Unpublished Report to NPWS

A003 Great Northern Diver *Gavia immer*

To maintain the favourable conservation condition of Great Northern Diver in Donegal Bay SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by Great Northern Diver, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A046 Light-bellied Brent Goose *Branta bernicla hrota*

To maintain the favourable conservation condition of Light-bellied Brent Goose in Donegal Bay SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by Light-bellied Brent Goose, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A065 Common Scoter *Melanitta nigra*

To maintain the favourable conservation condition of Common Scoter in Donegal Bay SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by Common Scoter, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A144 Sanderling *Calidris alba*

To maintain the favourable conservation condition of Sanderling in Donegal Bay SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by Sanderling, other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A999 Wetlands

To maintain the favourable conservation condition of the wetland habitat in Donegal Bay SPA as a resource for the regularly-occurring migratory waterbirds that utilise it. This is defined by the following attribute and target:

Attribute	Measure	Target	Notes
Wetland habitat area	Hectares	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 10,461ha, other than that occurring from natural patterns of variation	The wetland habitat area was estimated as 10,461ha using OSi data and relevant orthophotographs. For further information see part three of the conservation objectives supporting document

DONEGAL BAY

Bá Dhún na nGall

INVER BAY

Bá Inbhir

Mountcharles

Rossnowlagh

Donegal Bay

Ballyshannon

Bundoran

Kilcar

Killybegs

Rossguill Island

Inver

Dunkineely

Donegal

Letterkenny

Buncrana

Lifford

CO. DONEGAL

SPA 004151

Legend

SPA 004151

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 1:
DONEGAL BAY SPA
CONSERVATION OBJECTIVES
SPA DESIGNATION

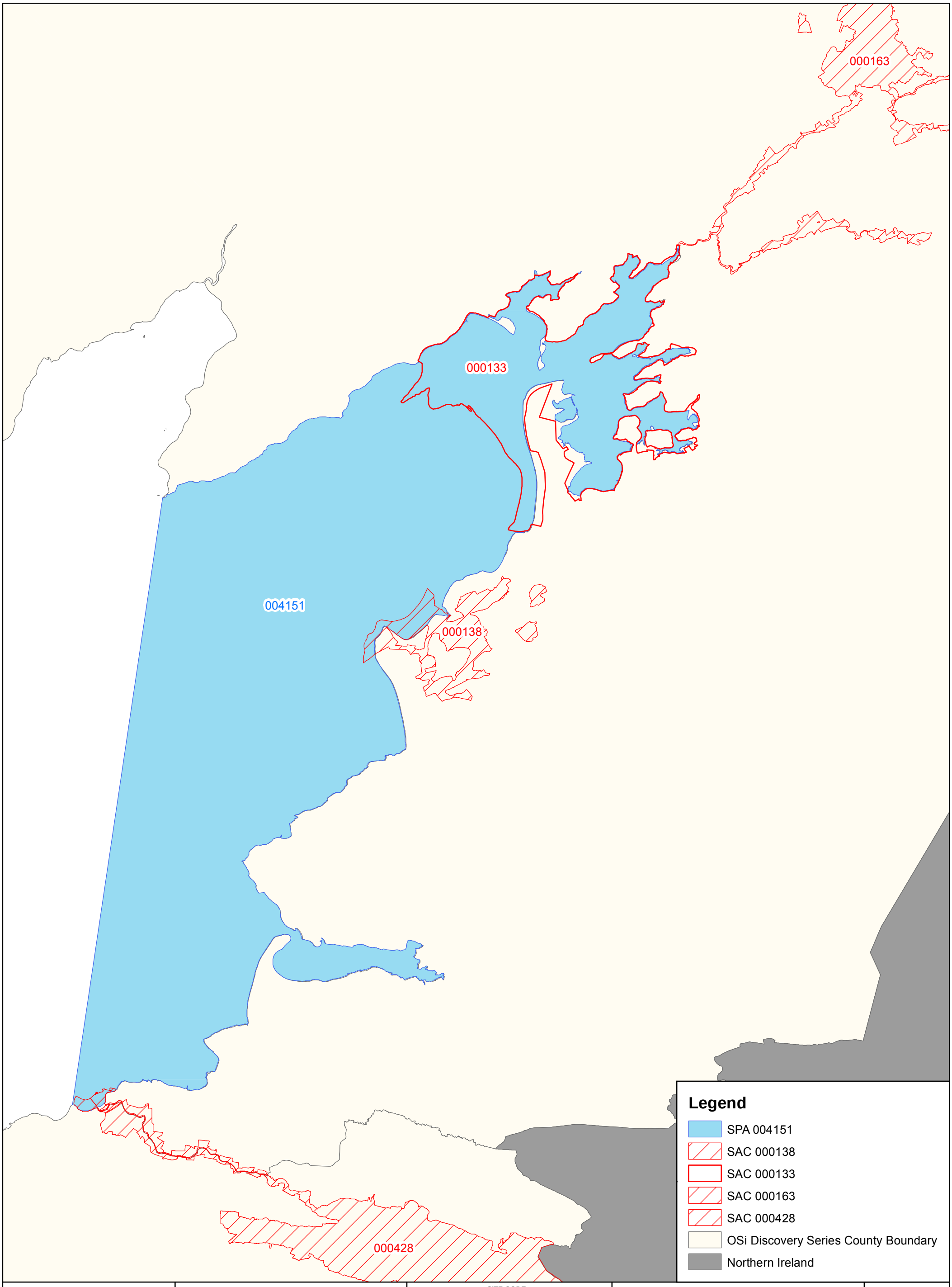
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SPA 004151 Version 2.01

0 1 2 3 km

N

Map Version 1
Date: Dec 2011



An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 2: DONEGAL BAY SPA CONSERVATION OBJECTIVES ADJOINING / OVERLAPPING DESIGNATIONS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SPA 004151 Version 2.01
SAC 000133 Version 1, SAC 000138 Version 1.02,
SAC 000163 Version 1.02, SAC 000428 Version 1.01

0 1.5 3 km

N

Map Version 1
Date: Dec 2011

Appendix B

Nutrient Sensitive Qualifying Interests

Code	Qualifying Interest	Code	Qualifying Interest	Code	Qualifying Interest
A001	Red-throated Diver (Gavia stellata)	A160	Curlew (Numenius arquata)	1130	Estuaries
A003	Great Northern Diver (Gavia immer)	A162	Redshank (Tringa totanus)	1140	Tidal mudflats
A004	Little Grebe (Tachybaptus ruficollis)	A164	Greenshank (Tringa nebularia)	1150	Lagoons*
A005	Great Crested Grebe (Podiceps cristatus)	A169	Turnstone (Arenaria interpres)	1160	Large shallow inlets and bays
A013	Manx Shearwater (Puffinus puffinus)	A179	Black-headed Gull (Larus ridibundus)	1170	Reefs
A014	Storm Petrel (Hydrobates pelagicus)	A182	Common Gull (Larus canus)	1210	Annual vegetation of drift lines
A016	Gannet (Morus bassanus)	A183	Lesser Black-backed Gull (Larus fuscus)	1230	Sea cliffs
A017	Cormorant (Phalacrocorax carbo)	A184	Herring Gull (Larus argentatus)	1310	Salicornia mud
A018	Shag (Phalacrocorax aristotelis)	A188	Kittiwake (Rissa tridactyla)	1330	Atlantic salt meadows
A028	Grey Heron (Ardea cinerea)	A199	Guillemot (Uria aalge)	1410	Mediterranean salt meadows
A037	Bewick's Swan (Cygnus columbianus bewickii)	A200	Razorbill (Alca torda)	1420	Halophilous scrub
A038	Whooper Swan (Cygnus cygnus)	A204	Puffin (Fratercula arctica)	2110	Embryonic shifting dunes
A043	Greylag Goose (Anser anser)	A229	Kingfisher (Alcedo atthis)	2120	Marram dunes (white dunes)
A045	Barnacle Goose (Branta leucopsis)	A395	Greenland White-fronted Goose (Anser albifrons flavirostris)	2130	Fixed dunes (grey dunes)*
A046	Light-bellied Brent Goose (Branta bernicla hrota)	A466	A/A149 Dunlin (Calidris alpina)	2140	Decalcified Empetrum dunes*
A048	Shelduck (Tadorna tadorna)	1013	Geyer's whorl snail (Vertigo geyeri)	2150	Decalcified dune heath*
A050	Wigeon (Anas penelope)	1014	Narrow-mouthed whorl snail (Vertigo angustior)	2170	Dunes with creeping willow
A051	Gadwall (Anas strepera)	1016	Desmoulin's whorl snail (Vertigo moulinsiana)	2190	Dune slack
A052	Teal (Anas crecca)	1024	Kerry Slug (Geomalacus maculosus)	21A0	Machair*
A053	Mallard (Anas platyrhynchos)	1029	Freshwater Pearl Mussel (Margaritifera margaritifera)	3110	Lowland oligotrophic lakes
A054	Pintail (Anas acuta)	1092	White-Clawed Crayfish (Austropotamobius pallipes)	3130	Upland oligotrophic lakes
A056	Shoveler (Anas clypeata)	1095	Sea Lamprey (Petromyzon marinus)	3150	Natural eutrophic lakes
A061	Tufted Duck (Aythya fuligula)	1096	Brook Lamprey (Lampetra planeri)	3160	Dystrophic lakes
A062	Scaup (Aythya marila)	1099	River Lamprey (Lampetra fluviatilis)	3180	Turloughs*

Code	Qualifying Interest	Code	Qualifying Interest	Code	Qualifying Interest
A065	Common Scoter (Melanitta nigra)	1103	Twaite Shad (Alosa fallax fallax)	3260	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation
A067	Goldeneye (Bucephala clangula)	1106	Atlantic Salmon (Salmo salar)	3270	Chenopodium rubri
A069	Red-breasted Merganser (Mergus serrator)	1303	Lesser Horseshoe Bat (Rhinolophus hipposideros)	6130	Calaminarian grassland
A130	Oystercatcher (Haematopus ostralegus)	1349	Bottle-Nosed Dolphin (Tursiops truncatus)	6210	Orchid-rich calcareous grassland*
A137	Ringed Plover (Charadrius hiaticula)	1351	Harbour Porpoise (Phocoena phocoena)	6410	Molinia meadows
A140	Golden Plover (Pluvialis apricaria)	1355	Otter (Lutra lutra)	6430	Hydrophilous tall herb
A141	Grey Plover (Pluvialis squatarola)	1364	Grey Seal (Halichoerus grypus)	7110	Raised bog (active)*
A142	Lapwing (Vanellus vanellus)	1365	Common Seal (Phoca vitulina vitulina)	7120	Degraded raised bogs
A143	Knot (Calidris canutus)	1421	Killarney Fern (Trichomanes speciosum)	7210	Cladium fen*
A144	Sanderling (Calidris alba)	1528	Marsh Saxifrage (Saxifraga hirculus)	7220	Petrifying springs*
A148	Purple Sandpiper (Calidris maritima)	1833	Slender Naiad (Najas flexilis)	7230	Alkaline fens
A156	Black-tailed Godwit (Limosa limosa)	1990	Nore Freshwater Pearl Mussel (Margaritifera durrovensis)	8240	Limestone pavement*
A157	Bar-tailed Godwit (Limosa lapponica)	1110	Sandbanks	8330	Sea caves
				91A0	Old oak woodlands
				91E0	Residual alluvial forests*

Appendix C

EAM Summary Report for 061 Knockataggart WSZ

Irish Water

Lead in Drinking Water Mitigation Plan - EAM

Knockataggart EAM

Issue 4 | 24 January 2022

Job number 257367

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Document Verification

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RYAN-HANLEY

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1 Introduction

This document presents the results of the implementation of the Lead Mitigation Environmental Assessment Methodology (EAM) to assess the impact of dosing Cavan Regional Water Supply Scheme with orthophosphate.

The assessment tracks the orthophosphate dosed drinking water from source (i.e. water treatment plant), through drinking water distribution (i.e. watermains), waste water collection and treatment systems (i.e. wastewater treatment plants and septic tanks) to environmental receptors (i.e. river water, groundwater, lake, and transitional waterbodies). The orthophosphate load that by-passes the wastewater treatment plants (i.e. through leakages and storm overflows) are also included in the assessment.

The assessment methodology is described in full in RPS (2016) *Irish Water – Lead in Drinking Water Mitigation Plan. Environmental Assessment Methodology*.

The assessment includes processing steps in Geographic Information System (GIS) and Excel. The assessment also draws upon the following source data:

- Results of the Plumbosolvency reports by Ryan Hanley.
- Results of pre-processing GIS work to generate regional input files.
- Data relating to Waste Water Treatment Plants (WWTP) from Annual Environmental Reports (AER) and the Environmental Protection agency (EPA) web-based WFD App which is accessed through their Eden Portal.
- Data relating to water body monitoring and characterisation from the EPA WFD App on the 20th January 2022.
- Data relating to rainfall and catchment areas from the OPW Flood Studies Update (FSU) Portal.
- GIS data river segment data providing river flows from the EPA “hydrotool data”.
- Gauge data providing river flows from the EPA web-based HydroNet.

2 Abbreviations & Glossary

- AER – Annual Environmental Report
- Agglomeration- the catchment of the WWTP
- DWWTS -Domestic Waste Water Treatment System
- EAM – Environmental Assessment Method
- ELV – Emission Limit Values
- EPA- Environmental Protection Agency
- FSU – Flood studies Update Portal – website hosted
- GIS – Geographic Information Systems
- GWB- Ground Water Body
- IW – Irish Water
- LWB – Lake Water Body
- OP- Orthophosphate (measured as PO_4-P)
- PE- Population Equivalent or unit per capita loading in waste-water treatment. PE can be considered the estimated number of people required to produce a measured load (eg. of organic matter, water or P) at the WWTP
- RWB – River Water Body
- SAAR - Standard-period Average Annual Rainfall method. The 30%ile flow for the river catchment is calculated using the catchment area and the SAAR value at the catchment outlet point. The area of the total river catchment is calculated using the Water Framework Directive App defined river subbasin GIS layer. The SAAR value is from the OPW FSU portal.
- SWO- Storm Water Overflow
- TP- Total Phosphorus
- TraC – Transitional and Coastal
- WFD- Water Framework Directive
- WSZ - Water Supply Zone
- WWTP – Waste Water Treatment Plant

3 Cavan Regional Water Supply Scheme

Cavan Regional Water Supply Scheme (RWSS) Water Supply Zone (WSZ) (0200PUB0100) is located in County Cavan and supplied by Knockataggart Water Treatment Plan (WTP). Flow from the WTP is distributed to the WSZ through the Killynebber and Billis reservoirs.

The Plumbosolvency Control Plan for the Water Supple Zone (WSZ) recommends universal orthophosphate dosing at the Knockataggart WTP. Figure 1, at the end of this report shows the location of the area to receive Orthophosphate dosed water.

The average flow from Knockataggart WTP is 4,500 m^3/day. Approximately 57% of the flow is accounted for, and this fixed rate for water mains leakage (43%) is assumed across the WSZ. There are an estimated 773 properties across the WSZ that are serviced by Domestic Wastewater Treatment Systems (DWWTS).

Water Supply Zone	**Cavan (0200PUB0100)**
Step 1 – Appropriate Assessment Screening	*To be completed by Ryan Hanley*
Model Assumptions	Concentration and loading units for orthophosphate (as $P0_4$-P) are mg/l P and kg/yr P. Adopted orthophosphate optimum dosing concentration is 0.8 mg/l P. Unaccounted for water from the mains is 43%. Seepage from the mains is distributed evenly across the entire length of the WSZ network. The water consumption per person has been assigned as 125 litres per day in order to calculate the direct discharges to surface water with 2.7 people per household. The water discharge per person is assigned as 105 litres per day for the discharge to DWWTS with 2.7 persons per household. Conversion factor for Total Phosphorus (TP) to Orthophosphate (OP) for WWTP effluent is 0.5. It is assumed there will be no treatment of additional orthophosphate load for WWTPs with secondary, primary or no treatment. For plants with tertiary treatment it is assumed all the additional load will be treated. Where a tertiary plant is in exceedance of its ELV for total phosphate or orthophosphate then the ability of the plant to treat the additional load is confirmed with Irish Water. Where IW indicates a tertiary plant has not remaining treatment capacity it will be assumed the entire additional load is not treated. Where existing monitoring data is not available a surrogate status is derived from the Orthophosphate indicative quality of the waterbody in the following hierarchy:

Water Supply Zone	Cavan (0200PUB0100)
	• Upstream waterbodies • Downstream waterbodies • Adjacent waterbodies of similar hydrological settings • Ecological status of the waterbody. The mid-point of that surrogate indicative quality range is used as baseline concentration.
Step 2 & 3 – Impact on Waste Water Treatment Plant (WWTP) Effluent Concentrations and receiving WBs	This section assesses the influent and effluent P loads and resultant orthophosphate dosages at WWTP within the WSZ before and after dosing. Inputs to and results of the Step 2 assessment for individual WWTP are given in Table 1. Where an agglomeration includes SWOs, discharges from this source are included. Emission Limit Value (ELVs) are assigned for WWTPs to protect the receiving River Waterbodies (RWB) from direct discharges during low flows. Where ELVs are in force these are shown in Table 1. WWTPs that are failing to comply with their ELVs are also indicated. The treatment level and PE of the WWTPs within the agglomerations are as follows; - Bultersbridge - Secondary Treatment PE 420 - Cavan Town – Tertiary Treatment PE 16,603 - Stradone – Secondary Treatment PE 42 A sensitivity analysis was carried out on the conversion between orthophosphate and Total Phosphorus at three factors; 0.4, 0.5 and 0.68. The results of the assessment are presented in Table 1.
Step 4 - Subsurface pathways	The loading from mains leakage is 1,956 m^3/d (571 kg/yr P). Approximately 443 kg/yr P of the load is attenuated along the flowpaths. The hydraulic loading from the DWWTS is 81 m^3/d (64 kg/yr P). Approximately 62 kg/yr P of the load is attenuated along the flowpaths. Flow monitoring gauges are available for four of the ten waterbodies within the assessment area. The river flows for ungauged waterbodies are established from Hydrotool data or, if that is not available, using the using the Area-Standard-period Average Annual Rainfall (SAAR) method. Baseline orthophosphate monitoring data and associated thresholds are available for all ten RWBs. Orthophosphate drinking water dosing does not lead to a deterioration in any RWB status from subsurface and near surface pathways.
Step 5 and 6 - Combined Impact from direct and diffuse sources on River Waterbodies (RWB)	This section assesses the combined impact as a result of increased orthophosphate load from WWTP discharges (Steps 2 & 3), seepage from mains and DWWTS and cumulative impacts from other drinking water dosing areas on River Waterbodies (RWBs). The increase in orthophosphate concentrations in the RWBs as a result of the P drinking water dosing is shown in Table 2.

Water Supply Zone	Cavan (0200PUB0100)
	Figure 2 illustrates the scale of orthophosphate loading to the receiving waterbodies from mains leakage, DWWTS and direct discharges from WWTP and SWOs and upstream dosing areas. This illustrates that a significant proportion of the loads come from mains seepage through the near surface pathways. In the Erne_080, Annalee_080 and Annalee_100 RWBs a large proportion of the load is also from upstream dosing areas, Cootehill and Lough Egish. For all rivers, leakage (via GW, NS and Preferential) is the most important local source of increases in load following orthophosphate dosing; however, inputs from Upstream of Annalee_80 carried through to Annalee_100 and Erne_80 are also important. Figure 3 presents the total loading to the drinking water dosing area from the main sources and illustrates how much of the loading is attenuated in the subsurface, treated in WWTPs and ultimately how much is transported to the receiving RWBs. This illustrated that the mains leakage and primary WWTP discharges account for the largest proportion of load and a large proportion of both the mains leakage and primary discharge loads are attenuated. Direct discharges (including SWOs) from WWTPs are combined with diffuse discharges at the following receiving waterbodies and tracked downstream from that point: • Bultersbridge WWTP - Annalee_100 • Cavan Town WWTP- Cavan_010 • Stradone WWTP - Stradone_020 The remainder receive diffuse discharge only. Orthophosphate drinking water dosing does not lead to a deterioration in any RWB from direct and diffuse sources.
Step 5 and 6 - Combined Impact through subsurface and surface pathways on Groundwater Waterbodies (GWB)	The increase in orthophosphate concentrations in the Groundwater Waterbodies (GWBs) as a result of the P drinking water dosing is shown in Table 3. Monitoring data is not available for the two GWB, Cavan and Kilashandra. The increase in concentration as a result of the drinking water dosing with orthophosphate does not cause a deterioration in the status of either GWB.
Step 5 and 6 - Combined Impact from direct and diffuse sources on Lakes within the Water Supply Zone	The increase in orthophosphate as a result of drinking water dosing is adopted as Total Phosphorus (TP) to assess the potential impact on lakes. The increase in concentrations in the Lake Waterbody (LWB) as a result of the drinking water dosing is shown in Table 4. Monitoring data is not available for any of the three LWBs.

Water Supply Zone	Cavan (0200PUB0100)
	The assessment indicates that the loading contribution to lakes is insignificant and does not cause a deterioration in status.
Step 5 and 6 - Combined Impact from direct and diffuse sources on Transitional and Coastal Waterbodies	The increase in orthophosphate concentrations in the downstream Transitional Waterbodies and Coastal (TraC) Waterbodies as a result of drinking water dosing is shown in Table 5. Baseline orthophosphate monitoring is available for Erne Estuary and Donegal Bay (Erne) summer. There is not enough data for classification of Donegal Bay (Erne)_winter, which is based on a surrogate of Donegal Bay (Erne) winter. The drinking water dosing with orthophosphate does not deteriorate the status of either TraC waterbody for both the summer and winter seasons.
Step 5 and 6 Cumulative Assessment of impact from all EAMs within the catchment on: **Transitional and Coastal Water Bodies** **AND** **Protected Waterbodies**	<u>Step 5 and 6 Cumulative Assessment of impact from all EAMs within catchment on Transitional and Coastal Waterbodies</u> A cumulative assessment was undertaken to assess the impact on TraC WBs from all the contributing EAMs. The assessment is carried out on a catchment scale. **<u>Erne</u>** The following EAMs are within the Erne catchment and contribute to the same TraC WBs as Knockataggart, see Figure 4: 069. Lough Egish 095. Bundoran 125. Crosses 147. Ballyshannon 195. Cootehill 258. Carnroe (Clones) The increase in orthophosphate concentrations in the downstream TraC WBs as a result of the drinking water dosing of all seven EAMs with orthophosphate is shown in Table 6. There is no deterioration in waterbody status as a result of the cumulative assessment. <u>Step 5 and 6 Cumulative Assessment of impact from EAMs on downstream Protected Waterbodies</u> The cumulative load from this dosing area and any upstream dosing area was tracked downstream to determine the potential concentration increase in any waterbodies which are Special Areas of Conservation (SAC). The increase in orthophosphate concentrations in the waterbodies (WBs) as a result of the P drinking water dosing is shown in Table 7 and Table 8. The results show there is no deterioration in WB status downstream of the EAM. The results that there will be no

Water Supply Zone	Cavan (0200PUB0100)
	discernible increase (i.e. above 0.00125mg/l) in any of the downstream SAC RWBs.
Conclusions	**Red, Amber, Green (RAG) STATUS: EAM Result - Green** The purpose of the RAG status is to indicate the waterbodies that are failing the EAM assessment on a map. Any waterbodies failing the EAM model will be marked as **Amber** in the interim while further analysis is being completed, where the further analysis confirms the water body is failing the water body will be coloured **Red**. If the EAM indicates there will not be a deterioration in the waterbody status as a result of drinking water dosing it will remain **Green**. A map of the RAG status of waterbodies is presented in Figure 4.
Recommendation	No recommendations.

Table 1: Increased loading/concentration from WWTPs due to dosing of drinking water – Dosing rate = 0.8 mg/l

Agglomeration and Discharge Type	Effluent Treatment level	WWDL ELV AER (2017) Compliance	Primary Discharge Receiving WB		Annual average TP Load kg/yr	OP Concentration (mg/l P) TP – OP Conversion factor varied for sensitivity analysis (40%, 50%, 68%)		
						0.5	0.4	0.68
Butlersbridge Primary Discharge	Secondary	No ELVs	Annalee_100	Pre-Dosing	143	3.74	2.99	5.08
				Post Dosing	161	4.21	3.36	5.72
Cavan Town Primary Discharge	Tertiary	Total Phosphate 2.0 mg/l - Compliant Orthophosphate 0.13mg/l – Compliant	Cavan_010	Pre-Dosing	146	0.04	0.08	0.13
				Post Dosing	146	0.04	0.08	0.13
Cavan Town SWOs (7 No.)				Pre-Dosing	140	0.18	0.36	0.62
				Post Dosing	159	0.20	0.41	0.70
Stradone Primary Discharge	Secondary	No ELVs	Stradone_020	Pre-Dosing	14	3.74	2.99	5.08
				Post Dosing	14	3.77	3.02	5.13
Stradone SWOs (1 No.)				Pre-Dosing	1	1.14	0.91	1.55
				Post Dosing	1	1.15	0.92	1.56

Table 2: Orthophosphate concentrations in river waterbodies following dosing of drinking water

Name	**EU_CD**	**Indicative Quality** *Surrogate Status in italic*	**Baseline Conc. (mg/l P)**	**75% of status threshold (mg/l P)**	**Cumulative load (kg/yr P)**	**Modelled dosing conc. (mg/l P)**	**Potential conc. following dosing (mg/l P)**
Annalee_080	IE_NW_36A021000	Good	0.0348	0.0325	111.9	0.0002	0.0350*
Annalee_100	IE_NW_36A021400	Poor	0.0604	0.0868	219.5	0.0003	0.0607
Cavan_010	IE_NW_36C020300	Poor	0.0622	0.0868	92.5	0.0019	0.0641
Cavan_020	IE_NW_36C020400	Poor	0.0749	0.0868	96.7	0.0016	0.0765
Erne_080	IE_NW_36E011300	Moderate	0.0425	0.0508	219.5	0.0002	0.0427
Laragh_010	IE_NW_36L010030	High	0.0185	0.0188	5.3	0.0002	0.0188
Laragh_020	IE_NW_36L010080	Good	0.0252	0.0325	8.8	0.0002	0.0255
Laragh_030	IE_NW_36L010400	Good	0.0303	0.0325	14.8	0.0002	0.0305
Stradone_010	IE_NW_36S020075	Good	0.0304	0.0325	1.4	0.0001	0.0305
Stradone_020	IE_NW_36S020200	High	0.0249	0.0188	5.6	0.0003	0.0252*

*Baseline concentration >75% threshold but concentration increase is below significance threshold (0.00125mg/l)

Table 3: Orthophosphate concentrations in groundwater waterbodies following dosing of drinking water

Name	**EU_CD**	**Indicative Quality** *Surrogate Status in italic*	**Baseline Conc. used in calculation (mg/l P)**	**75% of status threshold (mg/l P)**	**Cumulative load (kg/yr P)**	**Modelled dosing conc. (mg/l P)**	**Potential Baseline conc. following dosing (mg/l P)**
Cavan	IE_NW_G_061	*Good*	0.0175	0.0263	3.3	0.00003	0.0175
Kilashandra	IE_NW_G_062	*Good*	0.0175	0.0263	8.8	0.0007	0.0182

Table 4: Total phosphorus concentrations in lake waterbodies following dosing of drinking water

Name	**EU_CD**	**Indicative Quality** *Surrogate Status in italic*	**Baseline conc used in calculation (mg/l P)**	**75% of status threshold (mg/l P)**	**Cumulative load (kg/yr P)**	**Modelled dosing conc. (mg/l P)**	**Potential Baseline conc. following dosing (mg/l P)**
Beaghy	IE_NW_36_554	*Good*	0.0180	0.0213	6.5	0.0005	0.0185
Darrygid	IE_NW_36_580	*Good*	0.0180	0.0213	96.7	0.0016	0.0196
Coalpit	IE_NW_36_633	*Good*	0.0180	0.0213	96.7	0.0016	0.0196

Table 5: Orthophosphate concentrations in transitional waterbodies and coastal waterbodies following dosing of drinking water

Name	**EU_CD**	**Season**	**Indicative Quality** *Surrogate Status in italic*	**Baseline conc (mg/l P)**	**75% of status threshold (mg/l P)**	**Cumulative load (kg/yr P)**	**Modelled dosing conc. (mg/l P)**	**Potential conc. following dosing (mg/l P)**
Erne Estuary	IE_NW_030_0100	Summer	High	0.0230	0.0188	219.5	0.0001	0.0231*
		Winter	Good	0.0290	0.0363	219.5	0.0001	0.0291
Donegal Bay (Erne)	IE_NW_010_0000	Summer	High	0.0025	0.0188	219.5	0.0001	0.0026
		Winter	*High*	0.0125	0.0188	219.5	0.0001	0.0126

*Baseline concentration >75% threshold but concentration increase is below significance threshold (0.00125mg/l)

Table 6: Cumulative assessment of orthophosphate concentrations in transitional and coastal water bodies following dosing of drinking water

Name	**EU_CD**	**Season**	**Indicative Quality** *Surrogate Status in italic*	**Baseline Conc.(mg/l P)**	**75% of status threshold (mg/l P)**	**Load, (kg/yr P) from current EAM**	**Cumulative load (kg/yr P)**	**Modelled dosing conc. (mg/l P)**	**Potential conc. following dosing (mg/l P)**
Erne Estuary	IE_NW_030_0100	Summer	High	0.0230	0.0188	219.5	443.8	0.0001	0.0231*
		Winter	Good	0.0290	0.0363	219.5	443.8	0.0001	0.0291
Donegal Bay (Erne)	IE_NW_010_0000	Summer	High	0.0025	0.0188	219.5	769.8	0.0002	0.0027
		Winter	*High*	0.0125	0.0188	219.5	769.8	0.0002	0.0127

*Baseline concentration >75% threshold but concentration increase is below significance threshold (0.00125mg/l)

Table 7: Orthophosphate concentrations in downstream protected waterbodies following dosing of drinking water

Name	**EU_CD**	**Indicative Quality** *Surrogate Status in italic*	**Baseline Conc. (mg/l P)**	**75% of status threshold (mg/l P)**	**Cumulative load to SW (kg/yr P)**	**Modelled dosing conc. (mg/l P)**	**Potential conc. following dosing (mg/l P)**
Annalee_090	IE_NW_36A021150	Good	0.0340	0.0325	112.0	0.0002	0.0342*
Erne_090	IE_NW_36E011410	Moderate	0.0506	0.0508	258.0	0.0002	0.0508
Erne_100	IE_NW_36E011440	Moderate	0.0352	0.0508	258.0	0.0002	0.0354
Erne_110	UKGBNI1NW363604081	Moderate	0.0391	0.0508	258.0	0.0002	0.0393
Upper Lough Erne	UKGBNI1NW363602063	*Moderate*	0.0455	0.0508	258.0	0.0002	0.0457

*Baseline concentration >75% threshold but concentration increase is below significance threshold (0.00125mg/l)

Table 8: Total phosphorus concentrations in lake waterbodies following dosing of drinking water

Name	**EU_CD**	**Indicative Quality** *Surrogate Status in italic*	**Baseline conc (mg/l)**	**75% of status threshold (mg/l)**	**Cumulative load (kg/yr)**	**Modelled dosing conc. (mg/l)**	**Potential Baseline conc. following dosing (mg/l)**
Erne Upper	IE_NW_36_672	*Good*	0.0180	0.0213	258.0	0.0002	0.0182
Castlehume	UKGBNI3NW0025	*Good*	0.0180	0.0213	258.0	0.0002	0.0182
Erne Lower Devenish	UKGBNI3NW0006	*Good*	0.0180	0.0213	258.0	0.0002	0.0182

Figure 1: Cavan Regional Water Supply Dosing Areas

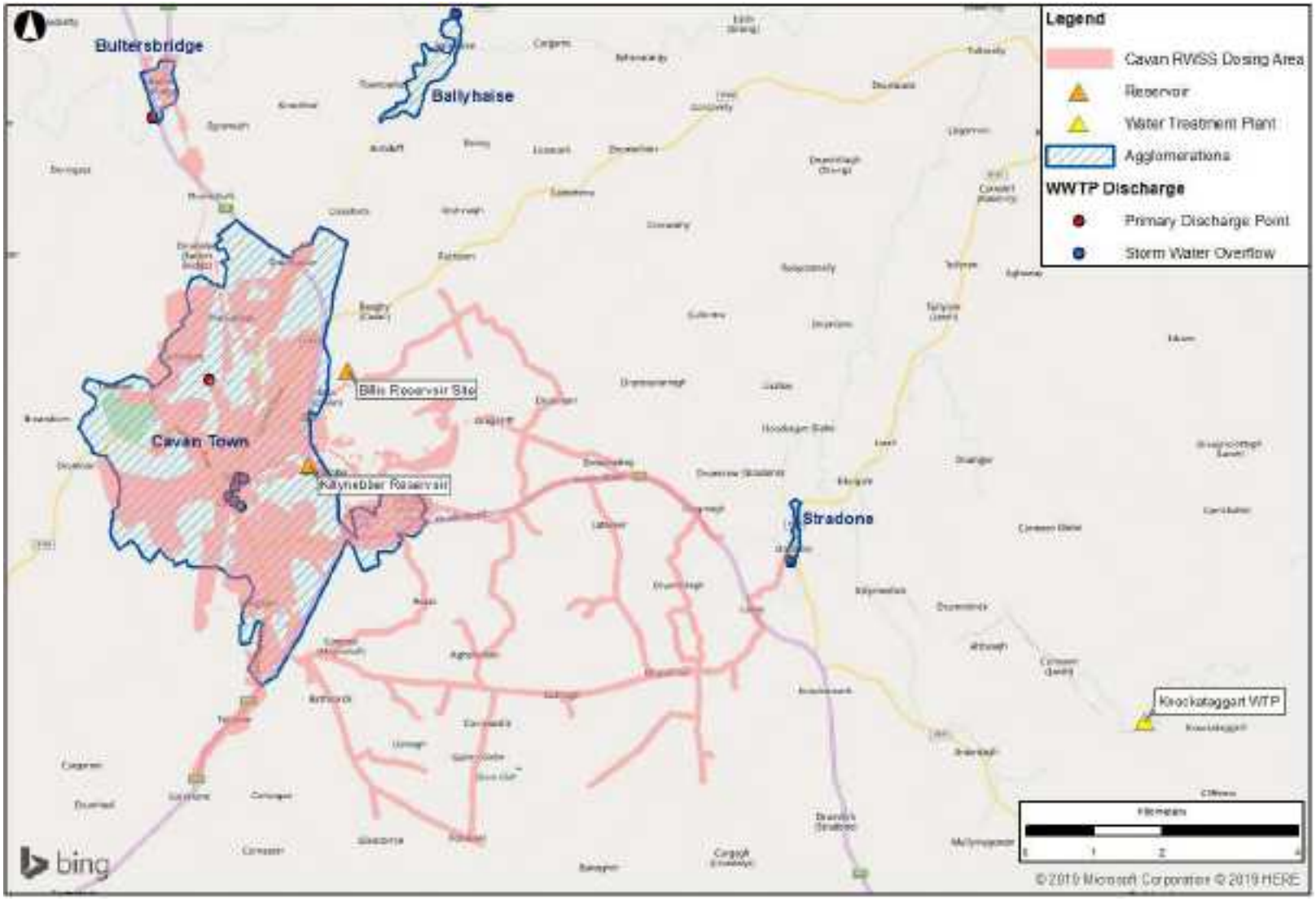

Figure 2: RWB Cumulative Loading Assessment

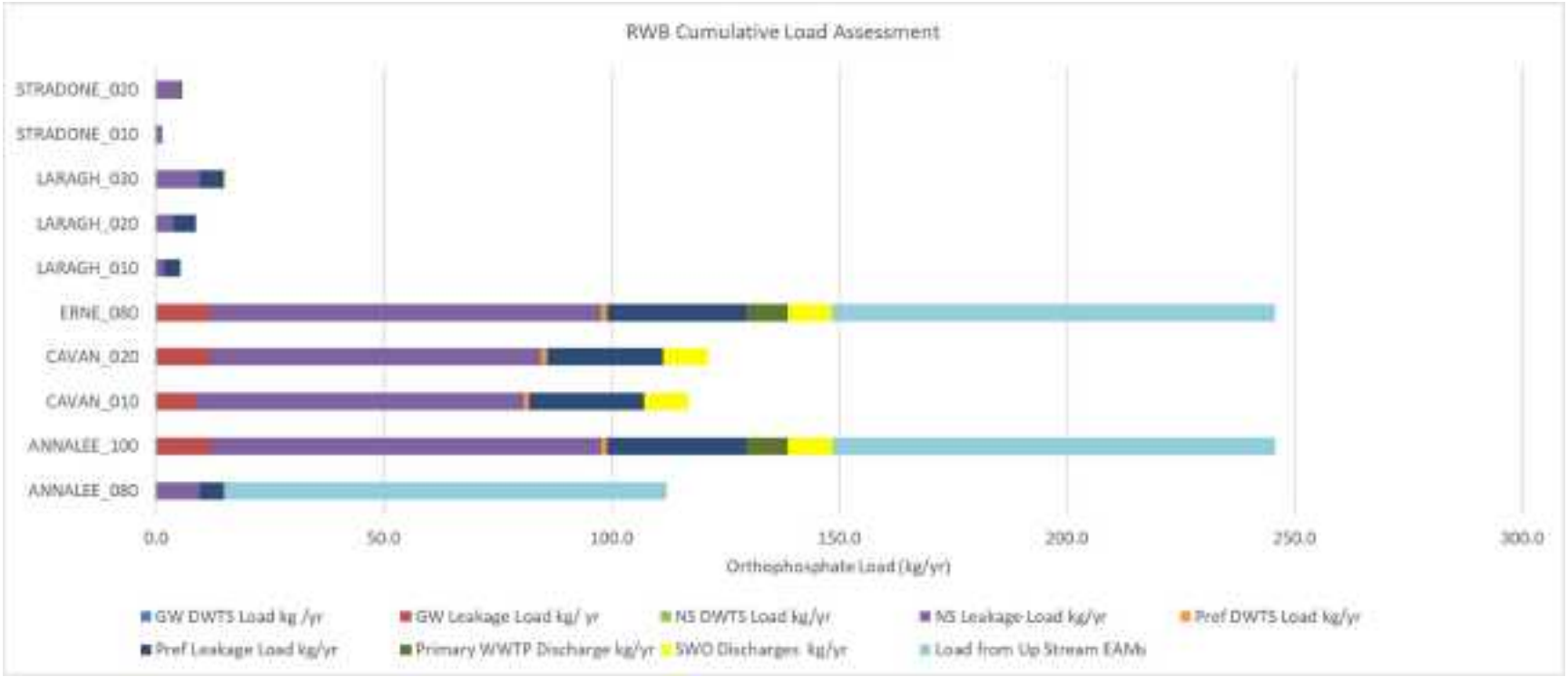

Figure 3: Total dosing area Attenuated, Treated and Transported Loads

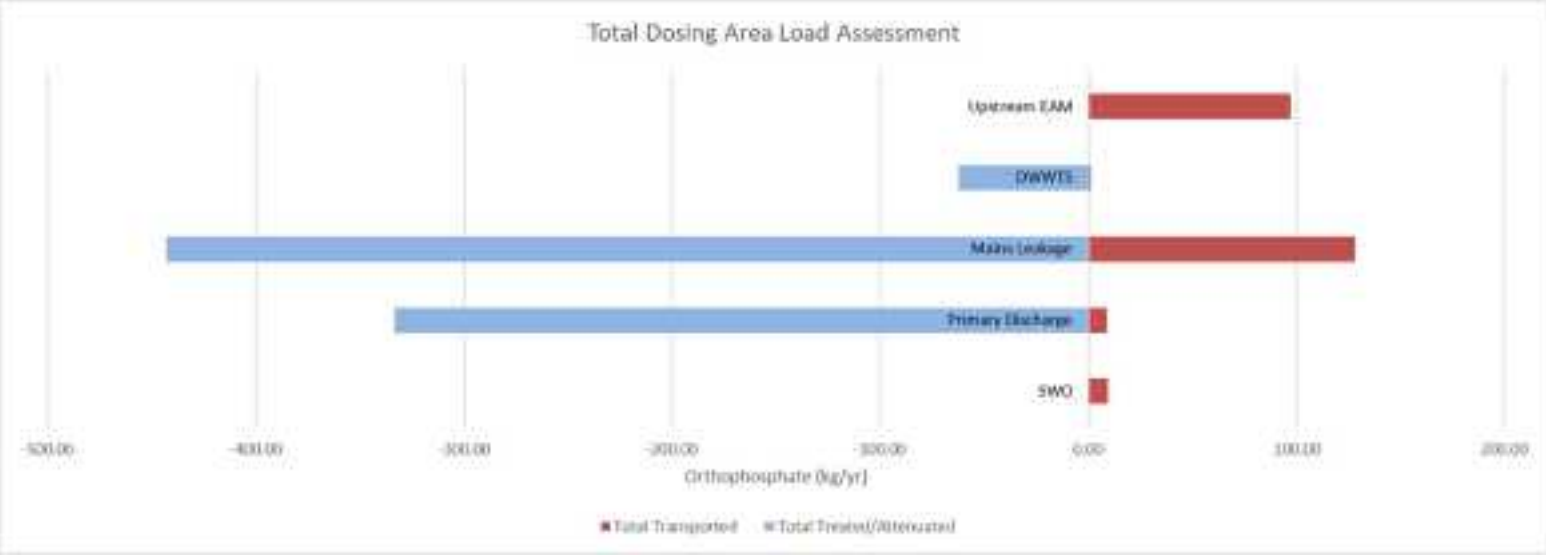

Figure 4: Upstream and downstream EAMs within WFD catchment

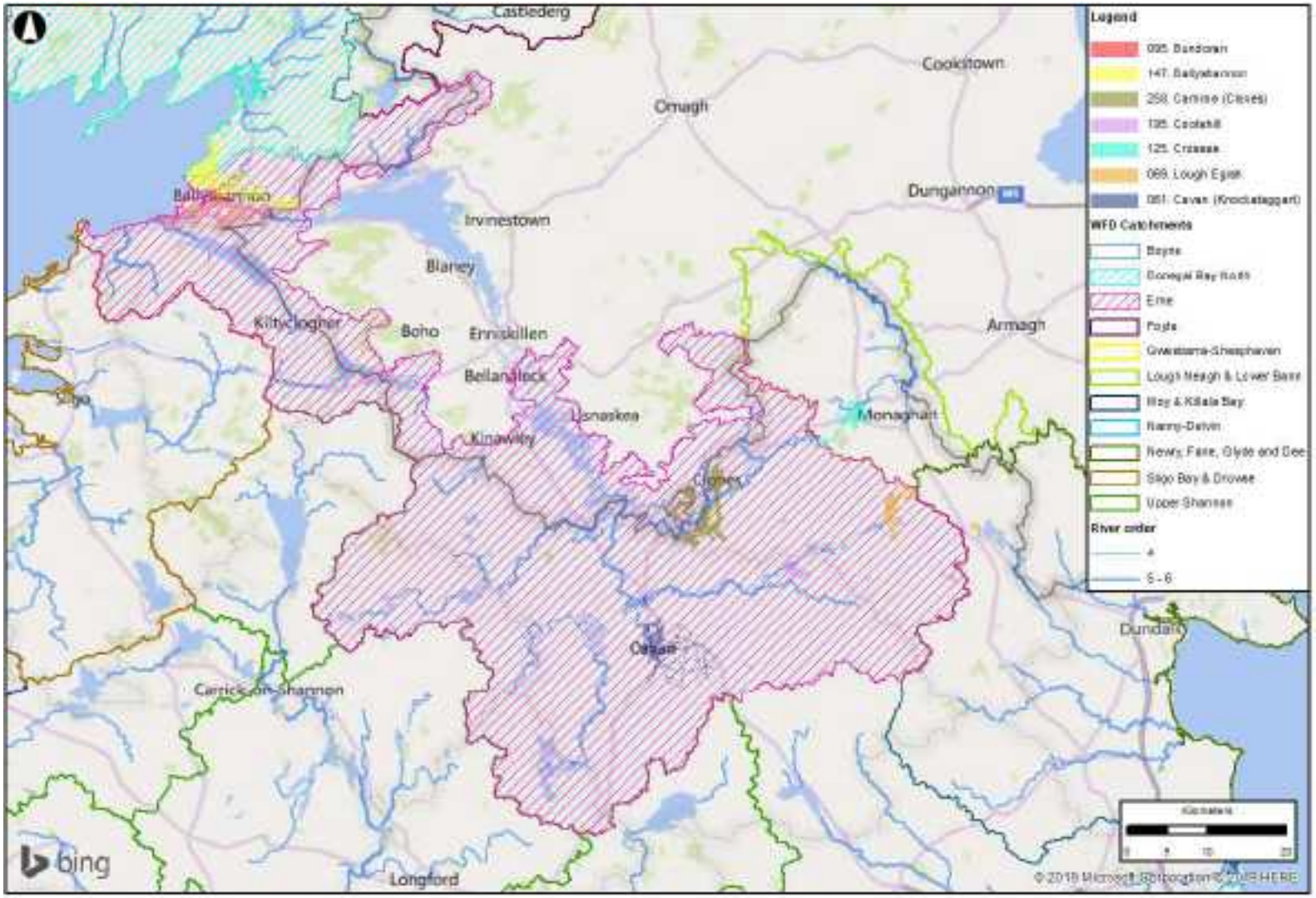

Figure 5: Red, Amber, Green (RAG) Status of waterbodies