IRISH WATER

LEAD IN DRINKING WATER MITIGATION PLAN – 022 LETTERKENNY WSZS

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 adverse 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 to be included in the 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 Goldrum and Ballymacool Water Treatment Plants (WTPs) to Letterkenny Water Supply Zone (WSZ) (0600PUB1110), Letterkenny Mixed WSZ (0600PUB1128) and Letterkenny Milford Mixed WSZ (0600PUB1130) in Co. Donegal.

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 plumbosolvency. The degree

[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

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 Letterkenny WSZs will be 1.0 mg/l P.

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 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 the risk 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 for AA 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 (2000);
- *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.

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 adverse 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 adverse 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 adverse 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.

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 15 km 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 15 km 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 and SSCOs 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 OP 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 2019d). 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

Water from Letterkenny (Goldrum) WTP (8,480 m^3/d) and Ballymacool WTP (1,560 m^3/d) is mixed at Ard O'Donnell Reservoir prior to distribution to Letterkenny (0600PUB1110) and Letterkenny Mixed (0600PUB1128) WSZs. The WSZs also receive 1,500 m^3/d from Pollen Dam WSZ, which is treated at Illies WTP. Letterkenny (Goldrum) WTP supplies water to Letterkenny Milford Mixed WSZ (0600PUB1130); however, the proportionate amount supplied by Letterkenny (Goldrum) WTP and Milford WTP has not been determined. In consideration of this, the AA Screening assesses a worst case scenario of 100% of flow to Letterkenny Milford Mixed WSZ from Letterkenny (Goldrum) WTP which is to receive a higher dosing of 1.0 mg/l OP as oppose to 0.6 mg/l P at Milford WTP.

At present, it is uncertain whether dosing will progress at Milford WTP and so this Screening Report considers water treated from Goldrum and Ballymacool WTP and supplied to Letterkenny (0600PUB1110), Letterkenny Mixed (0600PUB1128) and Letterkenny Milford Mixed WSZs (0600PUB1130), herein referred to Letterkenny WSZs. If Milford WTP OP dosing is to proceed, a further AA Screening will consider the impacts of this.

Letterkenny and Letterkenny Mixed WSZ supply water to Letterkenny town, Kilmacrenan town and a large rural surrounding area. Letterkenny Milford Mixed WSZ covers an area around Ramelton.

Based on an assessment of the risk of lead exceedances, the recommended Plumbosolvency Control Plan for Letterkenny WSZs if for universal dosing at the WTPs, specifically 1.0 mg/l P at the outlets of Goldrum and Ballymacool WTPs. The consideration of dosing of water supplied to the WSZs from Pollen Dam is not being considered as part of this phase of the project. Approximately 54% of the flow is accounted for and this fixed rate (46%) of water mains leakages has been assumed for Letterkenny WSZs.

The three WSZs cover a large rural area and five urban areas which are served by wastewater treatment plant (WWTP) agglomerations (Ramelton WWTP; Churchill Housing Scheme WWTP; Kilmacreannan WWTP; Letterkenny WWTP; and Termon Housing Scheme WWTP). The density of water mains is relatively low across the rural areas. There are an estimated 5,389 properties across the WSZs that are serviced by DWWTS.

Figure 1 Location of the Goldrum Water Treatment Plant site, Co. Donegal.

Figure 2 Location of the Ballymacool Water Treatment Plant site, Co. Donegal.

The proposed works will comprise **construction** and **operational** activities.

3.1.1 Construction Works

In the case of Letterkenny, Goldrum WTP is currently undergoing construction works as part of an upgrade for which installation of OP dosing has already been considered for. Henceforth, construction activities assessed in this Screening will refer only to activities required for the installation of OP dosing at Ballymacool WTP.

The Pb 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, should be installed on constructed concrete ground slabs, located within the site of the Ballymacool WTP Site boundary. The required 60 days storage volume at the Ballymacool WTP Site corresponds to 0.4 m^3.

Facilities to raise the pH of the water to the recommended pH of 8.0 will also be installed at the WTP. These facilities will consist of three free standing storage/ dilution tanks (with capacity for a minimum of 60 days dosing of sodium hydroxide/ sodium carbonate) with dosing pumps and control panel and an allowance for dry product storage (pallets / silos) plus conveying equipment. A bulk silo of c 32 m^3 and two batching tanks of c 0.5 m^3 each will be constructed in an appropriate building.

The scope of the **construction** works for the Ballymacool 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 pH correction facilities with an area of approximately 70 m^2 (a typical installation is shown in Figure 3). Exact locations will be confirmed following initial site assessment and investigations.

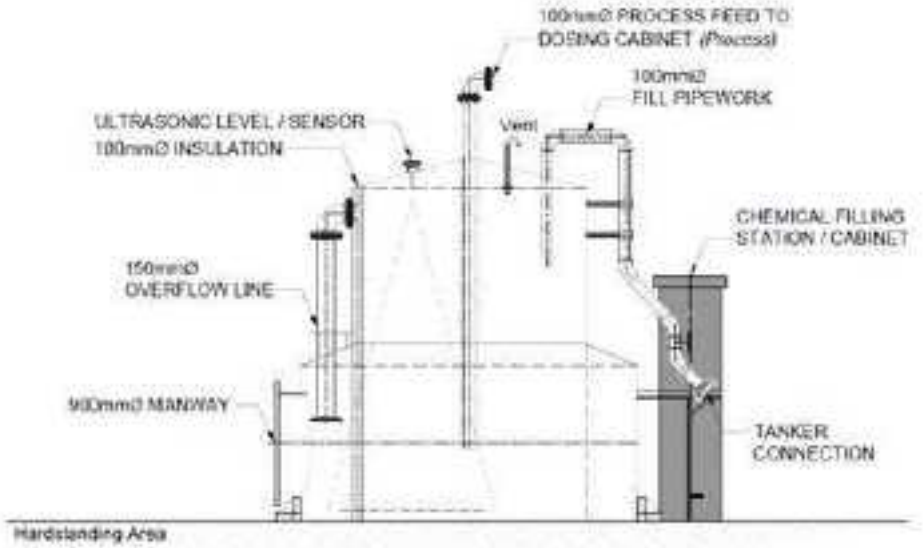

Figure 3 Sectional view of typical circular free standing chemical storage tank.

- Installation of OP dosing unit may include excavations, construction of new water process and duct chambers, duct and pipe laying and reinstatement works; and will have an area of approximately 30 m^2 (a typical dosing unit is shown in **Figure 4** and **Figure 5**). 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 a concrete base with cast in ducts within the WTP site boundaries. A 1.0 m wide concrete apron shall extend around the kiosk;

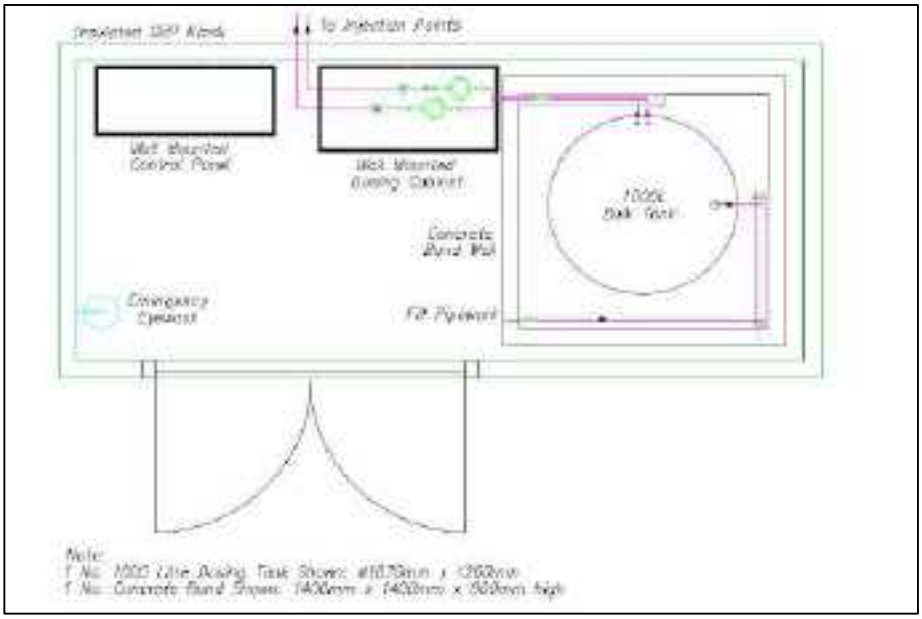

Figure 4 IW Schematic of a bulk tank kiosk layout in H_3PO_4 Installation with 500 litres< bulk storage ≤ 6,000 litres.

Figure 5 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 1.0 mg/l P for treated water at Goldrum and Ballymacool WTPs in a process similar to the addition of chlorine for disinfection.

Waste from the phosphate analyser will be routed to a public sewer on site where available and if not, waste shall be stored for a maximum of 60 days prior to removal by a transport vehicle.

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 OP 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 OP 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 OP susceptibility output mapping for subsurface pathways; the nutrient risk assessment for water bodies; 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 DWWTS.

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 OP 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 OP treatment point within the WSZ; enhanced wastewater treatment (to potentially remove equivalent P levels related to the OP 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 5**), based on the source-pathway-receptor model, from the water distribution and wastewater collection systems.

- The *source* of P is defined as the OP dosing at WTPs 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 DWWTS.

- *Receptors*, and their sensitivity, is of key consideration in the EAM. A water body may be more sensitive to additional P 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 7** 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 OP 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 and the potential for any impact on OP indicative water quality status from any increase in OP loading arising from the proposed OP dosing.

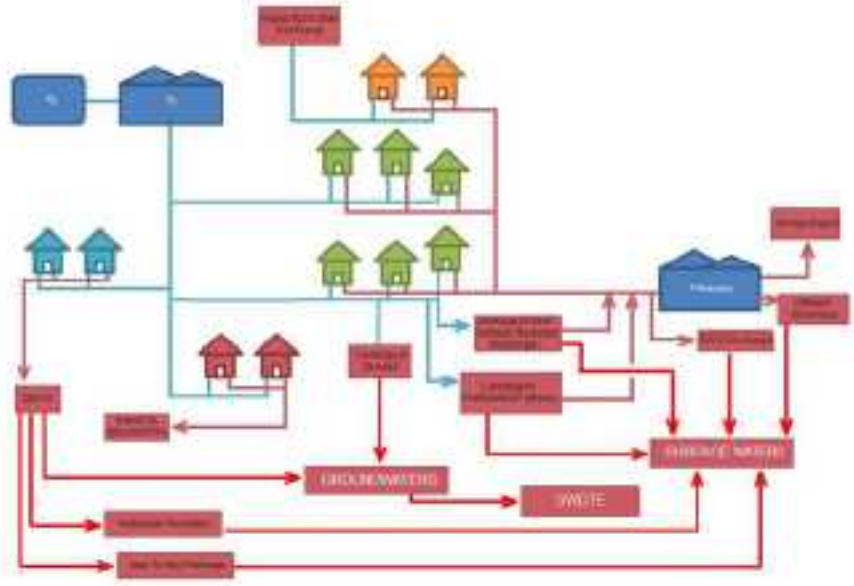

Figure 6 Conceptual Model of P Transfer

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.

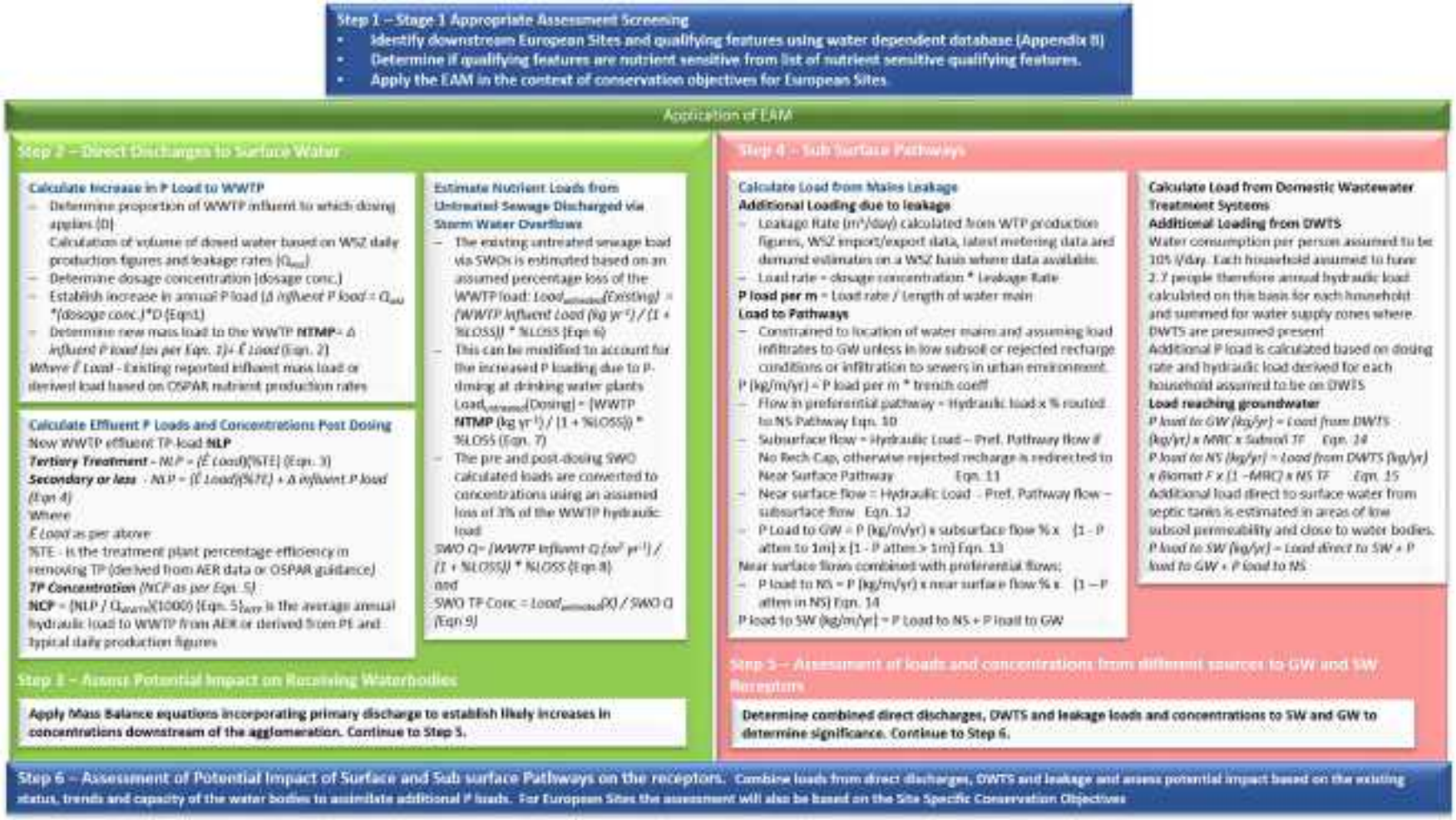

Figure 7 Stepwise Approach to the Environmental Assessment Methodology

4. PROJECT CONNECTIVITY TO EUROPEAN SITES

4.1 OVERVIEW OF THE PROJECT ZONE OF INFLUENCE

4.1.1 Construction Phase

This Section addresses Ballymacool WTP only, as stated previously OP dosing units are already in place at Letterkenny WTP. Ballymacool WTP site boundary is located more than 5 km distance by land from Lough Swilly SAC and Lough Swilly SPA. Given the location (outside of any European Site boundary, more than 5 km upstream of Lough Swilly via Swilly (Donegal)_010 river waterbody located entirely within the WTP site boundary), and scale (~80 m^2) of the construction of OP Dosing Units and pH correction facility for the proposed scheme, the potential for direct or indirect impacts during construction can be screened out at an early stage (**Figure 8**). Consideration of potential impact is in the absence of mitigation and with the acknowledgement that the Dosing Units are within the WTP site boundary, thereby having no links to European Sites. Construction impacts are therefore not assessed further.

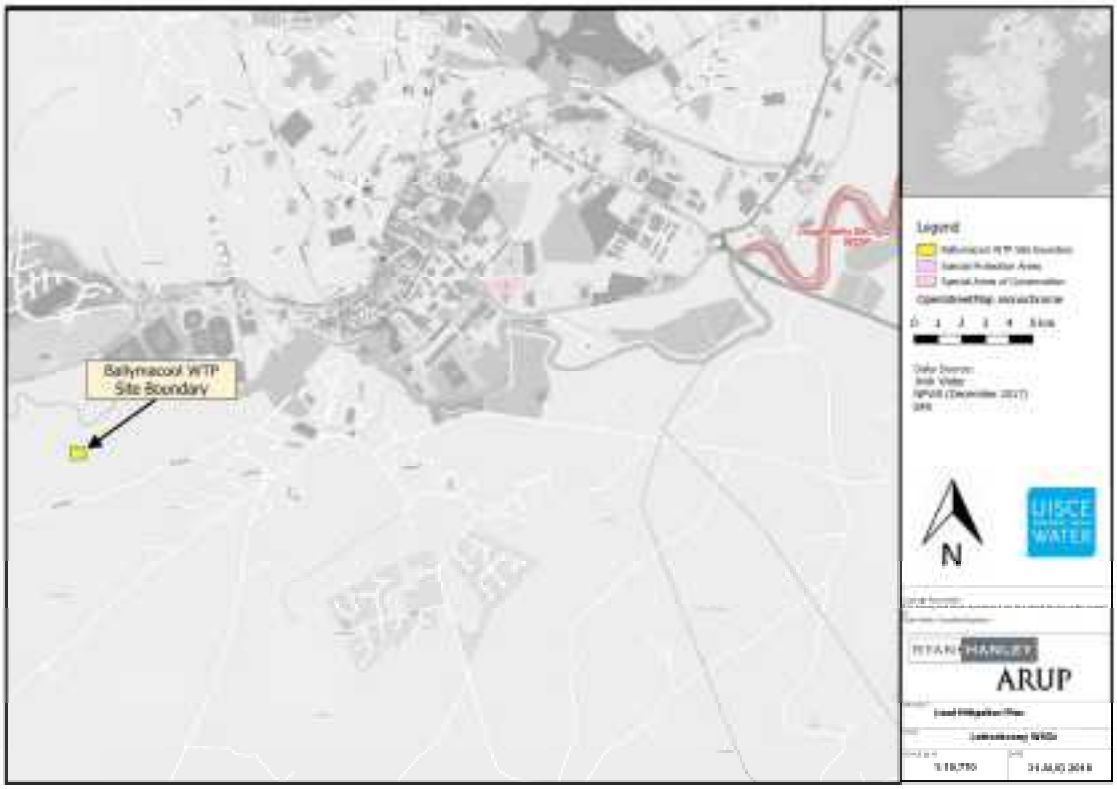

Figure 8 Location of the Ballymacool WTP with respect to European Sites

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 Goldrum and Ballymacool WTPs and associated WSZs (i.e. Letterkenny, Letterkenny Mixed, and Letterkenny Milford Mixed) and European Sites. The 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 ZoI are listed in **Table 1** and are displayed in **Figure 9**.

The EAM process identified 24 river waterbodies, 4 groundwater bodies, 4 lake waterbodies and 10 transitional and coastal 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:

- Bunlin_010 (IE_NW_38B040100) discharges into Mulroy Bay Broadwater coastal waterbody (IE_NW_200_0000);
- Glashagh (Lower)_010 (IE_NW_39G020200) flows into Carn Low_010 (IE_NW_39L012000) discharges into Swilly Estuary (IE_NW_220_0100) and Lough Swilly coastal waterbody (IE_NW_220_0000);
- Corravaddy Burn_010 (IE_NW_39C030250) flows into Swilly (Donegal)_010 (IE_NW_39S020300) prior to discharging to Swilly Estuary (IE_NW_220_0100) and Lough Swilly coastal waterbody (IE_NW_220_0000);
- Deele (Donegal)_030 (IE_NW_01D010500) flows into Deele (Donegal)_040, Deele (Donegal)_050 prior to discharging to Foyle and Faughan Estuaries transitional waterbody (UKGBNI5NW250010) and Lough Foyle coastal waterbody (GBNIIE6NW250);
- Dooballagh Burn_010 (IE_NW_39D020200) flows into Leslie Hill Stream_020 (IE_NW_39L050660) which discharges into Swilly Estuary (IE_NW_220_0100) and Lough Swilly coastal waterbody (IE_NW_220_0000);
- Glashagh (Upper)_010 (IE_NW_39G010200) flows into Glashagh (Upper)_020 (IE_NW_39G010400), Leannan_030 (IE_NW_39L010250), Leannan_040 (IE_NW_39L010300), Leannan_050 (IE_NW_39L010500), Leannan_060 (IE_NW_39L010600) before entering Fern (IE_NW_39_13) lake waterbody. From Fern lake waterbody, Leannan_060 continues to Carn Low_010 (IE_NW_39L012000) which discharges into Swilly Estuary (IE_NW_220_0100) and Lough Swilly coastal waterbody (IE_NW_220_0000);
- Knockybrin_010 (IE_NW_39K240610) discharges into Swilly Estuary (IE_NW_220_0100) and Lough Swilly coastal waterbody (IE_NW_220_0000);
- Leannan_010 (IE_NW_39L010100) flows into Gartan lake waterbody picking up Akibbon (IE_NW_39_11) and Nacally lake waterbody (IE_NW_39_68) en route; Leannan_020 (IE_NW_39L010200) flows from Gartan lake waterbody and into Leannan_030 (IE_NW_39L010250), Leannan_040 (IE_NW_39L010300), Leannan_050 (IE_NW_39L010500), Leannan_060 (IE_NW_39L010600) before entering Fern (IE_NW_39_13) lake waterbody. From Fern lake waterbody, Leannan_060 continues to Carn Low_010 (IE_NW_39L012000) which discharges into Swilly Estuary (IE_NW_220_0100) and Lough Swilly coastal waterbody (IE_NW_220_0000);
- Leslie Hill Stream_010 (IE_NW_39L050600) flows into Leslie Hill Stream_020 (IE_NW_39L050660) which discharges into Swilly Estuary (IE_NW_220_0100) and Lough Swilly coastal waterbody (IE_NW_220_0000);
- Loughkeel Burn_010 (IE_NW_38L030400) flows through Keel Kilmacrenan lake waterbody (IE_NW_38_75) to Mulroy Bay Broadwater coastal waterbody (IE_NW_200_0000);
- Lurgy_010 (IE_NW_39L020100) flows into Leannan_050 (IE_NW_39L010500), Leannan_060 (IE_NW_39L010600) before entering Fern (IE_NW_39_13) lake waterbody. From Fern lake waterbody, Leannan_060 continues to Carn Low_010 (IE_NW_39L012000) which discharges into Swilly Estuary (IE_NW_220_0100) and Lough Swilly coastal waterbody (IE_NW_220_0000);
- Newmill_010 (IE_NW_39N050990) discharges into Swilly Estuary (IE_NW_220_0100) and Lough Swilly coastal waterbody (IE_NW_220_0000);

- Swilly_010 (IE_NW_39S020050) flows into Swilly_020 (IE_NW_39S020100) and Swilly_030 (IE_NW_39S020200); which flows into Swilly (Donegal)_010 (IE_NW_39S020300) prior to discharging to Swilly Estuary (IE_NW_220_0100) and Lough Swilly coastal waterbody (IE_NW_220_0000);

The EAM process identified 4 groundwater bodies (highlighted in bold). Groundwater bodies touching or intersecting the WSZs, are also included in the ZoI. Hydrogeological linkages in karst areas are taken into account:

- **Lough Swilly (IEGBNI_NW_G_059);**
- **Manor Cunningham (IE_NW_G_052);**
- **Northwest Donegal (IE_NW_G_049); and**
- **Raphoe (IE_NW_G_054).**

Northwest Donegal is a large groundwater body accounting for approximately one third of the county. The main discharges are to rivers and streams crossing the GWB, reflecting short groundwater flow paths (30-300 m) and overall flow direction is expected to be to the northwest as determined by topography. As a result of this only those European Sites within a 300 m radius are considered in the ZoI (GSI, 2004).

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

Site Name	SAC/SPA Code	Water Dependent Species/Habitats	Nutrient Sensitive	Potential Hydrological/ Hydrogeological Connectivity
Ballyarr Wood SAC	000116	No	Yes	No
Meentygrannagh Bog SAC	000173	Yes	Yes	No
Tranarossan And Melmore Lough SAC	000194	Yes	Yes	Yes
Sheephaven SAC	001190	Yes	Yes	Yes
Ballyhoorisky Point to Fanad Head SAC	001975	Yes	Yes	Yes
North Inishowen Coast SAC	002012	Yes	Yes	Yes
Cloghernagore Bog and Glenveagh National Park SAC	002047	Yes	Yes	No
Mulroy Bay SAC	002159	Yes	Yes	Yes
Leannan River SAC	002176	Yes	Yes	Yes
Lough Swilly SAC	002287	Yes	Yes	Yes
River Finn SAC	002301	Yes	Yes	Yes
Derryveagh and Glendowan Mountains SPA	004039	Yes	Yes	Yes
Lough Fern SPA	004060	Yes	Yes	Yes
Lough Swilly SPA	004075	Yes	Yes	Yes
Lough Foyle SPA	004087	Yes	Yes	Yes
Fanad Head SPA	004148	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 ZoI). A number of sites have been excluded from further assessment in Section 5 and 6, due to the absence of hydrological/hydrogeological connectivity to at least one nutrient sensitive and water-dependant QI or SCI. The remaining sites are included for further assessment in order to determine whether the Project is likely to give rise to significant effects; these sites are detailed in **Table 2.**

The sites that screened out because of absence of water dependent habitats/ species and nutrient sensitivity included:

- Ballyarr Wood SAC (000116);

Sites that screened out owing to the fact that they are situated upstream of the dosing area and therefore lack hydrological/ hydrological connectivity, were:

- Meentygrannagh Bog SAC (000173) and Cloghernagore Bog and Glenveagh National Park SAC (002047) are upstream of the OP dosing area.

The remaining sites are included in this Screening assessment in order to determine whether the Project is likely to give rise to significant effects; these sites are detailed in **Table 2** and are displayed in **Figure 10**.

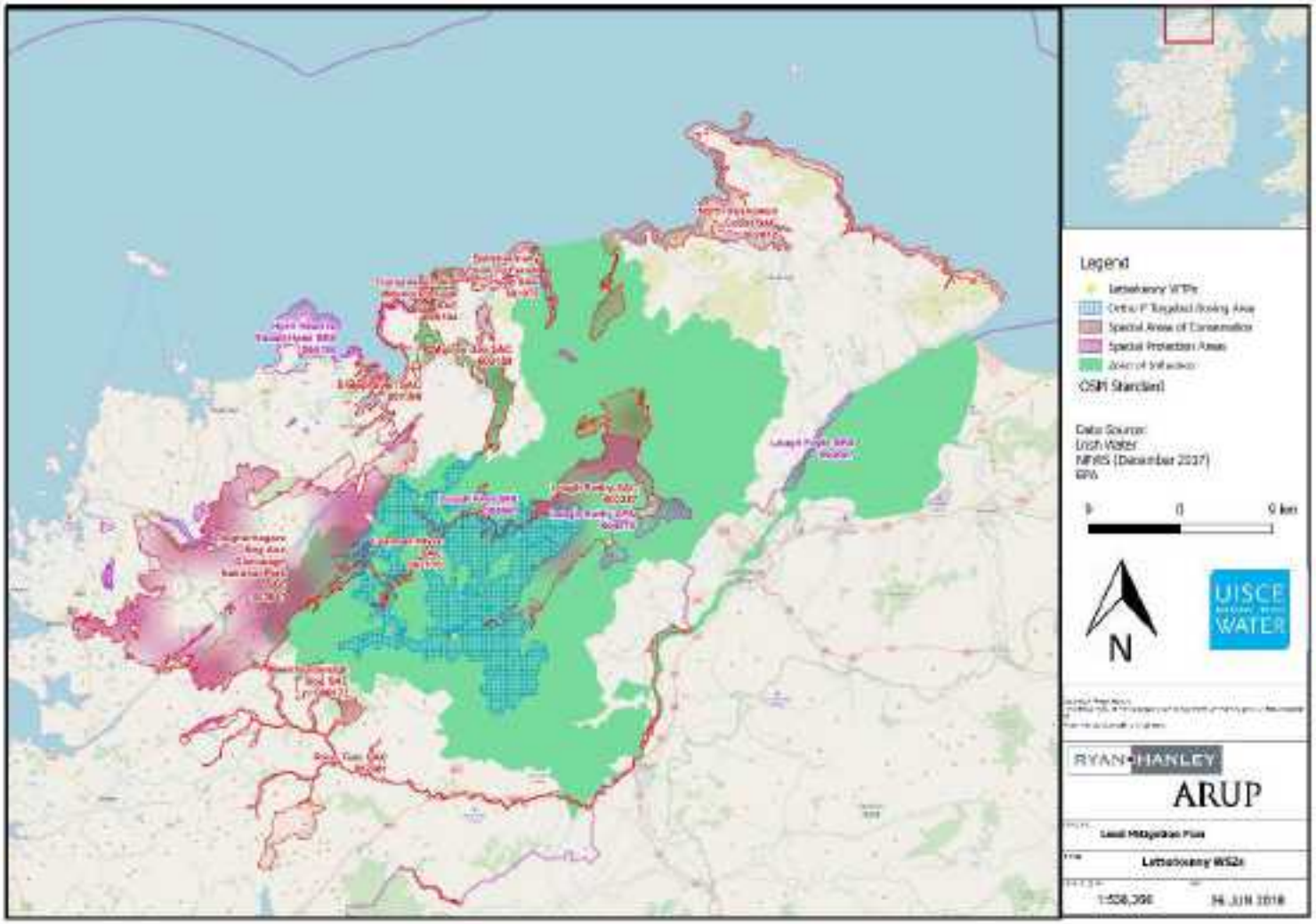

Figure 9 European Sites within the ZoI of the Proposed Project

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
Tranarossan And Melmore Lough	**SAC 000194**	**13th Apr 2015**	1140	Mudflats and sandflats not covered by seawater at low tide	Yes	Yes	Yes
			1210	Annual vegetation of drift lines	Yes	Yes	
			1220	Perennial vegetation of stony banks	Yes	No	
			1230	Vegetated sea cliffs of the Atlantic and Baltic coasts	Yes	Yes	
			2110	Embryonic shifting dunes	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	
			2140	Decalcified fixed dunes with *Empetrum nigrum*	Yes	Yes	
			2170	Dunes with *Salix repens* ssp. *argentea* (Salicion arenariae)	Yes	Yes	
			21A0	Machairs (* in Ireland)	Yes	Yes	
			3140	Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.	Yes	Yes	
			4030	European dry heaths	No	Yes	
			4060	Alpine and Boreal heaths	No	No	
			1395	*Petalophyllum ralfsii* (Petalwort)	Yes	Yes	
Sheephaven	**SAC 001190**	**30th Sept 2014**	1140	Mudflats and sandflats not covered by seawater at low tide	Yes	Yes	Yes
			1310	Salicornia mud	Yes	Yes	
			1330	Atlantic salt meadows	Yes	Yes	
			1410	Mediterranean salt meadows	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	
			2190	Humid dune slacks	Yes	Yes	
			21A0	Machairs (* in Ireland)	Yes	Yes	
			91A0	Old oak woodlands	No	Yes	
			1065	*Euphydryas aurinia* (Marsh Fritillary)	Yes	No	
			1395	*Petalophyllum ralfsii* (Petalwort)	Yes	Yes	
Ballyhoorisky Point to Fanad Head	**SAC 001975**	**27th Jan 2017**	1220	Perennial vegetation of stony banks	Yes	No	Yes
			1230	Vegetated sea cliffs of the Atlantic and Baltic coasts	Yes	Yes	
			3130	Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea	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
			3140	Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.	Yes	Yes	
			1014	*Vertigo angustior* (Narrow-mouthed Whorl Snail)	Yes	Yes	
			1833	*Najas flexilis* (Slender Naiad)	Yes	Yes	
North Inishowen Coast	**SAC 002012**	**24th Nov 2014**	1140	Mudflats and sandflats not covered by seawater at low tide	Yes	Yes	Yes
			1220	Perennial vegetation of stony banks	Yes	No	
			1230	Vegetated sea cliffs of the Atlantic and Baltic coasts	Yes	Yes	
			2130	Fixed coastal dunes with herbaceous vegetation (grey dunes)	Yes	Yes	
			21A0	Machairs (* in Ireland)	Yes	Yes	
			4030	European dry heaths	No	Yes	
			1014	*Vertigo angustior* (Narrow-mouthed Whorl Snail)	Yes	Yes	
			1355	*Lutra lutra* (Otter)	Yes	Yes	
Mulroy Bay	**SAC 002159**	**16th Oct 2012**	1160	Large shallow inlets and bays	Yes	Yes	Yes
			1170	Reefs	Yes	Yes	
			1355	*Lutra lutra* (Otter)	Yes	Yes	
Leannan River	**SAC 002176**	**21st Feb 2018**	3110	Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)	Yes	Yes	Yes
			3130	Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea	Yes	Yes	
			1029	*Margaritifera margaritifera* (Freshwater Pearl Mussel)	Yes	Yes	
			1106	*Salmo salar* (Salmon)	Yes	Yes	
			1355	*Lutra lutra* (Otter)	Yes	Yes	
			1833	*Najas flexilis* (Slender Naiad)	Yes	Yes	
Lough Swilly	**SAC 002287**	**19th July 2011**	1130	Estuaries	Yes	Yes	Yes
			1150	Coastal Lagoons	Yes	Yes	
			1330	Atlantic salt meadows	Yes	Yes	
			6410	*Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	Yes	Yes	
			91A0	Old sessile oak woods	No	Yes	
			1355	*Lutra lutra* (Otter)	Yes	Yes	
River Finn	**SAC 002301**	**31st May 2017**	3110	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)	Yes	Yes	Yes
			4010	Northern Atlantic wet heaths with Erica tetralix	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
			7130	Blanket bogs (*if active bog)	Yes	Yes	
			7140	Transition mires and quaking bogs	Yes	Yes	
			1106	*Salmo salar* (Salmon)	Yes	Yes	
			1355	*Lutra lutra* (Otter)	Yes	Yes	
Derryveagh and Glendowan Mountains	**SPA 004039**	**21st Feb 2018**	A001	Red-throated Diver (*Gavia stellata*)	Yes	Yes	Yes
			A098	Merlin (*Falco columbarius*)	Yes	Yes	
			A103	Peregrine (*Falco peregrinus*)	Yes	Yes	
			A140	Golden Plover (*Pluvialis apricaria*)	Yes	Yes	
			A466	Dunlin (*Calidris alpina schinzii*)	Yes	Yes	
Lough Fern	**SPA 004060**	**21st Feb 2018**	A059	Pochard (*Aythya ferina*)	Yes	Yes	Yes
			A999	Wetland and Waterbirds	Yes	Yes	
Lough Swilly	**SPA 004075**	**19th July 2011**	A005	Great Crested Grebe (*Podiceps cristatus*)	Yes	Yes	Yes
			A028	Grey Heron (*Ardea cinerea*)	Yes	Yes	
			A038	Whooper Swan (*Cygnus cygnus*)	Yes	Yes	
			A043	Greylag Goose (*Anser anser*)	Yes	Yes	
			A048	Shelduck (*Tadorna tadorna*)	Yes	Yes	
			A050	Wigeon (*Anas penelope*)	Yes	Yes	
			A052	Teal (*Anas crecca*)	Yes	Yes	
			A053	Mallard (*Anas platyrhynchos*)	Yes	Yes	
			A056	Shoveler (*Anas clypeata*)	Yes	Yes	
			A062	Scaup (*Aythya marila*)	Yes	Yes	
			A067	Goldeneye (*Bucephala clangula*)	Yes	Yes	
			A069	Red-breasted Merganser (*Mergus serrator*)	Yes	Yes	
			A125	Coot (*Fulica atra*)	Yes	Yes	
			A130	Oystercatcher (*Haematopus ostralegus*)	Yes	Yes	
			A143	Knot (*Calidris canutus*)	Yes	Yes	
			A149	Dunlin (*Calidris alpina*)	Yes	Yes	
			A160	Curlew (*Numenius arquata*)	Yes	Yes	
			A162	Redshank (*Tringa totanus*)	Yes	Yes	
			A164	Greenshank (*Tringa nebularia*)	Yes	Yes	
			A179	Black-headed Gull (*Chroicocephalus ridibundus*)	Yes	Yes	
			A182	Common Gull (*Larus canus*)	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
			A191	Sandwich Tern (*Sterna sandvicensis*)	Yes	Yes	
			A193	Common Tern (*Sterna hirundo*)	Yes	Yes	
			A395	Greenland White-fronted Goose (*Anser albifrons flavirostris*)	Yes	Yes	
			A999	Wetland and Waterbirds	Yes	Yes	
Lough Foyle	**SPA 004087**	**23rd Sept 2014**	A001	Red-throated Diver (*Gavia stellata*)	Yes	Yes	Yes
			A005	Great Crested Grebe (*Podiceps cristatus*)	Yes	Yes	
			A037	Bewick's Swan (*Cygnus columbianus bewickii*)	Yes	Yes	
			A038	Whooper Swan (*Cygnus cygnus*)	Yes	Yes	
			A043	Greylag Goose (*Anser anser*)	Yes	Yes	
			A046	Light-bellied Brent Goose (*Branta bernicla hrota*)	Yes	Yes	
			A048	Shelduck (*Tadorna tadorna*)	Yes	Yes	
			A050	Wigeon (*Anas penelope*)	Yes	Yes	
			A052	Teal (*Anas crecca*)	Yes	Yes	
			A053	Mallard (*Anas platyrhynchos*)	Yes	Yes	
			A063	Eider (*Somateria mollissima*)	Yes	Yes	
			A069	Red-breasted Merganser (*Mergus serrator*)	Yes	Yes	
			A130	Oystercatcher (*Haematopus ostralegus*)	Yes	Yes	
			A140	Golden Plover (*Pluvialis apricaria*)	Yes	Yes	
			A142	Lapwing (*Vanellus vanellus*)	Yes	Yes	
			A143	Knot (*Calidris canutus*)	Yes	Yes	
			A149	Dunlin (*Calidris alpina*)	Yes	Yes	
			A157	Bar-tailed Godwit (*Limosa lapponica*)	Yes	Yes	
			A160	Curlew (*Numenius arquata*)	Yes	Yes	
			A162	Redshank (*Tringa totanus*)	Yes	Yes	
			A179	Black-headed Gull (*Chroicocephalus ridibundus*)	Yes	Yes	
			A182	Common Gull (*Larus canus*)	Yes	Yes	
			A184	Herring Gull (*Larus argentatus*)	Yes	Yes	
			A999	Wetland and Waterbirds	Yes	Yes	
Fanad Head	**SPA 004148**	**21st Feb 2018**	A122	Corncrake (*Crex crex*)	Yes	Yes	Yes
Horn Head to Fanad Head	**SPA 004194**	**21st Feb 2018**	A009	Fulmar (*Fulmarus glacialis*)	Yes	Yes	Yes
			A017	Cormorant (*Phalacrocorax carbo*)	Yes	Yes	
			A018	Shag (*Phalacrocorax aristotelis*)	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
			A045	Barnacle Goose (*Branta leucopsis*)	Yes	Yes	
			A103	Peregrine (*Falco peregrinus*)	Yes	Yes	
			A188	Kittiwake (*Rissa tridactyla*)	Yes	Yes	
			A199	Guillemot (*Uria aalge*)	Yes	Yes	
			A200	Razorbill (*Alca torda*)	Yes	Yes	
			A346	Chough (*Pyrrhocorax pyrrhocorax*)	Yes	Yes	
			A395	Greenland White-fronted Goose (*Anser albifrons flavirostris*)	Yes	Yes	

* indicates a priority habitat under the Habitats Directive

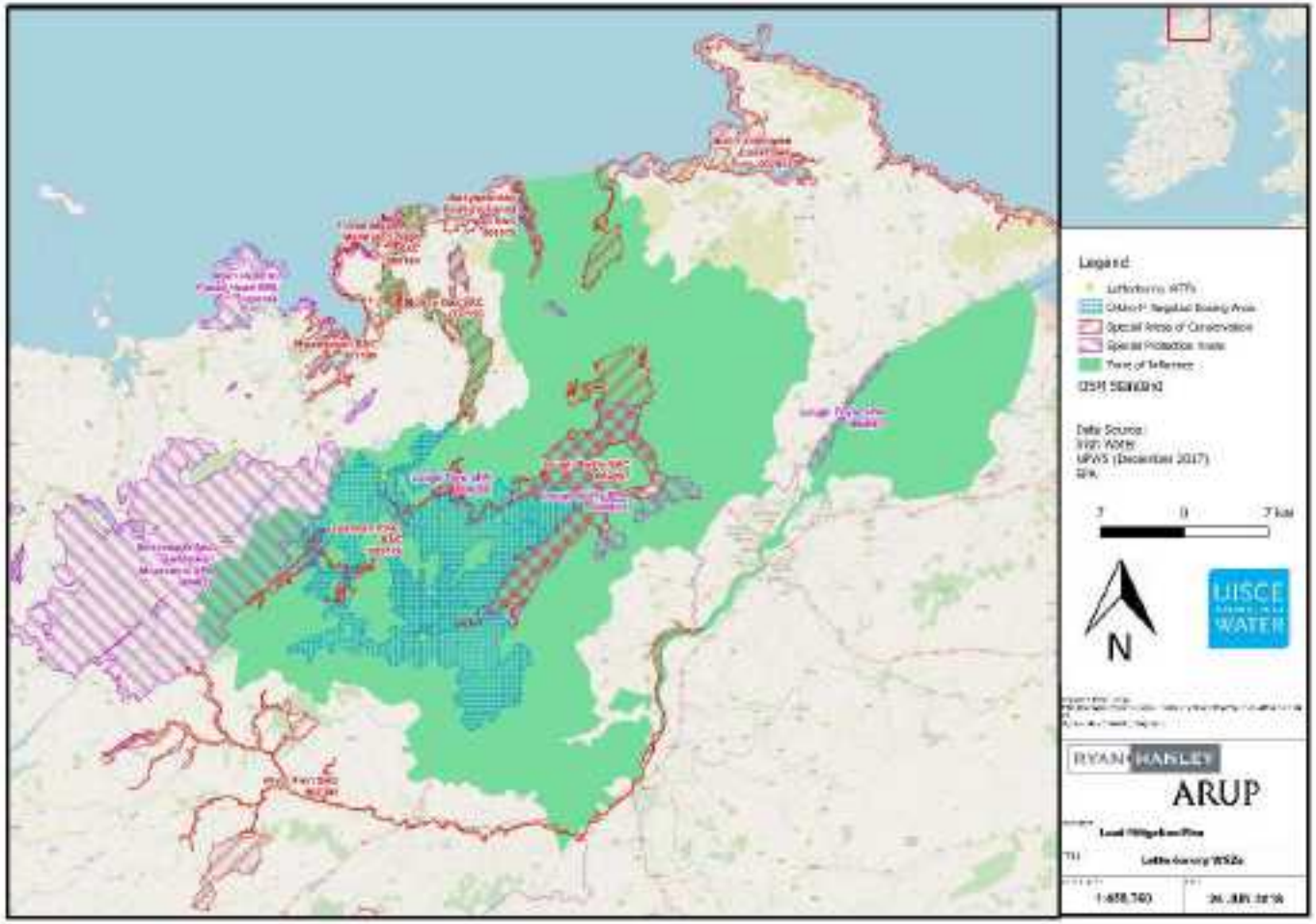

Figure 10 European Sites within the ZoI of the Proposed Project which are hydrologically or hydrogeologically connected

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 a 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 phosphorus 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 water bodies 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 OPERATIONAL IMPACTS

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 Screening to inform AA is the potential for significant effects arising from the additional OP load due to OP dosing at Ballymacool and Goldrum WTPs. 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 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) following dosing at the WTP.

The EAM has been completed assuming the capacity of a water body is a measure of its ability to absorb extra pressures before its status changes. For example, a river water body at Good Status will have mean phosphate values in the range 0.025 to 0.035 mg/l. River water bodies with mean phosphate concentrations of 0.0275 mg/l have 75% capacity left, i.e. high capacity, while river water bodies with a mean of 0.0325 mg/l have lower capacity (25%) as the concentrations are closer to the Good/Moderate Status boundary. In assessing the additional loads from the proposed OP 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 water body will not result in deterioration in status by 2021 even where the distance to threshold is currently assessed to be far. Where the water body baseline concentration is "Near" to the threshold before the effect of orthophosphate 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 of the Good/Moderate 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 water bodies 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 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.

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[3]	Ortho-P[4] Status[5] and Trends[6]	Baseline[7] P Conc.[8,9]	75% of Status Threshold (mg/l)	Cumulative Ortho P load to SW and GW[10]	Modelled Conc.[11] (mg/l)	Baseline Conc. @ 1.0 mg/l dosing rate	Evaluation
Tranarossan And Melmore Lough SAC (000194)	IE_NW_200_0000 Mulroy Bay Broadwater	CWB	Summer High/ Winter High	0.0057 / 0.0065	0.0188	1.1	0.00002	0.0057/ 0.0065	No deterioration in OP indicative WQ status
Sheephaven SAC (001190)	IE_NW_200_0000 Mulroy Bay Broadwater	CWB	Summer High/ Winter High	0.0057 / 0.0065	0.0188	1.1	0.00002	0.0057/ 0.0065	No deterioration in OP indicative WQ status
Ballyhoorisky Point to Fanad Head SAC 001975	IE_NW_220_0000 Lough Swilly	CWB	Summer High/ Winter High	0.0025 /0.0190	0.0188	442.6	0.0005	0.0030/ 0.0195*	No deterioration in OP indicative WQ status
	IEGBNI_NW_G_059 Lough Swilly	GWB	*Good*	*0.0175*	0.0263	7.6	0.00008	0.0176	No deterioration in OP indicative WQ status
North Inishowen Coast SAC 002012	IE_NW_220_0000 Lough Swilly	CWB	Summer High/ Winter High	0.0025 /0.0190	0.0188	442.6	0.0005	0.0030/ 0.0195*	No deterioration in OP indicative WQ status
	IEGBNI_NW_G_059 Lough Swilly	GWB	*Good*	*0.0175*	0.0263	7.6	0.00008	0.0176	No deterioration in OP indicative WQ status
Mulroy Bay SAC 002159	IE_NW_200_0000 Mulroy Bay Broadwater	CWB	Summer High/ Winter High	0.0057 / 0.0065	0.0188	1.1	0.00002	0.0057/ 0.0065	No deterioration in OP indicative WQ status
	IE_NW_38L030400 Loughkeel Burn_010	RWB	High	0.0109	0.0188	1.1	0.0002	0.0111	No deterioration in OP indicative WQ status

[3] Monitoring period is annual unless specified.
[4] TP in Lake waterbodies
[5] Surrogate Status indicated in italic;
[6] Distance to threshold in parentheses.
[7] Baseline year is 2014.
[8] Surrogate concentration is given in italic mg/l
[9] Ortho P in RWBs, TWBs, CWBs and GWBs; TP in LWBs.
[10] Cumulative Ortho P load to SW and GW from upstream and downstream dosing areas, Leakage, DWWTS and agglomerations (kg/yr).
[11] Values above 5% of Good / High boundary (0.00125 mg/l) for SW or 5% of Good / Fail boundary (0.00175 mg/l) for GW highlighted in yellow.

Site Name (Code)	Contributing WB Code_Name	WB Type[3]	Ortho-P[4] Status[5] and Trends[6]	Baseline[7] P Conc.[8,9]	75% of Status Threshold (mg/l)	Cumulative Ortho P load to SW and GW[10]	Modelled Conc.[11] (mg/l)	Baseline Conc. @ 1.0 mg/l dosing rate	Evaluation
	IE_NW_38B040100 Bunlin_010	RWB	*High*	0.0125	0.0188	6.6	0.0006	0.0131	No deterioration in OP indicative WQ status
	IE_NW_G_049 Northwest Donegal	GWB	*Good*	*0.0175 0*	0.0263	0.05	0.0000004	0.0175	No deterioration in OP indicative WQ status
Leannan River SAC 002176	IEGBNI_NW_G_059 Lough Swilly	GWB	*Good*	*0.0175*	0.0263	7.6	0.00008	0.0176	No deterioration in OP indicative WQ status
	IE_NW_39L012000 Carn Low_010	RWB	High	0.0125	0.0188	143.8	0.0005	0.0130	No deterioration in OP indicative WQ status
	IE_NW_39L010100 Leannan_010	RWB	High	0.0122	0.0188	4.4	0.00003	0.0122	No deterioration in OP indicative WQ status
	IE_NW_39L010200 Leannan_020	RWB	High	0.0106	0.0188	7.8	0.00004	0.0107	No deterioration in OP indicative WQ status
	IE_NW_39L010250 Leannan_030	RWB	*High*	*0.0125*	0.0188	18.9	0.0001	0.0126	No deterioration in OP indicative WQ status
	IE_NW_39L010300 Leannan_040	RWB	High	0.0056	0.0188	21.3	0.0001	0.0057	No deterioration in OP indicative WQ status
	IE_NW_39L010500 Lurgy River subsection of Leannan_050	RWB	Good	0.0265	0.0325	61.9	0.0014	0.0279	No deterioration in OP indicative WQ status
	IE_NW_39L010500 Leannan_050	RWB	High	0.0071	0.0188	90.5	0.0003	0.0074	No deterioration in OP indicative WQ status
	IE_NW_39L010600 Leannan_060	RWB	High	0.0097	0.0188	92.3	0.0003	0.0100	No deterioration in OP indicative WQ status
	IE_NW_39G010200 Glashagh (Upper)_010	RWB	*High*	0.0125	0.0188	4.6	0.0002	0.0127	No deterioration in OP indicative WQ status
	IE_NW_39G010400 Glashagh (Upper)_020	RWB	High	0.0076	0.0188	9.8	0.0003	0.0079	No deterioration in OP indicative WQ status
	IE_NW_39_11 Akibbon	LWB	Good	0.0146	0.0213	4.4	0.00003	0.0146	No deterioration in OP indicative WQ status
	IE_NW_39_12 Gartan	LWB	High	0.0071	0.0075	4.4	0.00003	0.0071	No deterioration in OP indicative WQ status
	IE_NW_39_13 Fern	LWB	Good	0.0292	0.0213	92.3	0.0003	0.0295*	No deterioration in OP indicative WQ status

Site Name (Code)	Contributing WB Code_Name	WB Type[3]	Ortho-P[4] Status[5] and Trends[6]	Baseline[7] P Conc.[8,9]	75% of Status Threshold (mg/l)	Cumulative Ortho P load to SW and GW[10]	Modelled Conc.[11] (mg/l)	Baseline Conc. @ 1.0 mg/l dosing rate	Evaluation
	IE_NW_39_68 Nacally	LWB	*High*	0.0050	0.0075	4.4	0.00003	0.0050	No deterioration in OP indicative WQ status
Lough Swilly SAC 002287	IE_NW_220_0100 Swilly Estuary	TWB	Summer High/ Winter High	0.0160 / 0.0200	0.0188	442.6	0.0007	0.0167/ 0.0207*	No deterioration in OP indicative WQ status
	IE_NW_220_0000 Lough Swilly	CWB	Summer High/ Winter High	0.0025 /0.0190	0.0188	442.6	0.0005	0.0030/ 0.0195*	No deterioration in OP indicative WQ status
	IEGBNI_NW_G_059 Lough Swilly	GWB	*Good*	*0.0175*	0.0263	7.6	0.00008	0.0176	No deterioration in OP indicative WQ status
	IE_NW_G_052 Manor Cunningham	GWB	*Good*	*0.01750*	0.0263	0.4	0.0001	0.0176	No deterioration in OP indicative WQ status
River Finn SAC 002301	UKGBNI5NW250010 Foyle and Faughan Estuaries	TWB	*Summer Good/ Winter Good*	0.0325	0.0363	1.4	0.000005	0.0325	No deterioration in OP indicative WQ status
	IE_NW_G_054 Raphoe	GWB	*Good*	0.0175	0.0263	0.2	0.00001	0.0175	No deterioration in OP indicative WQ status
	Deele (Donegal)_050	RWB	Good	0.0263	0.0325	1.4	0.000006	0.0226	No deterioration in OP indicative WQ status
Derryveagh and Glendowan Mountains SPA 004039	IEGBNI_NW_G_059 Lough Swilly	GWB	*Good*	*0.0175*	0.0263	7.6	0.00008	0.0176	No deterioration in OP indicative WQ status
	IE_NW_39L010100 Leannan_010	RWB	High	0.0122	0.0188	4.4	0.00003	0.0122	No deterioration in OP indicative WQ status
	IE_NW_39L020100 Loughkeel Burn_010	RWB	High	0.0109	0.0188	1.1	0.0002	0.0111	No deterioration in OP indicative WQ status
	IE_NW_39_11 Akibbon	LWB	Good	0.0146	0.0213	4.4	0.00003	0.0146	No deterioration in OP indicative WQ status
	IE_NW_39_12 Gartan	LWB	High	0.0071	0.0075	4.4	0.00003	0.0071	No deterioration in OP indicative WQ status
Lough Fern SPA 004060	IEGBNI_NW_G_059 Lough Swilly	GWB	*Good*	*0.0175*	0.0263	7.6	0.00008	0.0176	No deterioration in OP indicative WQ status
	IE_NW_39_13 Fern	LWB	Good	0.0292	0.0213	92.3	0.0003	0.0295*	No deterioration in OP indicative WQ status

Site Name (Code)	Contributing WB Code_Name	WB Type[3]	Ortho-P[4] Status[5] and Trends[6]	Baseline[7] P Conc.[8,9]	75% of Status Threshold (mg/l)	Cumulative Ortho P load to SW and GW[10]	Modelled Conc.[11] (mg/l)	Baseline Conc. @ 1.0 mg/l dosing rate	Evaluation
	IE_NW_39L010600 Leannan_060	RWB	High	0.0097	0.0188	92.3	0.0003	0.0100	No deterioration in OP indicative WQ status
Lough Swilly SPA 004075	IE_NW_220_0100 Swilly Estuary	TWB	Summer High/ Winter High	0.0160 / 0.0200	0.0188	442.6	0.0007	0.0167/ 0.0207*	No deterioration in OP indicative WQ status
	IE_NW_220_0000 Lough Swilly	CWB	Summer High/ Winter High	0.0025 /0.0190	0.0188	442.6	0.0005	0.0030/ 0.0195	No deterioration in OP indicative WQ status
	IEGBNI_NW_G_059 Lough Swilly	GWB	*Good*	*0.0175*	0.0263	7.6	0.00008	0.0176	No deterioration in OP indicative WQ status
	IE_NW_G_052 Manor Cunningham	GWB	*Good*	*0.0175*	0.0263	0.4	0.0001	0.0176	No deterioration in OP indicative WQ status
	IE_NW_39L050660 Leslie Hill Stream_020	RWB	Bad	*0.1184*	N/A	35.0	0.0006	0.1191	No deterioration in OP indicative WQ status
	IE_NW_39S020300 Swilly (Donegal)_010	RWB	*High*	*0.0125*	0.0188	170.3	0.0014	0.0139	No deterioration in OP indicative WQ status
	IE_NW_39L012000 Carn Low_010	RWB	High	0.0125	0.0188	143.8	0.0005	0.0130	No deterioration in OP indicative WQ status
	IE_NW_39K240610 Knockybrin_010	RWB	*High*	*0.0125*	0.0188	25.8	0.0013	0.0138	No deterioration in OP indicative WQ status
	IE_NW_39N050990 Newmill_010	RWB	*High*	*0.0125*	0.0188	17.0	0.0011	0.0136	No deterioration in OP indicative WQ status
Lough Foyle SPA 004087	UKGBNI5NW250010 Foyle and Faughan Estuaries	TWB	*Summer Good/ Winter Good*	0.0325	0.0363	1.4	0.000005	0.0325	No deterioration in OP indicative WQ status
	GBNIIE6NW250 Lough Foyle	CWB	*Summer High/ Winter High*	0.0125	0.0188	1.4	0.00002	0.0125	No deterioration in OP indicative WQ status
Fanad Head SPA 004148	IE_NW_220_0000 Lough Swilly	CWB	Summer High/ Winter High	0.0025 /0.0190	0.0188	442.6	0.0005	0.0030/ 0.0195*	No deterioration in OP indicative WQ status
	IEGBNI_NW_G_059 Lough Swilly	GWB	*Good*	*0.0175*	0.0263	7.6	0.00008	0.0176	No deterioration in OP indicative WQ status

Site Name (Code)	Contributing WB Code_Name	WB Type[3]	Ortho-P[4] Status[5] and Trends[6]	Baseline[7] P Conc.[8,9]	75% of Status Threshold (mg/l)	Cumulative Ortho P load to SW and GW[10]	Modelled Conc.[11] (mg/l)	Baseline Conc. @ 1.0 mg/l dosing rate	Evaluation
Horn Head to Fanad Head SPA 004194	IE_NW_200_0000 Mulroy Bay Broadwater	CWB	Summer High/ Winter High	0.0057 / 0.0065	0.0188	1.1	0.00002	0.0057/ 0.0065	No deterioration in OP indicative WQ status
	IE_NW_220_0000 Lough Swilly	CWB	Summer High/ Winter High	0.0025 /0.0190	0.0188	442.6	0.0005	0.0030/ 0.0195*	No deterioration in OP indicative WQ status
	IEGBNI_NW_G_059 Lough Swilly	GWB	*Good*	*0.0175*	0.0263	7.6	0.00008	0.0176	No deterioration in OP indicative WQ status

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 OP 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 OP 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 surface waters.

Table 4: Increased loading/concentration due to Orthophosphate Dosing – Dosing rate = 1.0 mg/l P

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
Ramelton Primary Discharge	**OP 2mg/l – Non-Compliant**	Pre-dosing	439	1.64	1.31	2.23
		Post Dosing	510	1.90	1.52	2.59
		% Increase	16%	16%	16%	16%
Ramelton SWOs (1 No.)		Pre-dosing	7	0.12	0.10	0.17
		Post Dosing	9	0.16	0.13	0.22
Churchill Housing Scheme Primary Discharge	**No ELVs**	Pre-dosing	15	5.34	4.27	7.26
		Post Dosing	16	5.88	4.70	8.00
		% Increase	10%	10%	10%	10%
Kilmacreannan Primary Discharge	**OP 0.5mg/l – Non-Compliant**	Pre-dosing	310	1.25	1.00	1.70
		Post Dosing	354	1.43	1.14	1.94
		% Increase	14%	14%	14%	14%
Kilmacreannan SWOs (1 No.)		Pre-dosing	19	0.37	0.30	0.51
		Post Dosing	20	0.40	0.32	0.54
Letterkenny Primary Discharge	**OP 1mg/l - Compliant**	Pre-dosing	573	0.08	0.07	0.11
		Post Dosing	573	0.08	0.07	0.11
		% Increase	0%	0%	0%	0%
Letterkenny SWOs (10 No.)		Pre-dosing	475	0.33	0.26	0.45
		Post Dosing	513	0.36	0.29	0.49
Termon Housing Scheme Primary Discharge	**No ELVs**	Pre-dosing	20	5.34	4.27	7.26
		Post Dosing	23	5.88	4.70	8.00
		% Increase	10%	10%	10%	10%

Ramelton WWTP Agglomeration

Ramelton WWTP provides preliminary treatment, i.e. no chemical dosing for P removal. Therefore the EAM assumes the additional load receives no treatment. The Effluent OP concentration will increase from 1.64 mg/l P to 1.90 mg/l P (16%) as a result of the OP dosing. The primary discharge point is located in the Swilly Estuary transitional waterbody. There is one SWO associated with this WWTP which discharges to the Swilly Estuary transitional waterbody. The SWO concentration will increase from 0.12 mg/l P to 0.17 mg/l P as a result of the OP dosing. The WWTP has and ELV of 2 mg/l TP and is currently non-compliant. The WWTP discharge point is located within **Lough Swilly SAC** and **Lough Swilly SPA**. The SWO discharge point is located within Lough Swilly SAC. The Swilly Estuary TWB has High indicative OP status a summer and winter baseline OP concentration of 0.010 mg/l and 0.020 mg/l P respectively. The modelled concentration for Swilly Estuary is 0.0008 mg/l P and the potential concentration following dosing is 0.011 mg/l P in summer and 0.021 mg/l P in winter.

Churchill Housing Scheme WWTP Agglomeration

Churchill Housing Scheme WWTP provides primary treatment, i.e. no chemical dosing for P removal. Therefore the EAM assumes the additional load receives no treatment. The effluent OP concentration will increase from 5.34 mg/l P to 5.88 mg/l P (10%) as a result of the OP dosing. The primary discharge point is to the Leannan_020 river waterbody upstream of the **Leannan River SAC**. There are no SWOs associated with this WWTP. The Leannan_020 RWB has High indicative OP status a baseline OP concentration of 0.021 mg/l P, a modelled concentration of 0.00004 mg/l P and a potential baseline following dosing of 0.021 mg/l P.

Kilmacrennan WWTP Agglomeration

Kilmacrennan WWTP provides secondary treatment, i.e. no chemical dosing for P removal. Therefore the EAM assumes the additional load receives no treatment. The effluent OP concentration will increase from 1.25 mg/l P to 1.43 mg/l P (14%) as a result of the OP dosing. There is one SWO associated with this WWTP. The SWO concentration will increase from 0.37 mg/l P to 0.40 mg/l P as a result of the OP dosing (7%). The WWTP has an ELV of 0.5 mg/l OP and is currently non-compliant. The primary discharge point and SWO discharge at the same location to the Lurgy River, in the Leannan_050 river waterbody within the **Leannan River SAC**. The Second Draft Sub-basin Management Plan identified that the Kilmacrennan WWTP is a significant point source risk to FPM populations in the Leannan catchment. For the purposes of this assessment the Lurgy section of the Leannan_050 RWB has also been assessed specifically to acknowledge the smaller dilution available in this stretch of the RWB compared to the Leannan_050 RWB. The Lurgy River subsection of the Leannan_050 RWB has High indicative OP status and a baseline OP concentration of 0.0011 mg/l P, a modelled concentration of 0.0014 mg/l P and a potential baseline following dosing of 0.0122 mg/l P.

Letterkenny WWTP Agglomeration

Letterkenny WWTP provides tertiary treatment, i.e. chemical dosing for P removal. Therefore the EAM assumes the additional load will be entirely treated at the plant under current operational management. The effluent OP concentration will remain unchanged, 0.08 mg/l P as a result of the OP dosing. There are ten SWOs associated with this WWTP. The SWOs concentration will increase from 0.33 mg/l P to 0.36 mg/l P as a result of the OP dosing (8%). The WWTP has and ELV of 1.0 mg/l OP and is currently compliant. The primary discharge point is located in the Swilly Estuary transitional waterbody. The Swilly Estuary TWB has High indicative OP status a summer and winter baseline OP concentration of 0.010 mg/l and 0.020 mg/l P respectively. The WWTP discharge point is located within **Lough Swilly SAC**. The SWOs discharge points are located on the Swilly (Donegal)_010 RWB upstream of Swilly Estuary TWB and **Lough Swilly SAC**. Swilly (Donegal)_010 RWB has High indicative OP status and a baseline OP concentration of 0.013 mg/l P.

Termon Housing Scheme WWTP Agglomeration

Termon Housing Scheme WWTP provides primary treatment, i.e. no chemical dosing for P removal. Therefore the EAM assumes the additional load receives no treatment. The effluent OP concentration will increase from 5.34 mg/l P to 5.88 mg/l P (10%) as a result of the OP dosing. The primary discharge

point is to the Leannan_050 river waterbody within the boundaries of the **Leannan River SAC**. There are no SWOs associated with this WWTP.

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 WWTP discharges, 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

- The Loughkeel Burn_010 (IE_NW_38L030400) and Bunlin_010 (IE_NW_38B040100) river waterbodies are hydrologically connected to **Mulroy Bay SAC** (**Table 3**).

- The Carn Low_010 (IE_NW_39L012000), Leannan_010 (IE_NW_39L010100), Leannan_020 (IE_NW_39L010200), Leannan_030 (IE_NW_39L010250), Leannan_040 (IE_NW_39L010300), Leannan_050 (IE_NW_39L010500), Leannan_060 (IE_NW_39L010600), Glashagh (Upper)_010 (IE_NW_39G010200), Glashagh (Upper)_020 (IE_NW_39G010400) river waterbodies are hydrologically connected to the **Leannan River SAC** (**Table 3**).

- The Deele (Donegal)_050 river waterbody is hydrologically connected to the **River Finn SAC (Table 3).**

- The Loughkeel Burn_010 (IE_NW_38L030400) and Leannan_010 (IE_NW_39L010100) river waterbodies are hydrologically connected to the **Derryveagh and Glendowan Mountains SPA** (**Table 3**).

- The Leannan_060 (IE_NW_39L010600) is hydrologically connected to **Lough Fern SPA (Table 3).**

- The Leslie Hill Stream_020 (IE_NW_39L050660), Swilly (Donegal)_010 (IE_NW_39S020300), Carn Low_010 (IE_NW_39L012000), Knockybrin_010 (IE_NW_39K240610), Newmill_010 (IE_NW_39N050990) river waterbodies are hydrologically connected to the **Lough Swilly SPA (Table 3).**

The OP dosing contributes OP load to receiving RWBs via loading from mains leakage and domestic wastewater treatment systems (DWWTS) via subsurface pathways. Loading from mains leakage is estimated at 1,929 kg/yr P of which 1,493 kg/yr P is attenuated along the flow paths. The hydraulic loading from the DWWTS is 444 kg/yr P of which 441 kg/yr P is attenuated along the flow paths. In Leannan_050, Leannan_060, Carn Low_010 and Swilly (Donegal)_010 primary discharges and SWO discharges from WWTPs are a significant proportion of the load. In the Leslie Hill Stream_010 upstream EAMs contribute a significant proportion of the load. The following dosing projects overlap with this project and have been cumulatively assessed by the EAM and considered here: 029 Illies, 103 Milford, 261 Tullyconnell and 136 Glenties Ardara.

The increase in OP concentrations in river waterbodies following dosing is estimated to be as much as 0.0014 mg/l P. The resulting OP concentrations following dosing ranges from 0.006 to 0.046 mg/l P (Appendix C). All RWBs except for the Knockybrin_010, Swilly (Donegal)_010 and Lurgy River subsection of Leannan_050 have predicted dosing concentrations below the 5% significance threshold Good/ High boundary (0.00125mg/l P) (as highlighted in **Table 3**) and therefore there is no risk of deterioration in the OP indicative water quality of these RWBs.

The Knockybrin_010 river waterbody has a predicted modelled dosing concentration of 0.0013 mg/l P and a surrogate 'High' OP indicative water quality status. The predicted post dosing concentration is

within the 75% upper threshold status (0.0188 mg/l P) for this waterbody and therefore there is no risk of deterioration in the WFD OP indicative water quality of this waterbody.

The Swilly (Donegal)_010 river waterbody has a predicted modelled dosing concentration of 0.0014 mg/l P and a surrogate 'High' OP indicative water quality status. The predicted post dosing concentration is within the 75% upper threshold status (0.0188 mg/l P) for this waterbody and therefore there is no risk of deterioration in the WFD OP indicative water quality of this waterbody.

The Lurgy River subsection of Leannan_050 river waterbody has a predicted modelled dosing concentration of 0.0014 mg/l P and a 'Good' OP indicative water quality status. The predicted post dosing concentration is within the 75% upper threshold status (0.0325 mg/l P) for this waterbody and therefore there is no risk of deterioration in the WFD OP indicative water quality of this waterbody.

Groundwater bodies

- Lough Swilly (IEGBNI_NW_G_059) groundwater body is hydrologically connected to **Ballyhoorisky Point to Fanad Head SAC** (**Table 3**).
- Lough Swilly (IEGBNI_NW_G_059) groundwater body is hydrologically connected to **North Inishowen Coast SAC** (**Table 3**).
- Northwest Donegal (IE_NW_G_049) groundwater body is hydrologically connected to **Mulroy Bay SAC** (**Table 3**).
- Lough Swilly (IEGBNI_NW_G_059) groundwater body is hydrologically connected to **Leannan River SAC** (**Table 3**).
- Lough Swilly (IEGBNI_NW_G_059) and Manor Cunningham (IE_NW_G_052) groundwater bodies are hydrologically connected to **Lough Swilly SAC** (**Table 3**).
- Raphoe (IE_NW_G_054) groundwater body is hydrologically connected to **River Finn SAC** (**Table 3**).
- Lough Swilly (IEGBNI_NW_G_059) groundwater body is hydrologically connected to **Derryveagh and Glendowan Mountains SPA** (**Table 3**).
- Lough Swilly (IEGBNI_NW_G_059) groundwater body is hydrologically connected to **Lough Fern SPA** (**Table 3**).
- Lough Swilly (IEGBNI_NW_G_059) and Manor Cunningham (IE_NW_G_052) groundwater bodies are hydrologically connected to **Lough Swilly SPA** (**Table 3**).
- Lough Swilly (IEGBNI_NW_G_059) groundwater body is hydrologically connected to **Fanad Head SPA** (**Table 3**).
- Lough Swilly (IEGBNI_NW_G_059) groundwater body is hydrologically connected to **Horn Head to Fanad Head SPA** (**Table 3**).

The following dosing projects overlap with this project and have been cumulatively assessed by the EAM and considered here: 029 Illies, 103 Milford, 261 Tullyconnell and 136 Glenties Ardara.

The increase in OP concentrations in the GWBs as a result of the OP dosing is up to 0.00008 mg/l P. The resulting OP concentrations in the GWBs following dosing is 0.018 mg/l P (**Table 3**). All GWBs have predicted dosing concentrations below the 5% of Good/ Fail boundary (0.00175mg/l P) (as highlighted

in Table 3) and are within the 75% of upper threshold and therefore there is no risk of deterioration in the WFD OP indicative water quality of these GWBs.

Lake waterbodies

- Akibbon (IE_NW_39_11, Gartan (IE_NW_39_12), Fern (IE_NW_39_13) and Nacally (IE_NW_39_68) lake waterbodies are hydrologically connected to **Leannan River SAC** (**Table 3**).

- Akibbon (IE_NW_39_11 and Gartan (IE_NW_39_12) LWBs are hydrologically connected to **Derryveagh and Glendowan Mountains SPA** (**Table 3**).

- Fern (IE_NW_39_13) LWB is hydrologically connected to **Lough Fern SPA (Table 3).**

The increase in OP concentration in LWBs as a result of OP dosing is up to 0.0003 mg/l TP. The resulting OP concentrations in the LWBs as a result of OP dosing range from 0.0050 mg/l TP to 0.0238 mg/l TP (**Table 3**). All LWBs 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 OP indicative water quality of these LWBs.

Transitional waterbodies

- Swilly Estuary (IE_NW_220_0100) transitional waterbody is hydrologically connected to the **Lough Swilly SAC and Lough Swilly SPA** (**Table 3**).

- Foyle and Faughan Estuaries (UKGBNI5NW250010) transitional waterbody is hydrologically connected to the **River Finn SAC and Lough Foyle SPA** (**Table 3**).

The following dosing projects overlap with this project and have been cumulatively assessed by the EAM and considered here: 029 Illies, 103 Milford, 261 Tullyconnell and 136 Glenties Ardara.

The increase in OP concentrations in the downstream transitional waterbodies as a result of dosing is up to 0.0009 mg/l P. The resulting OP concentrations following dosing range from 0.013 mg/l P to 0.0169 mg/l P. These TWBs 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 OP indicative water quality of these TWBs.

Coastal waterbodies

- Lough Swilly (IE_NW_220_0000) is hydrologically connected to **Ballyhoorisky Point to Fanad Head SAC, North Inishowen Coast SAC, Lough Swilly SAC, Fanad Head SPA** and **Lough Swilly SPA (Table 3).**

- Lough Swilly (IE_NW_220_0000) and Mulroy Bay Broadwater (IE_NW_200_0000) are hydrologically connected to **Horn Head to Fanad Head SPA (Table 3).**

- Mulroy Bay Broadwater (IE_NW_200_0000) is hydrologically connected to **Tranarossan And Melmore Lough SAC, Sheephaven SAC** and **Mulroy Bay SAC (Table 3).**

- Lough Foyle (GBNIIE6NW250) is hydrologically connected to **Lough Foyle SPA (Table 3).**

The following dosing projects overlap with this project and have been cumulatively assessed by the EAM and considered here: 029 Illies, 103 Milford, 261 Tullyconnell and 136 Glenties Ardara.

The increase in OP concentrations in the downstream coastal WBs as a result of dosing are up to 0.0007 mg/l P. The resulting OP concentrations range from 0.0032 mg/l P to 0.0127 mg/l P. These CWBs have a predicted dosing concentration 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 OP indicative water quality of these CWBs.

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 WFD OP indicative water quality of any river, lake, transitional, coastal 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. The OP indicative water quality status 'no deterioration' will be evaluated in the context of AA and the SAC/ SPA QI's in **Section 6**. Evaluation of potential for significant effects.

6. EVALUATION OF POTENTIAL FOR SIGNIFICANT EFFECTS

Impact pathways arising from the proposed construction and operational phases of the project have been investigated. Given the location and scale of the proposed construction works in relation to European sites, no potential construction impact pathways have been identified and therefore no assessment is regard in the context of significant effects for European Sites and their qualifying interests / conservation objectives.

The key pressure associated with the proposed OP dosing is the potential for increased OP levels in the receiving waters and connectivity to the qualifying interest (habitats and species) identified in **Table 1** that are both water dependent and nutrient sensitive (**Appendix C**). Fourteen European sites remain for evaluation of potential for significant effect **Tranarossan and Melmore Lough SAC (000194), Sheephaven SAC (001190), Ballyhoorisky Point to Fanad Head SAC (001975), North Inishowen Coast SAC (002012), Mulroy Bay SAC (002159), Leannan River SAC (002176), Lough Swilly SAC (002287), River Finn SAC (002301), Derryveagh and Glendowan Mountains SPA (004039), Lough Fern SPA (004060), Lough Swilly SPA (004075), Lough Foyle SPA (004087), Fanad Head SPA (004148), Horn Head to Fanad Head SPA (004194)**. The potential for the proposed orthophosphate to give rise to significant effects on these habitats and species, in view of their conservation objectives, are assessed in detail below.

6.1 TRANAROSSAN AND MELMORE LOUGH SAC 000194

6.1.1 (1140) Mudflats and sandflats not covered by seawater at low tide

Mudflats and sandflats habitat was estimated at 28 ha and the SSCOs (NPWS, 2015[12]) state that the conservation objective is to maintain the favourable conservation condition, specifically permanent habitat stable/ increasing and conserve 'Intertidal sand community complex' in a natural condition.

The CO supporting document (NPWS, 2015[13]) require no significant disturbance to communities. Disturbance can be in the form of nutrients, as in a change to the current input which are central to the development, growth and survival of the habitats and communities that exist there.

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 Tranarossan and Melmore Lough SAC. Mud and sand habitat (1140) is associated with transitional and coastal waterbodies, in this case the Mulroy Bay Broadwater coastal waterbody has been assessed. Other surface waterbodies are not connected to this habitat particularly and neither are the groundwater bodies. As such only this coastal waterbody is considered further. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Mulroy Bay Broadwater coastal waterbody (IE_NW_200_0000) and estimated an increase in OP concentrations of up to 0.00002 mg/l P. The resulting OP concentration following dosing is 0.0057 mg/l P for Summer and 0.0065 mg/l P for Winter (**Table 3; Appendix C**). The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Ballymacool WTP on OP indicative water quality statuses have demonstrated that there will be no change in the OP indicative water quality of the Mulroy Bay Broadwater coastal waterbody, there is

[12] NPWS (2015) Conservation Objectives: Tranarossan and Melmore Lough SAC 000194. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
[13] NPWS (2015) Tranarossan and Melmore Lough SAC (000194) Conservation objectives supporting document - Marine habitats [Version 1].

sufficient capacity within the status threshold, and there will be no alteration to water quality meaning there is no potential for significant effects to mud and sand habitat in Tranarossan and Melmore Lough SAC.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of this habitat in the Tranarossan and Melmore Lough SAC / no deterioration of its favourable conservation condition is identified.

6.1.2 (1210) Annual vegetation of drift lines, (2110) Embryonic shifting dunes, (2120) Shifting dunes along the shoreline with *Ammophila arenaria*, (2130) Fixed coastal dunes with herbaceous vegetation (grey dunes), (2140) Decalcified fixed dunes with *Empetrum nigrum*, (2170) Dunes with *Salix repens ssp. argentea* (*Salix arenariae*), (21A0) Machair, (1230) Vegetated sea cliffs of the Atlantic and Baltic coasts, (1395) *Petalophyllum ralfsii* (Petalwort)

Tranarossan and Melmore Lough SAC is designated for a range of coastal habitats and species as listed above that are usually found in close association with each other. The SSCOs (NPWS, 2015[14]) and coastal supporting document (NPWS, 2015[15]) set out the conservation objectives for these habitats and species and are defined by the following list of attributes and targets: Range, Area, Structure and Functions. Functions, is further broken into three attributes, i.e. physical structure, vegetation structure and vegetation composition. This OP dosing project has the potential to impact on the vegetation composition of these habitats increasing the percentage of negative indicator species present.

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 the aforementioned coastal habitats and species in Tranarossan and Melmore Lough SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Mulroy Bay Broadwater coastal waterbody (IE_NW_200_0000) and estimated an increase in OP concentrations of up to 0.00002mg/l P. The resulting OP concentration following dosing is 0.0057 mg/l P for Summer and 0.0065 mg/l P for Winter (**Table 3; Appendix C**). The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Ballymacool WTP on OP indicative water quality statuses have demonstrated that there will be no change in the OP indicative water quality of the Mulroy Bay Broadwater coastal waterbody, 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 aforementioned coastal habitats and species (i.e. 1210, 2110, 2120, 2130, 2140, 2170, 21A0, 1230 and (1395) in Tranarossan and Melmore Lough SAC.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of these habitats and species in the Tranarossan and Melmore Lough SAC / no deterioration of their favourable conservation condition is identified.

6.1.3 (3140) Hard oligo-mesotrophic waters with benthic vegetation of *Chara* sp

Hydrological connectivity between the Letterkenny WSZs OP dosing area and Tranarossan and Melmore Lough SAC is by coastal waterbody only (NPWS, 2015). This hard water lake habitat is therefore not connected to this OP dosing project and so is not discussed further.

[14] NPWS (2015) Conservation Objectives: Tranarossan and Melmore Lough SAC 000194. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
[15] Tranarossan and Melmore Lough SAC (000194) Conservation objectives supporting document - Coastal habitats [Version 1].

6.2 SHEEPHAVEN SAC 001190

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

Mudflats and sandflats habitat was estimated at 766ha and the SSCOs (NPWS, 2014[16]) state that the conservation objective is to maintain the favourable conservation condition, specifically permanent habitat stable/ increasing and conserve 'Sand to coarse sediment with *Pygospio elegans* community complex'; 'Sand with *Angulus tenuis* community complex' in a natural condition.

The CO supporting document (NPWS, 2014[17]) requires no significant disturbance to communities. Disturbance can be in the form of nutrients, as in a change to the current input which are central to the development, growth and survival of the habitats and communities that exist there.

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 Sheephaven SAC. Mud and sand habitat (1140) is associated with transitional and coastal waterbodies, in this case the Mulroy Bay Broadwater coastal waterbody has been assessed. Other surface waterbodies are not connected to this habitat particularly and neither are the groundwater bodies. As such only this coastal waterbody is considered further. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Mulroy Bay Broadwater coastal waterbody (IE_NW_200_0000) and estimated an increase in OP concentrations of up to 0.00002mg/l P. The resulting OP concentration following dosing is 0.0057 mg/l P for Summer and 0.0065 mg/l P for Winter (Table 3; Appendix C). The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Ballymacool WTP on OP indicative water quality statuses have demonstrated that there will be no change in the OP indicative water quality of the Mulroy Bay Broadwater coastal waterbody, 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 mud and sand habitat in Sheephaven Bay SAC.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of this habitat in the Sheephaven Bay SAC / no deterioration of its favourable conservation condition is identified.

6.2.2 (1330) Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*), (1410) Mediterranean salt meadows (*Juncetalia maritimi*), (2120) Shifting dunes along the shoreline with *Ammophila arenaria*, (2130) Fixed coastal dunes with herbaceous vegetation (grey dunes), (21A0) Machair, (1395) *Petalophyllum ralfsii* (Petalwort)

Sheephaven Bay SAC is designated for a range of coastal habitats and species as listed above that are usually found in close association with each other. The SSCOs (NPWS, 2014) and coastal supporting document (NPWS, 2014[18]) set out the conservation objectives for these habitats and species and are defined by the following list of attributes and targets: Range, Area, Structure and Functions. Functions, is further broken into three attributes, i.e. physical structure, vegetation structure and vegetation

[16] NPWS (2014) Conservation Objectives: Sheephaven SAC 001190. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
[17] NPWS (2014) Sheephaven SAC (001190) Conservation objectives supporting document - marine habitats [Version 1].
[18] NPWS (2014) Sheephaven SAC (001190) Conservation objectives supporting document - Coastal habitats [Version 1].

composition. This OP dosing project has the potential to impact on the vegetation composition of these habitats increasing the percentage of negative indicator species present.

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 the aforementioned coastal habitats and species in Sheephaven Bay SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Mulroy Bay Broadwater coastal waterbody (IE_NW_200_0000) and estimated an increase in OP concentrations of up to 0.00002 mg/l P. The resulting OP concentration following dosing is 0.0057 mg/l P for Summer and 0.0065 mg/l P for Winter (**Table 3; Appendix C**). The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Ballymacool WTP on OP indicative water quality statuses have demonstrated that there will be no change in the OP WFD indicative water quality of the Mulroy Bay Broadwater coastal waterbody, 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 aforementioned coastal habitats and species (i.e. 1330, 1410, 2120, 2130, 21A0, and 1395 in Sheephaven Bay SAC.

Furthermore, dosing will not prevent the maintenance and restoration of the favourable conservation condition of these habitats and species in the Sheephaven Bay SAC / no deterioration of their favourable conservation condition is identified.

6.3 BALLYHOORISKY POINT TO FANAD HEAD SAC 001975

6.3.1 (1014) Narrow-mouthed whorl snail (*Vertigo angustior*)

Vertigo angustior is a terrestrial groundwater-dependant species. There is one known site for this species in this SAC on the dunes in Kinlackagh Bay (NPWS, 2017[19]). The target is to maintain the favourable conservation condition. A review of the SSCOs targets and measures for *Vertigo angustior* found no nutrient specific targets for the species (NPWS, 2017). However, the IUCN Red List of threatened species lists eutrophication as a 'main threat' to this species. Increases in P levels would allow higher vegetation to grow and outcompete the yellow sedge and moss habitat that is required by the snail.

Table 3 identifies the groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to narrow-mouthed whorl snail in Ballyhoorisky Point to Fanad Head SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Lough Swilly groundwater body (IEGBNI_NW_G_059) and estimated an increase in OP concentrations of up to 0.0001 mg/l P. The resulting OP concentration following dosing is 0.0176 mg/l P (**Table 3; Appendix C**). The GWB OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this groundwater body.

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Ballymacool WTP on OP indicative water quality statuses have demonstrated that there will be no

[19] NPWS (2017) Conservation Objectives: Ballyhoorisky Point to Fanad Head SAC 001975. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

change in the OP WFD indicative water quality of the Lough Swilly groundwater body, 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 narrow-mouthed whorl snail in Ballyhoorisky Point to Fanad Head SAC.

Furthermore, dosing will not prevent the maintenance or restoration of the favourable conservation condition of this species in the Ballyhoorisky Point to Fanad Head SAC/ no deterioration of its favourable conservation condition is identified.

6.3.2 (1230) Vegetated sea cliffs of the Atlantic and Baltic coasts

Four sub-sites of Vegetated sea cliffs were identified in Ballyhoorisky Point to Fanad Head SAC (NPWS, 2017) all of which fall under the 'hard cliff' definition of sea cliffs. Hard cliffs are composed of rocks which are hard and relatively resistant to erosion. Vegetation of hard sea cliffs in exposed situations exhibits a strong maritime influence and is relatively stable. Sea cliffs can have groundwater influences in the form of flushes or seepages however, in the case of Ballyhoorisky Point to Fanad Head SAC no groundwater seepages or flushes were identified in association with the sea cliffs (NPWS, 2017[20]). In any case were groundwater seepages or flushes to be present, **Table 3** identified Lough Swilly groundwater body as having hydrologically or hydrogeologically connectivity to Vegetated sea cliffs of the Atlantic and Baltic coasts. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Lough Swilly groundwater body (IEGBNI_NW_G_059) and estimated an increase in OP concentrations of up to 0.0001 mg/l P. The resulting OP concentration following dosing is 0.0176 mg/l P (**Table 3; Appendix C**). The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this groundwater body.

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Ballymacool WTP on OP indicative water quality statuses have demonstrated that there will be no change in the OP WFD indicative water quality of the Lough Swilly groundwater body, 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 Vegetated sea cliffs of the Atlantic and Baltic coasts in Ballyhoorisky Point to Fanad Head SAC.

Furthermore, dosing will not prevent the maintenance or restoration of the favourable conservation condition of this habitat in the Ballyhoorisky Point to Fanad Head SAC/ no deterioration of its favourable conservation condition is identified.

6.3.3 (1833) Slender Naiad (*Najas flexilis*) and (3130) Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea, (3140) Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp

The SSCOs (NPWS, 2017) for *Najas flexilis* (1833), Oligotrophic to mesotrophic standing waters (3130), and Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. in Ballyhoorisky Point to Fanad Head SAC with specific relevance to the current project include the attributes 'Lake substratum quality' and 'Water Quality'. For the attribute 'Lake substratum quality' the target is to 'Maintain appropriate substratum type, extent and chemistry to support the vegetation; and for 'Water quality' the targets are: to restore average annual TP concentration of ≤10µg/l TP or ≤10-20 µg/l TP; to maintain the average growing season (March-October) chlorophyll *a* concentration of <5.8µg/l or <5.8 -10µg/l; to maintain

[20] NPWS (2017) Ballyhoorisky Point to Fanad Head SAC (site code: 1975). Conservation objectives supporting document- Coastal habitats Version 1.

high phytoplankton composition status; to maintain trace/absent attached algal biomass (<5% cover) and high phytobenthos status; and to maintain high macrophyte status.

Table 3 identifies the surface waterbodies and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to *Najas flexilis*, 3130 habitat and 3140 habitat in Ballyhoorisky Point to Fanad Head SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Lough Swilly groundwater body (IEGBNI_NW_G_059) and estimated an increase in OP concentrations of up to 0.0001 mg/l P. The resulting OP concentration following dosing is 0.0176 mg/l P (**Table 3; Appendix C**). The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this groundwater body.

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Ballymacool WTP on OP indicative water quality statuses have demonstrated that there will be no change in the OP WFD indicative water quality of the Lough Swilly groundwater body, 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 mentioned lake habitats and associated species (1833, 3130 and 3140) in Ballyhoorisky Point to Fanad Head SAC.

Furthermore, dosing will not prevent the maintenance or restoration of the favourable conservation condition of these habitats and species in the Ballyhoorisky Point to Fanad Head SAC/ no deterioration of their favourable conservation condition is identified.

6.4 NORTH INISHOWEN COAST SAC 002012

6.4.1 (1140) Mudflats and sandflats not covered by seawater at low tide

Mudflats and sandflats habitat was estimated at 988ha and the SSCOs (NPWS, 2014[21]) state that the conservation objective is to maintain the favourable conservation condition, specifically permanent habitat stable/ increasing, maintain community Zostera-dominated community extent and high quality and conserve 'Fine to medium sand with *Eurydice pulchra* community complex; Muddy sand to coarse sediment with *Pygospio elegans* community complex; Sand with *Angulus tenuis* and *Scoloplos (Scoloplos) armiger* community complex' in a natural condition.

The CO supporting document (NPWS, 2014[22]) requires no significant disturbance to communities. Disturbance can be in the form of nutrients, as in a change to the current input which are central to the development, growth and survival of the habitats and communities that exist there.

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 North Inishowen Coast SAC. Mud and sand habitat (1140) is associated with transitional and coastal waterbodies, in this case the Lough Swilly coastal waterbody has been assessed. Other surface waterbodies are not connected to this habitat particularly and neither are the groundwater bodies. As such only this coastal waterbody is considered further. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Lough Swilly coastal waterbody (IE_NW_220_0000) and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0030

[21] NPWS (2014) Conservation Objectives: North Inishowen Coast SAC 002012. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
[22] NPWS (2014) North Inishowen Coast SAC (002012) Conservation objectives supporting document - Marine habitats [Version 1].

mg/l P in summer and 0.0195 mg/l P in winter (**Table 3; Appendix C**). The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High. Baseline Concentration >75% threshold but concentration increase is below significance threshold (0.00125mg/l). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Ballymacool WTP on OP indicative water quality statuses have demonstrated that there will be no change in the OP WFD indicative water quality of the Lough Swilly coastal waterbody, 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 mud and sand habitat in North Inishowen Coast SAC.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of this habitat in the North Inishowen Coast SAC / no deterioration of its favourable conservation condition is identified.

6.4.2 (1230) Vegetated sea cliffs of the Atlantic and Baltic coasts, (2130) Fixed coastal dunes with herbaceous vegetation (grey dunes), (21A0) Machairs

North Inishowen Coast SAC is designated for a range of coastal habitats as listed above that are usually found in close association with each other. The SSCOs (NPWS, 2014) and coastal supporting document (NPWS, 2014[23]) set out the conservation objectives for these habitats and species and are defined by the following list of attributes and targets: Range, Area, Structure and Functions. Functions, is further broken into three attributes, i.e. physical structure, vegetation structure and vegetation composition. This OP dosing project has the potential to impact on the vegetation composition of these habitats increasing the percentage of negative indicator species present.

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 the aforementioned coastal habitats North Inishowen Coast SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Lough Swilly coastal waterbody (IE_NW_220_0000) and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0030 mg/l P in summer and 0.0195 mg/l P in winter (**Table 3; Appendix C**). The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High. Baseline Concentration >75% threshold but concentration increase is below significance threshold (0.00125mg/l). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this coastal waterbody.

- Lough Swilly groundwater body (IEGBNI_NW_G_059) and estimated an increase in OP concentrations of up to 0.0001 mg/l P. The resulting OP concentration following dosing is 0.0176 mg/l P (**Table 3; Appendix C**). The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this groundwater body.

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Ballymacool WTP on OP indicative water quality statuses have demonstrated that there will be no change in the OP WFD indicative water quality of the Lough Swilly coastal waterbody and groundwater body, there is sufficient capacity within the status thresholds, and there will be no alteration to water

[23] NPWS (2104) North Inishowen Coast SAC (002012) Conservation objectives supporting document - Coastal habitats [Version 1].

quality meaning there is no potential for significant effects to the aforementioned coastal habitats in North Inishowen Coast SAC.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of these habitats in the North Inishowen Coast SAC / no deterioration of their favourable conservation condition is identified.

6.4.3 (1014) Narrow-mouthed Whorl Snail (*Vertigo angustior*)

Vertigo angustior is a terrestrial groundwater-dependant species. There are two known sites for this species in this SAC on the sand dunes in the townlands of Lag and Drung and at Tullagh Bay (NPWS, 2014). The target is to maintain the favourable conservation condition. A review of the SSCOs targets and measures for *Vertigo angustior* found no nutrient specific targets for the species (NPWS, 2014). However, the IUCN Red List of threatened species lists eutrophication as a 'main threat' to this species. Increases in P levels would allow higher vegetation to grow and outcompete the yellow sedge and moss habitat that is required by the snail.

Table 3 identifies the groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to narrow-mouthed whorl snail in North Inishowen Coast SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Lough Swilly groundwater body (IEGBNI_NW_G_059) and estimated an increase in OP concentrations of up to 0.0001 mg/l P. The resulting OP concentration following dosing is 0.0176 mg/l P (**Table 3; Appendix C**). The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this groundwater body

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Balymacool WTP on WFD OP indicative water quality have demonstrated that there will be no change in the OP WFD indicative water quality of the Lough Swilly groundwater body, 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 narrow-mouthed whorl snail in North Inishowen Coast SAC.

Furthermore, dosing will not prevent the maintenance or restoration of the favourable conservation condition of this species in the North Inishowen Coast SAC/ no deterioration of its favourable conservation condition is identified.

6.4.4 (1355) Otter (*Lutra lutra*)

The distribution of otter in this SAC is currently estimated at 93.6% and the distribution conservation objective is for no significant decline. A review of the SSCOs (NPWS, 2014) found no specific attributes or targets relating to water quality however 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.

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 North Inishowen Coast SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Lough Swilly coastal waterbody (IE_NW_220_0000) and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0030

mg/l P in summer and 0.0195 mg/l P in winter (**Table 3; Appendix C**). The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High. Baseline Concentration >75% threshold but concentration increase is below significance threshold (0.00125mg/l). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this coastal waterbody.

- Lough Swilly groundwater body (IEGBNI_NW_G_059) and estimated an increase in OP concentrations of up to 0.0001 mg/l P. The resulting OP concentration following dosing is 0.0176 mg/l P (**Table 3; Appendix C**). The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this groundwater body.

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Balymacool WTP on OP indicative water quality statuses have demonstrated that there will be no change in the OP WFD indicative water quality of the Lough Swilly coastal waterbody and groundwater body, there is sufficient capacity within the status thresholds, and there will be no alteration to water quality meaning there is no potential for significant effects to otter in North Inishowen Coast SAC.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of this species in the North Inishowen Coast SAC / no deterioration of its favourable conservation condition is identified.

6.5 MULROY BAY SAC 002159

6.5.1 (1160) Large shallow inlets and bays and (1170) Reefs

'Large shallow inlets and bays' is a large physiographic feature that wholly incorporates 'Reefs' within its area. There are no nutrient specific targets in the SSCO (NPWS, 2012[24]). The attributes and targets that will maintain the favourable conservation condition of this habitat do not make specific reference to water quality and nutrient conditions. The COs supporting document for Marine habitats (NPWS, 2012[25]) does require that activities or operations that cause significant disturbance to communities but may not necessarily represent a continuous or ongoing source of disturbance over time and space may be assessed in a context-specific manner, giving due consideration to the proposed nature and scale of activities during the reporting cycle and the particular resilience of the receiving habitat in combination with other activities within the designated site.

Table 3 identifies the surface waterbodies and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to 'Large shallow inlets and bays' and 'Reefs' in Mulroy Bay SAC.

- Mulroy Bay Broadwater coastal waterbody (IE_NW_200_0000) and estimated an increase in OP concentrations of up to 0.00002mg/l P. The resulting OP concentration following dosing is 0.0057 mg/l P for Summer and 0.0065 mg/l P for Winter (**Table 3; Appendix C**). The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Ballymacool WTP on OP indicative water quality statuses have demonstrated that there will be no

[24] NPWS (2012) Conservation Objectives: Mulroy Bay SAC 002159. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
[25] NPWS (2012) Mulroy Bay SAC (site code: 2159). Conservation objectives supporting document- Marine habitats Version 1.

change in the OP WFD indicative water quality of the Mulroy Bay Broadwater coastal waterbody, 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 these habitats in Mulroy Bay SAC.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of these habitats in the Mulroy Bay SAC / no deterioration of their favourable conservation condition is identified.

6.5.2 (1355) Otter (*Lutra lutra*)

The target for otter distribution based on previous survey findings is 88% positive survey sites; however more recent surveys indicated FCS at 65% and so the overall target is to 'restore' the favourable conservation status. A review of the SSCOs (NPWS, 2012) found no specific attributes or targets relating to water quality however 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.

Table 3 identifies the surface waterbodies and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to otter in Mulroy Bay SAC.

- Mulroy Bay Broadwater coastal waterbody (IE_NW_200_0000) and estimated an increase in OP concentrations of up to 0.00002mg/l P. The resulting OP concentration following dosing is 0.0057 mg/l P for Summer and 0.0065 mg/l P for Winter (**Table 3; Appendix C**). The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this coastal waterbody.

- Loughkeel Burn_010 river waterbody (IE_NW_38L030400) and estimated an increase in OP concentrations of up to 0.0002 mg/l P. The resulting OP concentration following dosing is 0.0111 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. *High*. This river waterbody is not conducive to supporting the fish fauna that form part of the otter's diet however, the modelled dosing concentration is below the level of significance (>0.00125 mg/l) and therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

- Bunlin_010 river waterbody (IE_NW_38B040100) and estimated an increase in OP concentrations of up to 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0131mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. *High*. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

- Northwest Donegal groundwater body (IE_NW_G_049) and estimated an increase in OP concentrations of up to 0.0000004 mg/l P. The resulting OP concentration following dosing is 0.0175 mg/l P (**Table 3; Appendix C**). The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this groundwater body.

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Ballymacool WTP on OP indicative water quality statuses have demonstrated that there will be no

change in the OP WFD indicative water quality of the aforementioned surface and groundwater bodies, there is sufficient capacity within the status threshold, and there will be no alteration to water quality. The baseline 'Moderate' status within the Lough keel Burn river waterbody is not conducive to supporting salmonids which form part of the otter's diet; however, the modelled dosing from the proposed project is below the significance threshold (<0.00125 mg/l P) and therefore will not prevent the restoration to favourable conservation condition. Therefore there is no potential for significant effects to otter in Mulroy Bay SAC.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of otter habitat in the Mulroy Bay SAC / no deterioration of its favourable conservation condition is identified.

6.6 LEANNAN RIVER SAC 002176

6.6.1 (1833) Slender Naiad (*Najas flexilis*) and (3130) Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea*, (3140) Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp

The COs (NPWS, 2018[26]) for the Leannan River are not site specific and so targets and attributes of the neighbouring Ballyhoorisky Point to Fanad Head SAC have been adopted here. Specifically, with relevance to the current project, include the attributes 'Lake substratum quality' and 'Water Quality'. For the attribute 'Lake substratum quality' the target is to 'Maintain appropriate substratum type, extent and chemistry to support the vegetation; and for 'Water quality' the targets are: to restore average annual TP concentration of ≤10µg/l TP (Lough Gartan and Lough Akibbon) or ≤10-20 µg/l TP (Lough Fern); to maintain the average growing season (March-October) chlorophyll a concentration of <5.8µg/l or <5.8 -10µg/l; to maintain high phytoplankton composition status; to maintain trace/absent attached algal biomass (<5% cover) and high phytobenthos status; and to maintain high macrophyte status.

Table 3 identifies the surface waterbodies and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to *Najas flexilis*, 3130 habitat and 3140 habitat in Leannan River SAC, specifically lake water bodies and groundwater bodies. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Lough Swilly groundwater body (IEGBNI_NW_G_059) and estimated an increase in OP concentrations of up to 0.0001 mg/l P. The resulting OP concentration following dosing is 0.0176 mg/l P (**Table 3; Appendix C**). The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this groundwater body.

- Akibbon (IE_NW_39_11) lake waterbody and estimated an increase in TP concentrations of up to 0.00003 mg/l TP. The resulting TP concentration following dosing is 0.0146 mg/l TP (**Table 3; Appendix C**). The LWB WFD TP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l TP). Therefore there is no risk of deterioration in WFD TP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this lake waterbody.

- Gartan (IE_NW_39_12) lake waterbody and estimated an increase in TP concentrations of up to 0.00003 mg/l TP. The resulting TP concentration following dosing is 0.0071 mg/l TP (**Table 3; Appendix C**). The LWB WFD TP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status

[26] NPWS (2018) Conservation objectives for Leannan River SAC [002176]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.

for SW bodies (<0.00125 mg/l TP). Therefore there is no risk of deterioration in WFD TP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this lake waterbody.

- Fern (IE_NW_39_13) lake waterbody and estimated an increase in TP concentrations of up to 0.0003 mg/l TP. The resulting TP concentration following dosing is 0.0295 mg/l TP (**Table 3; Appendix C**). The LWB WFD TP indicative water quality is unchanged following dosing, i.e. Good. Baseline Concentration >75% threshold but concentration increase is below significance threshold (0.00125mg/l). Therefore the relative contribution to baseline conditions negates the risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this lake waterbody.

- Nacally (IE_NW_39_68) lake waterbody and estimated an increase in TP concentrations of up to 0.00003 mg/l TP. The resulting TP concentration following dosing is 0.0050 mg/l TP (**Table 3; Appendix C**). The LWB WFD TP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l TP). Therefore there is no risk of deterioration in WFD TP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this lake waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Ballymacool WTP on TP indicative water quality statuses have demonstrated that there will be no change in the TP WFD indicative water quality of the aforementioned lake waterbodies and groundwater bodies, there is sufficient capacity within the status threshold, and there will be no alteration to water quality. However, baseline TP concentrations in Fern are currently 0.023 mg/l and the abovementioned lake habitats and associated species (1833, 3130 and 3140) require 0.010-0.020 mg/l TP. Therefore the current baseline is not conducive to supporting these habitats and its associated species. However the modelled dosing concentration is <0.00125 mg/l and below the significance threshold.

Furthermore, dosing will not prevent the restoration to favourable conservation condition of the aforementioned lake habitats and its associated species in the Leannan River SAC.

6.6.2 (1029) *Margaritifera margaritifera* (freshwater pearl mussel)

There are no SSCOs (NPWS, 2018) for this SAC, however, the Second Draft Leannan Sub-basin Management Plan (2010)[27] highlights that the population is currently at unfavourable status and in need of restoration. Specific attributes and targets adopted from the River Barrow and River Nore SAC (NPWS, 2011[28]) demonstrate how restoration to favourable conservation condition can be achieved. Targets and attributes relevant to the proposed OP dosing project include:

- Habitat extent: To restore suitable habitat in length of river corresponding to distribution target (i.e. Leannan catchment) and any additional stretches necessary for salmonid spawning;

- Water quality – macroinvertebrates and diatoms: To restore the water quality of the habitat extent to greater than 0.90 for macroinvertebrates and 0.93 for diatoms. These EQRs relate to very high water quality/ oligotrophic conditions); and

- Host fish: Maintain sufficient juvenile salmonids to host glochidial larvae.

[27] http://wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/Second%20Draft%20of%20Leannan%20Sub-Plan%20March.2010.pdf

[28] NPWS (2011) Conservation Objectives: River Barrow and River Nore SAC 002162. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

Table 3 identifies the surface waterbodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to freshwater pearl mussel in Leannan River SAC, specifically surface waterbodies and groundwater bodies. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Carn Low_010 (IE_NW_39L012000) river waterbody and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0130 mg/l P (**Table 3; Appendix C**). The RWB WFD OP status is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there will be no deterioration in OP water quality in this river waterbody arising from this project.

- Leannan_010 (IE_NW_39L010100) river waterbody and estimated an increase in OP concentrations of up to 0.00003 mg/l P. The resulting OP concentration following dosing is i.e. 0.0122 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

- Leannan_020 (IE_NW_39L010200) river waterbody and estimated an increase in OP concentrations of up to 0.00004 mg/l P. The resulting OP concentration following dosing is unchanged, i.e. 0.0107 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

- Leannan_030 (IE_NW_39L010250) river waterbody and estimated an increase in OP concentrations of up to 0.0001 mg/l P. The resulting OP concentration following dosing is 0.0126 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

- Leannan_040 (IE_NW_39L010300) river waterbody and estimated an increase in OP concentrations of up to 0.0001 mg/l P. The resulting OP concentration following dosing is 0.0057 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

- Leannan_050 (IE_NW_39L010500) river waterbody and estimated an increase in OP concentrations of up to 0.0003 mg/l P. The resulting OP concentration following dosing is 0.0074 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). The baseline is not conducive to supporting FPM however, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody and dosing will not prevent the restoration of this waterbody to 'High' status.

- Lurgy_River subsection of the Leannan_050 has also been assessed separate to the Lurgy_010 RWB and the Leannan_050 to acknowledge the importance of this tributary to the Freshwater

Pearl Mussel Population. The Second Draft Leannan Sub-basin Management Plan (2010)[29] highlights that while the population reside in the main Leannan River the Lurgy is an important tributary of the Leannan. Lurgy_River subsection of the Leannan_050 river waterbody estimated an increase in OP concentrations of up to 0.0014 mg/l P. The resulting OP concentration following dosing is 0.0279 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is in exceedance of the significance threshold (0.00125 mg/l P), however predicted post dosing concentration is within the 75% upper threshold status (0.0325 mg/l P) for this waterbody and dosing will not result in a deterioration in this waterbody status. The baseline is not conducive to supporting FPM however, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody and dosing will not prevent the restoration of this waterbody to 'High' status.

- Leannan_060 (IE_NW_39L010600) river waterbody and estimated an increase in OP concentrations of up to 0.0003 mg/l P. The resulting OP concentration following dosing is 0.0100 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

- Glashagh (Upper)_010 (IE_NW_39G010200) river waterbody and estimated an increase in OP concentrations of up to 0.0002 mg/l P. The resulting OP concentration following dosing is 0.0127 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. *High*. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

- Glashagh (Upper)_020 (IE_NW_39G010400) river waterbody and estimated an increase in OP concentrations of up to 0.0003 mg/l P. The resulting OP concentration following dosing is 0.0079 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. *High*. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Ballymacool WTP on OP indicative water quality statuses have demonstrated that there will be no change in the OP indicative water quality statuses of the aforementioned waterbodies. The baselines are all within the 75% threshold with the exception of Carn Low_010 and the Leannan_020. In these two RWBs the modelled dosing concentration does not exceed the significance threshold and therefore there is no risk of deterioration in water quality and therefore there is no potential for significant effects to Freshwater Pearl Mussel in Leannan River SAC.

Furthermore, dosing will not prevent the restoration to favourable conservation condition of Freshwater Pearl Mussel in the Leannan River SAC.

6.6.3 (1355) *Lutra lutra* (Otter)

A review of the COs for otter (NPWS, 2018) found no specific attributes or targets relating to water quality however the National Parks and Wildlife Service's Threat Response Plan for the Otter (NPWS,

29 http://wfdireland.ie/docs/5_FreshwaterPearlMusselPlans/Freshwater%20Pearl%20Mussel%20Plans%20March%202010/Second%20Draft%20of%20Leannan%20Sub-Plan%20March.2010.pdf

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 the species 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. The current FCS target is for 88% however, the current range is 65% and so the CO for otter in the River Finn SAC is to restore the favourable conservation condition. 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 Leannan River SAC.

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

- Akibbon (IE_NW_39_11) lake waterbody and estimated an increase in TP concentrations of up to 0.00003 mg/l TP. The resulting TP concentration following dosing is 0.0146 mg/l TP (**Table 3; Appendix C**). The LWB WFD TP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l TP). Therefore there is no risk of deterioration in WFD TP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this lake waterbody.

- Gartan (IE_NW_39_12) lake waterbody and estimated an increase in TP concentrations of up to 0.00003 mg/l TP. The resulting TP concentration following dosing is 0.0071 mg/l TP (**Table 3; Appendix C**). The LWB WFD TP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l TP). Therefore there is no risk of deterioration in WFD TP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this lake waterbody.

- Fern (IE_NW_39_13) lake waterbody and estimated an increase in TP concentrations of up to 0.0003 mg/l TP. The resulting TP concentration following dosing is 0.0295 mg/l TP (**Table 3; Appendix C**). The LWB WFD TP indicative water quality is unchanged following dosing, i.e. Good. Baseline Concentration >75% threshold but concentration increase is below significance threshold (0.00125mg/l). Therefore the relative contribution to baseline conditions negates the risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this lake waterbody.

- Nacally (IE_NW_39_68) lake waterbody and estimated an increase in TP concentrations of up to 0.00003 mg/l TP. The resulting TP concentration following dosing is 0.0050 mg/l TP (**Table 3; Appendix C**). The LWB WFD TP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l TP). Therefore there is no risk of deterioration in WFD TP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this lake waterbody.

- Carn Low_010 (IE_NW_39L012000) river waterbody and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0130 mg/l P (**Table 3; Appendix C**). The RWB WFD OP status is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there will be no deterioration in OP water quality in this river waterbody arising from this project.
- Leannan_010 (IE_NW_39L010100) river waterbody and estimated an increase in OP concentrations of up to 0.00003 mg/l P. The resulting OP concentration following dosing is i.e. 0.0122 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of

deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

- Leannan_020 (IE_NW_39L010200) river waterbody and estimated an increase in OP concentrations of up to 0.00004 mg/l P. The resulting OP concentration following dosing is unchanged, i.e. 0.0107 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.
- Leannan_030 (IE_NW_39L010250) river waterbody and estimated an increase in OP concentrations of up to 0.0001 mg/l P. The resulting OP concentration following dosing is 0.0126 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.
- Leannan_040 (IE_NW_39L010300) river waterbody and estimated an increase in OP concentrations of up to 0.0001 mg/l P. The resulting OP concentration following dosing is 0.0057 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.
- Leannan_050 (IE_NW_39L010500) river waterbody and estimated an increase in OP concentrations of up to 0.0003 mg/l P. The resulting OP concentration following dosing is 0.0074 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). The baseline is not conducive to supporting FPM however, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody and dosing will not prevent the restoration of this waterbody to 'High' status.
- Lurgy_River subsection of the Leannan_050 has also been assessed separate to the Lurgy_010 RWB and the Leannan_050 to acknowledge the importance of this tributary to the Freshwater Pearl Mussel Population. The Second Draft Leannan Sub-basin Management Plan (2010)[30] highlights that while the population reside in the main Leannan River the Lurgy is an important tributary of the Leannan. Lurgy_River subsection of the Leannan_050 river waterbody estimated an increase in OP concentrations of up to 0.0014 mg/l P. The resulting OP concentration following dosing is 0.0279 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is in exceedance of the significance threshold (0.00125 mg/l P), however predicted post dosing concentration is within the 75% upper threshold status (0.0325 mg/l P) for this waterbody and dosing will not result in a deterioration in this waterbody status. The baseline is not conducive to supporting FPM however, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody and dosing will not prevent the restoration of this waterbody to 'High' status.
- Leannan_060 (IE_NW_39L010600) river waterbody and estimated an increase in OP concentrations of up to 0.0003 mg/l P. The resulting OP concentration following dosing is 0.0100 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.
- Glashagh (Upper)_010 (IE_NW_39G010200) river waterbody and estimated an increase in OP concentrations of up to 0.0002 mg/l P. The resulting OP concentration following dosing is

0.0127 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. *High*. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

- Glashagh (Upper)_020 (IE_NW_39G010400) river waterbody and estimated an increase in OP concentrations of up to 0.0003 mg/l P. The resulting OP concentration following dosing is 0.0079 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. *High*. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Ballymacool WTP on OP indicative water quality statuses have demonstrated that there will be no change in the OP indicative water quality statuses of the aforementioned waterbodies. The baselines are all within the 75% threshold with the exception of Carn Low_010 and the Leannan_020. In these two RWBs the modelled dosing concentration does not exceed the significance threshold and therefore there is no risk of deterioration in water quality and therefore there is no potential for significant effects to otter in Leannan River SAC.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of otter habitat in the Leannan River SAC / no deterioration of its favourable conservation condition is identified.

6.6.4 (1106) *Salmo salar* (Salmon)

The COs for salmon in the Leannan River SAC (NPWS, 2018) are to 'maintain' or 'restore' favourable conservation condition. SSCOs are not available and so SSCOs from nearby River Finn SAC are adopted here. The distribution target refers to '% river accessible'. Water quality is a particular threat to salmon King et al. (2011) highlight the deterioration in water quality and ongoing point and diffuse sources of pollution as a key threat to salmon including the potential effects from municipal discharges. The SSCO (NPWS, 2017) requires that the spawning habitat should not be reduced. Deterioration in water quality has the potential for a detrimental effect on spawning habitats, particularly where nutrient conditions result in excessive algal growth and macrophyte abundance, leading to smothering, shading effects, alteration of macroinvertebrate communities and silt deposition. The SSCO for salmon also requires a Q-value of at least 4, which equates to good ecological status.

Table 3 identifies the surface waterbodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to freshwater pearl mussel in Leannan River SAC, specifically lake water bodies and groundwater bodies. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Akibbon (IE_NW_39_11) lake waterbody and estimated an increase in TP concentrations of up to 0.00003 mg/l TP. The resulting TP concentration following dosing is 0.0146 mg/l TP (**Table 3; Appendix C**). The LWB WFD TP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l TP). Therefore there is no risk of deterioration in WFD TP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this lake waterbody.

- Gartan (IE_NW_39_12) lake waterbody and estimated an increase in TP concentrations of up to 0.00003 mg/l TP. The resulting TP concentration following dosing is 0.0071 mg/l TP (**Table 3; Appendix C**). The LWB WFD TP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l TP). Therefore there is no risk of deterioration in WFD TP

indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this lake waterbody.

- Fern (IE_NW_39_13) lake waterbody and estimated an increase in TP concentrations of up to 0.0003 mg/l TP. The resulting TP concentration following dosing is 0.0295 mg/l TP (**Table 3; Appendix C**). The LWB WFD TP indicative water quality is unchanged following dosing, i.e. Good. Baseline Concentration >75% threshold but concentration increase is below significance threshold (0.00125mg/l). Therefore the relative contribution to baseline conditions negates the risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this lake waterbody.

- Nacally (IE_NW_39_68) lake waterbody and estimated an increase in TP concentrations of up to 0.00003 mg/l TP. The resulting TP concentration following dosing is 0.0050 mg/l TP (**Table 3; Appendix C**). The LWB WFD TP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l TP). Therefore there is no risk of deterioration in WFD TP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this lake waterbody.

- Carn Low_010 (IE_NW_39L012000) river waterbody and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0130 mg/l P (**Table 3; Appendix C**). The RWB WFD OP status is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there will be no deterioration in OP water quality in this river waterbody arising from this project.

- Leannan_010 (IE_NW_39L010100) river waterbody and estimated an increase in OP concentrations of up to 0.00003 mg/l P. The resulting OP concentration following dosing is i.e. 0.0122 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

- Leannan_020 (IE_NW_39L010200) river waterbody and estimated an increase in OP concentrations of up to 0.00004 mg/l P. The resulting OP concentration following dosing is unchanged, i.e. 0.0107 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

- Leannan_030 (IE_NW_39L010250) river waterbody and estimated an increase in OP concentrations of up to 0.0001 mg/l P. The resulting OP concentration following dosing is 0.0126 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

- Leannan_040 (IE_NW_39L010300) river waterbody and estimated an increase in OP concentrations of up to 0.0001 mg/l P. The resulting OP concentration following dosing is 0.0057 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of

deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

- Leannan_050 (IE_NW_39L010500) river waterbody and estimated an increase in OP concentrations of up to 0.0003 mg/l P. The resulting OP concentration following dosing is 0.0074 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). The baseline is not conducive to supporting FPM however, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody and dosing will not prevent the restoration of this waterbody to 'High' status.

- Lurgy_River subsection of the Leannan_050 has also been assessed separate to the Lurgy_010 RWB and the Leannan_050 to acknowledge the importance of this tributary to the Freshwater Pearl Mussel Population. The Second Draft Leannan Sub-basin Management Plan (2010)[31] highlights that while the population reside in the main Leannan River the Lurgy is an important tributary of the Leannan. Lurgy_River subsection of the Leannan_050 river waterbody estimated an increase in OP concentrations of up to 0.0014 mg/l P. The resulting OP concentration following dosing is 0.0279 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is in exceedance of the significance threshold (0.00125 mg/l P), however predicted post dosing concentration is within the 75% upper threshold status (0.0325 mg/l P) for this waterbody and dosing will not result in a deterioration in this waterbody status. The baseline is not conducive to supporting FPM however, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody and dosing will not prevent the restoration of this waterbody to 'High' status.

- Leannan_060 (IE_NW_39L010600) river waterbody and estimated an increase in OP concentrations of up to 0.0003 mg/l P. The resulting OP concentration following dosing is 0.0100 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

- Glashagh (Upper)_010 (IE_NW_39G010200) river waterbody and estimated an increase in OP concentrations of up to 0.0002 mg/l P. The resulting OP concentration following dosing is 0.0127 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. *High*. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

- Glashagh (Upper)_020 (IE_NW_39G010400) river waterbody and estimated an increase in OP concentrations of up to 0.0003 mg/l P. The resulting OP concentration following dosing is 0.0079 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. *High*. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Ballymacool WTP on OP indicative water quality statuses have demonstrated that there will be no change in the OP indicative water quality statuses of the aforementioned waterbodies. The baselines

are all within the 75% threshold with the exception of Carn Low_010 and the Leannan_020. In these two RWBs the modelled dosing concentration does not exceed the significance threshold and therefore there is no risk of deterioration in water quality and therefore there is no potential for significant effects to salmon in Leannan River SAC.

Furthermore, dosing will not prevent the maintenance or restoration of the favourable conservation condition of salmon habitat in the Leannan River SAC / no deterioration of its favourable conservation condition is identified.

6.7 LOUGH SWILLY SAC 002287

6.7.1 (1130) Estuaries

The attributes and targets that will maintain the favourable conservation condition of this habitat in Lough Swilly SAC do not make specific reference to water quality and nutrient conditions (NPWS, 2011[32]); however, there is a requirement to conserve community types in their natural conditions (NPWS, 2011e[33]). The COs supporting document for Marine habitats does require that activities or operations that cause significant disturbance to communities but may not necessarily represent a continuous or ongoing source of disturbance over time and space may be assessed in a context -specific manner, giving due consideration to the proposed nature and scale of activities during the reporting cycle and the particular resilience of the receiving habitat in combination with other activities within the designated site. The attribute and target relevant to this project is as follows: to conserve 'Fine sand community complex; Intertidal mixed sediment with polychaetes; Subtidal mixed sediment with polychaetes and bivalves; Muddy fine sand with *Thyasira flexuosa*; Mud community complex and *Ostrea edulis* dominated Community' in a natural condition.

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

- Lough Swilly coastal waterbody (IE_NW_220_0000) and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0030 mg/l P in summer and 0.0195 mg/l P in winter (Table 3; Appendix C). The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High. Baseline Concentration >75% threshold but concentration increase is below significance threshold (0.00125mg/l). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this coastal waterbody.

- Swilly Estuary transitional waterbody (IE_NW_220_0100) and estimated an increase in OP concentrations of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0167 mg/l P in summer and 0.0207 mg/l P in winter (**Table 3; Appendix C**). The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High. Baseline Concentration >75% threshold but concentration increase is below significance threshold (0.00125mg/l). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this transitional waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Ballymacool WTP on WFD OP statuses have demonstrated that there will be no change in the OP WFD indicative water quality of the above mentioned surface waterbodies and groundwater bodies, there is

[32] NPWS (2011) Conservation Objectives: Lough Swilly SAC 002287 and Lough Swilly SPA 004075. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
[33] NPWS (2011) Lough Swilly SAC (002287) Conservation objectives supporting document - marine habitats [Version 1].

sufficient capacity within the status threshold, and there will be no alteration to water quality meaning there is no potential for significant effects to estuarine habitat in Lough Swilly SAC.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of estuarine habitat in Lough Swilly SAC / no deterioration of its favourable conservation condition is identified.

6.7.2 (1150) Coastal lagoons

Two coastal lagoons have been identified in Lough Swilly SAC, Inch and Blanket Nook and described in the SSCOs (NPWS, 2011). There is currently a restoration target for the MRP concentration in coastal lagoons in this SAC. Annual median MRP needs to be reduced to <0.01 mg/l at Inch and <0.02 mg/l at Blanket Nook.

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

- Lough Swilly groundwater body (IEGBNI_NW_G_059) and estimated an increase in OP concentrations of up to 0.0001 mg/l P. The resulting OP concentration following dosing is unchanged remaining at 0.0176 mg/l P (**Table 3; Appendix C**). The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this groundwater body.

- Lough Swilly coastal waterbody (IE_NW_220_0000) and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0030 mg/l P in summer and 0.0195 mg/l P in winter (Table 3; Appendix C). The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High. Baseline Concentration >75% threshold but concentration increase is below significance threshold (0.00125mg/l). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this coastal waterbody.

- Swilly Estuary transitional waterbody (IE_NW_220_0100) and estimated an increase in OP concentrations of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0167 mg/l P in summer and 0.0207 mg/l P in winter (**Table 3; Appendix C**). The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High. Baseline Concentration >75% threshold but concentration increase is below significance threshold (0.00125mg/l). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this transitional waterbody.

- Manor Cunningham groundwater body (IE_NW_G_052) and estimated an increase in OP concentrations of up to 0.0001 mg/l P. The resulting OP concentration following dosing is unchanged remaining at 0.0176 mg/l P (**Table 3; Appendix C**). The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this groundwater body.

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Ballymacool WTP on WFD OP statuses have demonstrated that there will be no change in the OP WFD indicative water quality of the above mentioned surface waterbodies and groundwater bodies, 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 coastal lagoons arising from this project in Lough Swilly SAC.

Furthermore, dosing will not prevent the restoration of the favourable conservation condition of coastal lagoon habitat in Lough Swilly SAC.

6.7.3 (1330) Atlantic salt *meadows* (Glauco-Puccinellietalia maritimae)

Five sub-sites of Atlantic salt meadows have been mapped in Lough Swilly SAC. The SSCOs (NPWS, 2011) and coastal supporting document (NPWS, 2011[34]) set out the conservation objectives for this habitat and are defined by the following list of attributes and targets: Range, Area, Structure and Functions. Functions, is further broken into three attributes, i.e. physical structure, vegetation structure and vegetation composition. This OP dosing project has the potential to impact on the vegetation composition of these habitats increasing the percentage of negative indicator species present.

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

- Lough Swilly groundwater body (IEGBNI_NW_G_059) and estimated an increase in OP concentrations of up to 0.0001 mg/l P. The resulting OP concentration following dosing is unchanged remaining at 0.0176 mg/l P (**Table 3; Appendix C**). The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this groundwater body.

- Lough Swilly coastal waterbody (IE_NW_220_0000) and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0030 mg/l P in summer and 0.0195 mg/l P in winter (Table 3; Appendix C). The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High. Baseline Concentration >75% threshold but concentration increase is below significance threshold (0.00125mg/l). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this coastal waterbody.

- Swilly Estuary transitional waterbody (IE_NW_220_0100) and estimated an increase in OP concentrations of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0167 mg/l P in summer and 0.0207 mg/l P in winter (**Table 3; Appendix C**). The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High. Baseline Concentration >75% threshold but concentration increase is below significance threshold (0.00125mg/l). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this transitional waterbody.

- Manor Cunningham groundwater body (IE_NW_G_052) and estimated an increase in OP concentrations of up to 0.0001 mg/l P. The resulting OP concentration following dosing is unchanged remaining at 0.0176 mg/l P (**Table 3; Appendix C**). The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this groundwater body.

[34] NPWS (2011) Lough Swilly SAC (002287) Conservation objectives supporting document - coastal habitats [Version 1]

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Ballymacool WTP on WFD OP statuses have demonstrated that there will be no change in the OP WFD indicative water quality of the above mentioned surface waterbodies and groundwater bodies, 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 salt meadow habitat arising from this project in Lough Swilly SAC.

Furthermore, dosing will not prevent the restoration of the favourable conservation condition of coastal lagoon habitat in Lough Swilly SAC.

6.7.4 (1355) *Lutra lutra* (Otter)

A review of the SSCOs for otter (NPWS, 2017) found no specific attributes or targets relating to water quality however 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 the species 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. The current FCS target is for 88% however, the current range is 65% and so the CO for otter in the River Finn SAC is to restore the favourable conservation condition. 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 River Finn SAC.

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

- Lough Swilly groundwater body (IEGBNI_NW_G_059) and estimated an increase in OP concentrations of up to 0.0001 mg/l P. The resulting OP concentration following dosing is unchanged remaining at 0.0176 mg/l P (**Table 3; Appendix C**). The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this groundwater body.

- Lough Swilly coastal waterbody (IE_NW_220_0000) and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0030 mg/l P in summer and 0.0195 mg/l P in winter (Table 3; Appendix C). The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High. Baseline Concentration >75% threshold but concentration increase is below significance threshold (0.00125mg/l). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this coastal waterbody.

- Swilly Estuary transitional waterbody (IE_NW_220_0100) and estimated an increase in OP concentrations of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0167 mg/l P in summer and 0.0207 mg/l P in winter (**Table 3; Appendix C**). The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High. Baseline Concentration >75% threshold but concentration increase is below significance threshold (0.00125mg/l). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this transitional waterbody.

- Manor Cunningham groundwater body (IE_NW_G_052) and estimated an increase in OP concentrations of up to 0.0001 mg/l P. The resulting OP concentration following dosing is unchanged remaining at 0.0176 mg/l P (**Table 3; Appendix C**). The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is

below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this groundwater body.

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Ballymacool WTP on WFD OP statuses have demonstrated that there will be no change in the OP WFD indicative water quality of the above mentioned surface waterbodies and groundwater bodies, 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 otter habitat arising from this project in Lough Swilly SAC.

Furthermore, dosing will not prevent the restoration of the favourable conservation condition of otter in Lough Swilly SAC.

6.8 RIVER FINN SAC 002301

6.8.1 (3110) Oligotrophic waters containing very few minerals of sandy plains

Lake habitat 3110 is likely to occur in Lough Derg, Finn and Belshade lakes. These lakes are upstream of the dosing area and therefore no hydrological connectivity has been established (NPWS, 2017[35]). This habitat is therefore not assessed any further.

6.8.2 (4010) Northern Atlantic wet heaths with Erica tetralix, (7130) Blanket bogs (*if active bog), (7140) Transition mires and quaking bogs

Heath (4010) and bog habitat (7130 and 7140) are reported to occur in the upland areas of the SAC and therefore no hydrological connectivity has been established (NPWS, 2017). These habitats are therefore not assessed any further.

6.8.3 *Salmo salar* (Salmon)

The SSCOs for salmon in the freshwater reaches of the River Finn SAC (NPWS, 2017) are to 'maintain' favourable conservation condition. The distribution target refers to '% river accessible' and therefore hydrological connectivity between the Letterkenny WSZs and River Finn SAC has been established and shown that the Deele (Donegal)_030 receives OP dosed water. Water quality is a particular threat to salmon King *et al*. (2011) highlight the deterioration in water quality and ongoing point and diffuse sources of pollution as a key threat to salmon including the potential effects from municipal discharges. The SSCO (NPWS, 2017) requires that the spawning habitat should not be reduced. Deterioration in water quality has the potential for a detrimental effect on spawning habitats, particularly where nutrient conditions result in excessive algal growth and macrophyte abundance, leading to smothering, shading effects, alteration of macroinvertebrate communities and silt deposition. The SSCO for salmon also requires a Q-value of at least 4, which equates to good ecological status.

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

- Deele (Donegal)_030 river waterbody and estimated an increase in OP concentrations of up to 0.00001 mg/l P. The resulting OP concentration following dosing is 0.0263 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

[35] NPWS (2017) Conservation Objectives: River Finn SAC 002301. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Ballymacool WTP on WFD OP statuses have demonstrated that there will be no change in the OP WFD indicative water quality of the above mentioned waterbody, 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 habitats associated with salmon in River Finn SAC.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of salmon in River Finn SAC / no deterioration of its favourable conservation condition is identified.

6.8.4 *Lutra lutra* (Otter)

A review of the SSCOs for otter (NPWS, 2017) found no specific attributes or targets relating to water quality however 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 the species 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. The current FCS target is for 88% however, the current range is 93.6% and so the CO for otter in the River Finn SAC is to maintain the favourable conservation condition. 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 River Finn SAC.

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

- Raphoe groundwater body (IE_NW_G_054) and estimated an increase in OP concentrations of up to 0.00001 mg/l P. The resulting OP concentration following dosing is 0.0175 mg/l P (**Table 3; Appendix C**). The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this groundwater body.

- Foyle and Faughan Estuaries transitional waterbody (UKGBNI5NW250010) and estimated an increase in OP concentrations of up to 0.000005 mg/l P. The resulting OP concentration following dosing for summer and winter 0.0325 mg/l P in summer and winter (**Table 3; Appendix C**). The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this transitional waterbody.

- Deele (Donegal)_030 river waterbody and estimated an increase in OP concentrations of up to 0.00001 mg/l P. The resulting OP concentration following dosing is 0.0263 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Ballymacool WTP on WFD OP statuses have demonstrated that there will be no change in the OP WFD indicative water quality of the above mentioned surface waterbodies and groundwater body, 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 otter in River Finn SAC.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of otter in River Finn SAC / no deterioration of its favourable conservation condition is identified.

6.9 DERRYVEAGH AND GLENDOWAN MOUNTAINS SPA 004039

Derryveagh and Glendowan Mountains SPA in north-west Donegal, is an extensive upland area (300 – 678 m) comprising Glenveagh National Park, a substantial part of the Derryveagh and Glendowan Mountains and a number of the surrounding lakes. The site is an SPA for (A001) Red-throated Diver

(A098) Merlin, (A103) Peregrine, (A140) Golden Plover, (A466) Dunlin. The COs (NPWS, 2016[36]) are to maintain or restore the favourable conservation condition of the above listed bird species.

Table 3 identifies the surface waterbodies and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to the above listed bird species in Derryveagh and Glendowan Mountains SPA. It is assumed that bird species have the potential to interact with all surface waterbodies and groundwater bodies (via seepages) identified in **Table 3**. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Lough Swilly groundwater body (IEGBNI_NW_G_059) and estimated an increase in OP concentrations of up to 0.0001 mg/l P. The resulting OP concentration following dosing is unchanged remaining at 0.0176 mg/l P (**Table 3; Appendix C**). The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this groundwater body.

- Akibbon (IE_NW_39_11) lake waterbody and estimated an increase in TP concentrations of up to 0.00003 mg/l. The resulting TP concentration following dosing is 0.0165 mg/l (**Table 3; Appendix C**). The LWB WFD TP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this lake waterbody.

- Gartan (IE_NW_39_12) lake waterbody and estimated an increase in TP concentrations of up to 0.00003 mg/l. The resulting TP concentration following dosing is unchanged remaining at 0.0071 mg/l (**Table 3; Appendix C**). The LWB WFD TP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this lake waterbody.

- Leannan_010 (IE_NW_39L010100) river waterbody and estimated an increase in OP concentrations of up to 0.00003 mg/l P. The resulting OP concentration following dosing is i.e. 0.0122 mg/l P (Table 3; Appendix C). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of

[36] NPWS (2018) Conservation objectives for Derryveagh and Glendowan Mountains SPA [004039]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.

deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

- Loughkeel Burn_010 (IE_NW_39L020100) river waterbody and estimated an increase in OP concentrations of up to 0.0002 mg/l P. The resulting OP concentration following dosing is 0.0111 mg/l P (**Table 3; Appendix C**). The RWB WFD OP status is unchanged following dosing, i.e. High. This water quality may not be conducive to supporting the above listed bird species. However the modelled dosing concentration of the proposed project is below the significance threshold (>0.00125) and therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Ballymacool WTP on WFD OP/TP statuses have demonstrated that there will be no change in the OP/TP WFD status 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 habitats associated with the above mentioned bird species in Derryveagh and Glendowan Mountains SPA.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of these species in Derryveagh and Glendowan Mountains SPA / no deterioration of their favourable conservation condition is identified.

6.10 LOUGH FERN SPA 004060

Lough Fern SPA comprises Lough Fern, a relatively small lake (2.5 km length) situated on the Leannan River in Co. Donegal. The site is an SPA for (A059) Pochard and (A999) Wetland and Waterbirds. The COs (NPWS, 2016[37]) are to maintain or restore the favourable conservation condition of the Pochard and the habitat Wetlands and waterbirds.

Table 3 identifies the surface waterbodies and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to Corncrake in Fanad Head SPA. It is assumed that bird species have the potential to interact with all surface waterbodies and groundwater bodies (via seepages) identified in **Table 3**. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Lough Swilly groundwater body (IEGBNI_NW_G_059) and estimated an increase in OP concentrations of up to 0.0001 mg/l P. The resulting OP concentration following dosing is unchanged remaining at 0.0176 mg/l P (Table 3; Appendix C). The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this groundwater body.

- Fern (IE_NW_39_13) lake waterbody and estimated an increase in OP concentrations of up to 0.0003 mg/l TP. The resulting TP concentration following dosing is 0.00295 mg/l TP (**Table 3; Appendix C**). The LWB WFD TP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

- Leannan_060 (IE_NW_39L010600) river waterbody and estimated an increase in OP concentrations of up to 0.0003 mg/l P. The resulting OP concentration following dosing is 0.0100

[37] NPWS (2018) Conservation objectives for Lough Fern SPA [004060]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.

mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Ballymacool WTP on WFD OP/TP statuses have demonstrated that there will be no change in the OP/TP WFD indicative water quality of the above mentioned waterbodies, and there will be no alteration to water quality meaning there is no potential for significant effects to habitats associated with the above mentioned bird species in Lough Fern SPA.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of bird species and wetlands habitat in Lough Fern SPA / no deterioration of their favourable conservation condition is identified.

6.11 LOUGH SWILLY SPA 004075

Lough Swilly SPA comprises the inner part of Lough Swilly from just east of Letterkenny northwards to Killygarvan on the west side and Buncrana on the east side; and incorporates Inch Lough. The site is characterised by improved pasture and arable fields – important to geese and swans; estuarine habitat of the River Swilly, the River Leannan and the Isle Burn and the predominant habitat is a series of extensive sand and mud flats which are exposed at low tide - both estuaries and sand/mud flats. The site is an SPA for: (A005) Great Crested Grebe, (A028) Grey Heron, (A038) Whooper Swan, (A043) Greylag Goose, (A048) Shelduck, (A050) Wigeon, (A052) Teal, (A053) Mallard, (A056) Shoveler, (A062) Scaup, (A067) Goldeneye, (A069) Red-breasted Merganser, (A125) Coot, (A130) Oystercatcher, (A143) Knot, (A149) Dunlin, (A160) Curlew, (A162) Redshank, (A164) Greenshank, (A179) Black-headed Gull, (A182) Common Gull, (A191) Sandwich Tern, (A193) Common Tern, (A395) Greenland White-fronted Goose and Wetland and Waterbirds (A999). The SSCOs (NPWS, 2014[38]) for Lough Swilly SPA list targets for each species, 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.

Furthermore, the permanent area occupied by the wetland habitat (A999 – Wetlands) should be stable and not significantly lessened, other than that occurring from natural patterns of variation.

Changes in organic and nutrient loading to an estuary may have various consequences for the ecology of the estuarine system including changes in the abundances of some benthic invertebrates that form prey species for water birds (e.g. Burton et al. 2002[39]). This could have knock-on effects upon water bird foraging distribution, prey intake rates, and ultimately upon survival and fitness.

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

[38] NPWS (2011) Conservation Objectives: Lough Swilly SAC 002287 and Lough Swilly SPA 004075. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

[39] 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.

- Lough Swilly coastal waterbody (IE_NW_220_0000) and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0030 mg/l P in summer and 0.0195 mg/l P in winter (Table 3; Appendix C). The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this coastal waterbody.

- Swilly Estuary transitional waterbody (IE_NW_220_0100) and estimated an increase in OP concentrations of up to 0.0007 mg/l P. The resulting OP concentration following dosing is 0.0167 mg/l P in summer and 0.0207 mg/l P in winter (**Table 3; Appendix C**). The TWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this transitional waterbody.

- Lough Swilly groundwater body (IEGBNI_NW_G_059) and estimated an increase in OP concentrations of up to 0.0001mg/l P. The resulting OP concentration following dosing is 0.0176 mg/l P (**Table 3; Appendix C**). The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this groundwater body.

- Manor Cunningham groundwater body (IE_NW_G_052) and estimated an increase in OP concentrations of up to 0.0001 mg/l P. The resulting OP concentration following dosing is unchanged remaining at 0.0176 mg/l P (Table 3; Appendix C). The GWB WFD OP status is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this groundwater body.

- Leslie Hill Stream_020 river waterbody (IE_NW_39L050660) and estimated an increase in OP concentrations of up to 0.0006 mg/l P. The resulting OP concentration following dosing is unchanged, i.e. 0.1191mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Bad. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

- Swilly (Donegal)_010 river waterbody (IE_NW_39S020300) and estimated an increase in OP concentrations of up to 0.0014 mg/l P. The resulting OP concentration following dosing is 0.0139 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is in exceedance of the significance threshold (0.00125 mg/l P), however predicted post dosing concentration is within the 75% upper threshold status (0.0188 mg/l P) for this waterbody and dosing will not result in a deterioration in this waterbody status. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

- Carn Low_010 river waterbody (IE_NW_39L012000) and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is unchanged, i.e. 0.0130 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there

is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

- Knockybrin_010 river waterbody (IE_NW_39K240610) and estimated an increase in OP concentrations of up to 0.0013 mg/l P. The resulting OP concentration following dosing is unchanged, i.e. 0.0138 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is in exceedance of the significance threshold (0.00125 mg/l P), however predicted post dosing concentration is within the 75% upper threshold status (0.0188 mg/l P) for this waterbody and dosing will not result in a deterioration in this waterbody status. Therefore. there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

- Newmill_010 river waterbody (IE_NW_39N050990) and estimated an increase in OP concentrations of up to 0.0011 mg/l P. The resulting OP concentration following dosing is 0.0136 mg/l P (**Table 3; Appendix C**). The RWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this river waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Ballymacool 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 habitats associated with the above mentioned bird species in Lough Swilly SPA.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of these bird species in Lough Swilly SPA / no deterioration of their favourable conservation condition is identified.

6.12 LOUGH FOYLE SPA 004087

Lough Foyle SPA comprises a section of the western shore of Lough Foyle from Muff to north of Vances Point in Co. Donegal. The site forms part of the larger cross-border Lough Foyle complex which regularly supports in excess of 20,000 wintering waterbirds. The site is an SPA for: (A001) Red-throated Diver, (A005) Great Crested Grebe, (A037 Bewick's Swan, (A038) Whooper Swan, (A043) Greylag Goose, (A046) Brent Goose, (A048) Shelduck, (A050) Wigeon, (A052) Teal, (A053) Mallard, (A063) Eider, (A069) Red-breasted, (A130) Oystercatcher, (A140) Golden Plover, (A142) Lapwing, (A143) Knot, (A149) Dunlin, (A157) Bar-tailed Godwit, (A160) Curlew, (A162) Redshank, (A179) Black-headed Gull (A182) Common Gull, (A184) Herring Gull, (A999) Wetlands. The SSCOs (NPWS, 2014[40]) for Lough Foyle SPA list targets for each species, 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.

Furthermore, the permanent area occupied by the wetland habitat (A999 – Wetlands) should be stable and not significantly lessened, other than that occurring from natural patterns of variation.

Changes in organic and nutrient loading to an estuary may have various consequences for the ecology of the estuarine system including changes in the abundances of some benthic invertebrates that form prey

[40] NPWS (2014) Conservation Objectives: Lough Foyle SPA 004087. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

species for water birds (e.g. Burton et al. 2002[41]). This could have knock-on effects upon water bird foraging distribution, prey intake rates, and ultimately upon survival and fitness.

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

- Lough Foyle coastal waterbody (GBNIIE6NW250) and estimated an increase in OP concentrations of up to 0.00002 mg/l P. The resulting OP concentration following dosing is 0.0125 mg/l P in summer and in winter (**Table 3; Appendix C**). The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this coastal waterbody.

- Foyle and Faughan Estuaries transitional waterbody (UKGBNI5NW250010) and estimated an increase in OP concentrations of up to 0.000005mg/l P. The resulting OP concentration following dosing for summer and winter is 0.0325 mg/l P (**Table 3; Appendix C**). The TWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this transitional waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Ballymacool WTP on WFD OP statuses have demonstrated that there will be no change in the OP WFD indicative water quality of the above mentioned coastal waterbody and groundwater body, 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 habitats associated with the above mentioned bird species in Lough Foyle SPA.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of these species in Lough Foyle SPA / no deterioration of their favourable conservation condition is identified.

6.13 FANAD HEAD SPA 004148

Fanad Head SPA comprises two areas of extensively managed grassland on the Fanad Head peninsula on the north coast of Co. Donegal. The site is an SPA for (A122) Corncrake. The COs (NPWS, 2016[42]) are to maintain or restore the favourable conservation condition of the Corncrake.

Table 3 identifies the surface waterbodies and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to Corncrake in Fanad Head SPA. It is assumed that bird species have the potential to interact with all surface waterbodies and groundwater bodies (via seepages) identified in **Table 3**. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on Orthophosphate indicative water quality on:

- Lough Swilly coastal waterbody (IE_NW_220_0000) and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0030 mg/l P in summer and 0.0195 mg/l P in winter (Table 3; Appendix C). The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing

[41] 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.

[42] NPWS (2018) Conservation objectives for Fanad Head SPA [004148]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.

concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this coastal waterbody.

- Lough Swilly groundwater body (IEGBNI_NW_G_059) and estimated an increase in OP concentrations of up to 0.0001 mg/l P. The resulting OP concentration following dosing is 0.0176 mg/l P (Table 3; Appendix C). The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this groundwater body.

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Ballymacool WTP on WFD OP statuses have demonstrated that there will be no change in the OP WFD indicative water quality of the above mentioned coastal waterbody and groundwater body, 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 habitats associated with Corncrake in Fanad Head SPA.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of this species in the Fanad Head SPA / no deterioration of its favourable conservation condition is identified.

6.14 HORN HEAD TO FANAD HEAD SPA 004194

Horn Head to Fanad Head SPA comprises a number of separate sections of the north Co. Donegal coastline stretching some 70 km eastwards from Dooros Point, south-west of Horn Head to just south of Saldanha Head, south of Fanad Head. The site includes the high coast areas and sea cliffs, land adjacent to the cliff edge and the sand dunes and lake at Dunfanaghy/ Rinclevan. The high water mark forms the seaward boundary, except at Horn Head where the adjacent sea area to a distance of 500 m from the cliff base is included. The site is an SPA for the following species: Chough, Peregrine, Fulmar, Cormorant, Shag, Kittiwake, Guillemot, Razorbill, Greenland White-fronted Goose and Barnacle Goose. The site is also of special conservation interest for holding an assemblage of over 20,000 breeding seabirds. The COs (NPWS, 2016[43]) are to maintain or restore the favourable conservation condition of the above listed bird species. Bird species with nutrient sensitivity and water dependency as identified in Appendix B are Cormorant, Barnacle Goose and Greenland White-fronted Goose.

Table 3 identifies the surface waterbodies and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to cormorants, barnacle geese and Greenland white-fronted geese in Horn Head to Fanad Head SPA. It is assumed that bird species have the potential to interact with all surface waterbodies and groundwater bodies (via seepages) identified in **Table 3**. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Lough Swilly coastal waterbody (IE_NW_220_0000) and estimated an increase in OP concentrations of up to 0.0005 mg/l P. The resulting OP concentration following dosing is 0.0030 mg/l P in summer and 0.0195 mg/l P in winter (Table 3; Appendix C). The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP WFD indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this coastal waterbody.

- Lough Swilly groundwater body (IEGBNI_NW_G_059) and estimated an increase in OP concentrations of up to 0.0001 mg/l P. The resulting OP concentration following dosing is 0.0176 mg/l P (Table 3; Appendix C). The GWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. The modelled dosing concentration is below the significance

[43] NPWS (2016) Conservation objectives for Horn Head to Fanad Head SPA [004194]. Generic Version 5.0. Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

threshold for good/fail status for GW bodies (<0.00175 mg/l P). Therefore there is no risk of deterioration in WFD OP WFD indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this groundwater body.

- Mulroy Bay Broadwater coastal waterbody (IE_NW_200_0000) and estimated an increase in OP concentrations of up to 0.00002 mg/l P. The resulting OP concentration following dosing for summer is 0.0057 mg/l P and winter is 0.0065 mg/l P (**Table 3; Appendix C**). The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High. The modelled dosing concentration is below the significance threshold for high/good status for SW bodies (<0.00125 mg/l P). Therefore there is no risk of deterioration in WFD OP WFD indicative water quality following OP dosing in Goldrum and Ballymacool WTP for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Goldrum and Ballymacool WTP on WFD OP statuses have demonstrated that there will be no change in the OP WFD indicative water quality of the above mentioned coastal waterbodies and groundwater body, 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 habitats associated with the above-mentioned bird species in Horn Head to Fanad Head SPA.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of these species in the Horn Head to Fanad Head SPA / no deterioration of their favourable conservation condition is identified.

6.15 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. Impacts 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 Donegal County Council planning enquiry system 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
Donegal County Council Development Plan 2018 – 2024. The objectives of relevance in the Donegal County Development Plan include under Infrastructure (Water and Environmental Services): **WES-0-3:** Provision of adequate and secure supply of clean and wholesome drinking water to existing supply areas and to those areas identified for growth; Protection and improvement of existing water quality supply; protection and conservation of the County's water resources through minimisation of leakage and promotion of public awareness and involvement in water conservation; provision of adequate wastewater treatment for public collection systems and adequate capacity. **WES-0-5:** Maintain, protect, improve and enhance surface waters and groundwater quality in accordance with the relevant River Basin Management Plan. **WES-0-6** Provision of environmental protection of surface water and groundwater from pollution in accordance with the River Basin Management Plan, Groundwater Protection Scheme and Source Protection Plans for public water supplies; protection against soil contamination; ensuring full compliance with relevant National and European Regulations, Statutes and Directives through monitoring and control of relevant activities. **CCG-P-4:** Any developments, in the form of individual projects and plans will be subjected, during the early planning and application stages to assessments to investigate their impacts, either alone or in combination with other plans or projects on Natura 2000 sites. Specific and targeted mitigation measures will be proposed for individual projects and plans as they evolve and are brought through the planning process. This approach will ensure that the content, policies and objectives of the Donegal County Development Plan 2018 to 2024 adequately protects, conserves or restores the Natura 2000 network.	▪ N/A	The Donegal County Council Development Plan 2018 – 2024 emphasises the objectives of its water services which include enhancement and improved quality of the service to its customers. The plan also outlines the importance of compliance with the North Western River Basin Management Plan (now replaced by the Draft National Plan 2018-2021[44]), and emphasises compliance with environmental objectives. There is no potential for cumulative effects with these plans.
River Basin Management Plan For Ireland 2018 – 2021 Public Consultation on the River Basin Management Plan (RBMP) for Ireland (2018 – 2021), began in February 2017. 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'	▪ N/A	The objectives of the RBMP are to: ▪ Prevent deterioration; ▪ Restore good status; ▪ Reduce chemical pollution; and

[44] DHPLG (2016) Public Consultation on the River Basin Management Plan for Ireland (2018-2021)

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 water body 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 water bodies 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 water bodies that are *At Risk*. Urban waste water, hydromorphology and forestry were also significant pressures amongst others.		▪ 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.
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 water bodies. 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	▪ Land use change or intensification;	Foodwise 2025 was subject to its own AA[45].

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

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.	▪ Water pollution; ▪ Nitrogen deposition; and ▪ Disturbance to habitats / species	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 effects are predicted. Mitigation measures 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 2014 – 2020 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 2014-2020 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	▪ Overgrazing; ▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition; and ▪ Disturbance to habitats / species;	The RDP for 2014 – 2020 has been subject to SEA[46], and AA[47]. 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.

[46] https://www.agriculture.gov.ie/media/migration/ruralenvironment/ruraldevelopment/ruraldevelopmentprogramme2014-2020/StrategEnvironmAssessSumState090615.pdf

[47] https://www.agriculture.gov.ie/media/migration/agarchive/ruralenvironment/preparatoryworkfortherdp2014-2020/RDP20142020DraftAppropriateAssessmentReport160514.pdf

'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 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[48]. 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.
Forest Policy Review: Forests, Products and People – A Renewed Vision (2014) / Forestry Programme 2014 - 2020 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	▪ Habitat loss or destruction; ▪ Habitat fragmentation or degradation; ▪ Water quality changes; and ▪ Disturbance to species.	Ireland's Forestry Programme 2014 – 2020 has undergone AA[49]. 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.

[48] http://www.housing.gov.ie/sites/default/files/migrated-files/en/Publications/Environment/Water/FileDownLoad,35218,en.PDF

[49] https://www.agriculture.gov.ie/media/migration/forestry/publicconsultation/newforestryprogramme2014-2020/nis/ForestryProgrammeNaturaImpactStatement290914.pdf

which 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 water bodies, 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.

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. OP dosing upstream of Letterkenny WSZs and Letterkenny Milford Mixed WSZs have been considered in the EAM and are assessed herein.

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 Goldrum and Ballymacool WTP, for the Letterkenny WSZs 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 **Tranarossan and Melmore Lough SAC (000194), Sheephaven SAC (001190), Ballyhoorisky Point to Fanad Head SAC (001975), North Inishowen Coast SAC (002012), Mulroy Bay SAC (002159), Leannan River SAC (002176), Lough Swilly SAC (002287), River Finn SAC (002301), Derryveagh and Glendowan Mountains SPA (004039), Lough Fern SPA (004060), Lough Swilly SPA (004075), Lough Foyle SPA (004087), Fanad Head SPA (004148)** and **Horn Head to Fanad Head SPA (004194)** has 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 based on the information provided by the EAM there is not potential for significant direct, indirect or cumulative impacts which would adversely 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 (at this stage) that an AA is not required.

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NPWS (2015) Conservation Objectives: Tranarossan and Melmore Lough SAC 000194. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NPWS (2015) Tranarossan and Melmore Lough SAC (000194) Conservation objectives supporting document- Coastal habitats. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NPWS (2015) Tranarossan and Melmore Lough SAC (000194) Conservation objectives supporting document- Marine habitats. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NPWS (2017) Conservation Objectives: Ballyhoorisky Point to Fanad Head SAC 001975. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

NPWS (2017) Ballyhoorisky Point to Fanad Head SAC (001975) Conservation objectives supporting document- Najas habitats. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NPWS (2017) Conservation Objectives: River Finn SAC 002301. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

NPWS (2017) River Finn SAC (002301) Conservation objectives supporting document- blanket bogs and associated habitats. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NPWS (2018) Conservation objectives for Leannan River SAC [002176]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.

NPWS (2018) Conservation objectives for Derryveagh and Glendowan Mountains SPA [004039]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.

NPWS (2018) Conservation objectives for Lough Fern SPA [004060]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.

NPWS (2018) Conservation objectives for Fanad Head SPA [004148]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht

NPWS (2018) Conservation objectives for Horn Head to Fanad Head SPA [004194]. 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

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Tranarossan and Melmore Lough SAC 000194

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
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***

000194	Tranarossan and Melmore Lough SAC
1140	Mudflats and sandflats not covered by seawater at low tide
1210	Annual vegetation of drift lines
1220	Perennial vegetation of stony banks
1230	Vegetated sea cliffs of the Atlantic and Baltic coasts
1395	Petalwort *Petalophyllum ralfsii*
2110	Embryonic shifting dunes
2120	Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)
2130	Fixed coastal dunes with herbaceous vegetation (grey dunes)*
2140	Decalcified fixed dunes with *Empetrum nigrum**
2170	Dunes with *Salix repens* ssp. *argentea* (Salicion arenariae)
21A0	Machairs (* in Ireland)
3140	Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.
4030	European dry heaths
4060	Alpine and Boreal heaths

Please note that this SAC overlaps with Horn Head to Fanad Head SPA (004194). It adjoins Sheephaven SAC (001190) and Mulroy Bay SAC (002159). See map 2. The conservation objectives for this site should be used in conjunction with those for overlapping and adjacent 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 :	1984
Title :	The vegetation of Irish lakes
Author :	Heuff, H.
Series :	Unpublished report to NPWS
Year :	1996
Title :	Biomar survey of Irish machair sites
Author :	Crawford, I.; Bleasdale, A.; Conaghan, J.
Series :	Irish Wildlife Manual No. 3
Year :	1999
Title :	National Shingle Beach Survey of Ireland 1999
Author :	Moore, D.; Wilson, F.
Series :	Unpublished Report to NPWS
Year :	2009
Title :	Coastal Monitoring Project 2004-2006
Author :	Ryle, T.; Murray, A.; Connolly, K.; Swann, M.
Series :	Unpublished report to NPWS
Year :	2011
Title :	National survey and assessment of the conservation status of Irish sea cliffs
Author :	Barron, S.J.; Delaney, A.; Perrin, P.M.; Martin, J.; O'Neill, F.
Series :	Irish Wildlife Manual No. 53
Year :	2013
Title :	A survey of the benthic macrophytes of three hard-water lakes: Lough Bunny, Lough Carra and Lough Owel
Author :	Roden, C.; Murphy, P.
Series :	Irish Wildlife Manual No. 70
Year :	2013
Title :	Monitoring survey of Annex I sand dune habitats in Ireland
Author :	Delaney, A.; Devaney, F.M; Martin, J.M.; Barron, S.J.
Series :	Irish Wildlife Manual No. 75
Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 2. Habitats assessments
Author :	NPWS
Series :	Conservation assessments
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 :	Tranarossan and Melmore Lough SAC (site code: 194) Conservation objectives supporting document- coastal habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document

Year :	2015
Title :	Tranarossan and Melmore Lough SAC (site code: 194) Conservation objectives supporting document- marine habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	1982
Title :	Eutrophication of waters. Monitoring assessment and control
Author :	OECD
Series :	OECD, Paris
Year :	1988
Title :	The Irish red data book 1. Vascular plants
Author :	Curtis, T.G.F; McGough, H.N.
Series :	Wildlife Service, Dublin
Year :	1999
Title :	A survey of the sublittoral vegetation of 15 machair loughs in north west Ireland/ A survey of coastal lakes in Counties Galway, Mayo, Sligo and Donegal/ A survey of Irish machair loughs
Author :	Roden, C.
Series :	Report to the National Heritage Council, Kilkenny
Year :	2000
Title :	Colour in Irish lakes
Author :	Free, G.; Allott, N.; Mills, P.; Kennelly, C.; Day, S.
Series :	Verhandlungen Internationale Vereinigung für theoretische und angewandte Limnologie. 27: 2620-2623
Year :	2001
Title :	Aquatic plants in Britain and Ireland
Author :	Preston, C.D.; Croft, J.M.
Series :	Harley Books, Colchester
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 :	2006
Title :	A reference-based typology and ecological assessment system for Irish lakes. Preliminary investigations. Final report. Project 2000-FS-1-M1 Ecological assessment of lakes pilot study to establish monitoring methodologies EU (WFD)
Author :	Free, G.; Little, R.; Tierney, D.; Donnelly, K.; Coroni, R.
Series :	EPA, Wexford
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 :	Intertidal benthic survey of Tranarossan and Melmore Lough 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
Year :	2013
Title :	Tranarossan & Melmore Lough SAC (000194), Sheephaven Bay SAC (001190) and Ballyness Bay SAC (001090). Field report
Author :	Patterson, A.; Kennedy, B.
Series :	Unpublished report to NPWS
Year :	in prep.
Title :	Habitats Directive Annex I lake habitats: a working interpretation for the purposes of site-specific conservation objectives and Article 17 reporting
Author :	O Connor, A.
Series :	Unpublished report to NPWS
Year :	in prep.
Title :	Monitoring of hard-water lakes in Ireland using charophytes and other macrophytes
Author :	Roden, C.; Murphy, P.
Series :	Unpublished report to NPWS

Spatial data sources

Year :	Interpolated 2014
Title :	2011, 2013 intertidal 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 :	1140, 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 :	2011
Title :	National Survey and assessment of the conservation status of Irish sea cliffs
GIS Operations :	Clipped to SAC boundary
Used For :	1230 (map 5)
Year :	Revision 2012
Title :	National Shingle Beach Survey
GIS Operations :	Clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1220 (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 :	1210, 2110, 2120, 2130, 2140, 2170, 21A0 (map 6)
Year :	2013
Title :	Sand Dune Monitoring Project 2011. 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 :	1210, 2110, 2120, 2130, 2140, 2170, 21A0 (map 6)
Year :	2008
Title :	OSi 1:5000 IG vector dataset
GIS Operations :	WaterPolygons feature class clipped to the SAC boundary. Expert opinion used to identify Annex I habitat and to resolve any issues arising
Used For :	3140 (map 7)
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)

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 Tranarossan and Melmore Lough 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 28ha using OSi data
Community distribution	Hectares	Conserve the following community type in a natural condition: Intertidal sand community complex. See map 4	Based on intertidal surveys undertaken in 2011 (MERC, 2012) and 2013 (Patterson and Kennedy, 2013). See marine supporting document for further details

1210 Annual vegetation of drift lines

To maintain the favourable conservation condition of Annual vegetation of drift lines in Tranarossan and Melmore 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, including erosion and succession	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009) and the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). This habitat was not mapped at either sub-site in the SAC (Tanarossan or Melmore). Habitat is very difficult to measure in view of its dynamic nature which means that it can appear and disappear within a site from year to year. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes	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	Dunes are naturally dynamic systems that require continuous supply and circulation of sand. Accumulation of organic matter in tidal litter is essential for trapping sand and initiating dune formation. 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	Based on data from Ryle et al. (2009) and Delaney et al. (2013). 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 with typical species: sea rocket (*Cakile maritima*), sea sandwort (*Honckenya peploides*), prickly saltwort (*Salsola kali)* and orache (*Atriplex spp.*)	Based on data from Ryle et al. (2009) and Delaney et al. (2013). 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) and Delaney et al. (2013). 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

1220 Perennial vegetation of stony banks

To maintain the favourable conservation condition of Perennial vegetation of stony banks in Tranarossan and Melmore 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, including erosion and succession	Current area unknown. The habitat was recorded as being present but extent was not mapped from one sub-site (Rossguill Peninsula) during the National Shingle Beach Survey (Moore and Wilson, 1999). NB further unsurveyed areas maybe present within the SAC. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 6 for survey location	Full distribution unknown at present, although the habitat has been recorded at Rossguill Peninsula by Moore and Wilson (1999). Habitat likely to be more widespread. 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 Moore and Wilson (1999). Shingle features are relatively stable in the long term. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Moore and Wilson (1999). At Rossguill Peninsula the vegetated shingle is associated with transitions to machair and cliff. Lichens are present at this sub-site, indicating a degree of stability. 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 typical vegetated shingle flora including the range of sub-communities within the different zones	Based on data from Moore and Wilson (1999). Species recorded include marram (*Ammophila arenaria*) and oyster plant (*Mertensia maritima*). 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 Moore and Wilson (1999). 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

1230 Vegetated sea cliffs of the Atlantic and Baltic coasts

To maintain the favourable conservation condition of Vegetated sea cliffs of the Atlantic and Baltic coasts in Tranarossan and Melmore Lough SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat length	Kilometres	Area stable, subject to natural processes, including erosion. For sub-sites mapped: Melmore - 1.19km; Dundooan Lower - 3.32km; Downies - 12.14km; Crocknamurleog - 0.83km; Gortnalughoge - 3.39km. See map 5	Based on data from the Irish Sea Cliff Survey (ISCS) (Barron et al., 2011). Cliffs are linear features and are therefore measured in kilometres. Five sub-sites were identified using a combination of aerial photos and the DCENR helicopter viewer. The length of each cliff was measured (in some cases the cliff was measured in sections) to give a total estimated area of 20.87km within the SAC. The length of cliff likely to be underestimated. See coastal habitats supporting document for further details
Habitat distribution	Occurance	No decline, subject to natural processes. See map 5	Cliffs are known to occur along the coastline of this SAC. Both hard and soft cliffs have been noted (Browne, 2005; Barron et al., 2011). However, it is estimated that over 90% of the cliffs are of the hard type. See coastal habitats supporting document for further details
Physical structure: functionality and hydrological regime	Occurrence of artificial barriers	No alteration to natural functioning of geomorphological and hydrological processes due to artificial structures	Maintaining natural geomorphological processes including natural erosion is important for the health of vegetated sea cliff. Hydrological processes maintain flushes and in some cases tufa formations that can be associated with sea cliffs. At Gortnalughgoge, freshwater seep was noted by the ISCS. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of sea cliff habitat zonations including transitional zones, subject to natural processes including erosion and succession	Based on data from Barron et al. (2011). A range of habitats such as heath and sand dune systems occur adjacent to the sea cliffs in the sub-sites. See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from Barron et al. (2011). 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 the Irish Sea Cliff Survey (Barron et al., 2011)	Based on data from Barron et al. (2011). Scot's lovage (*Ligusticum scoticum*) and roseroot (*Rhodiola rosea*) have been recorded on sea cliffs in this SAC. See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from Barron et al. (2011). See coastal habitats supporting document for further details
Vegetation composition: bracken and woody species	Percentage	Cover of bracken (*Pteridium aquilinum*) on grassland and/or heath less than 10%. Cover of woody species on grassland and/or heath less than 20%	Based on data from Barron et al. (2011). See coastal habitats supporting document for further details

2110 Embryonic shifting dunes

To maintain the favourable conservation condition of Embryonic shifting dunes in Tranarossan and Melmore 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, including erosion and succession. For sub-sites mapped: Melmore - 0.10ha; Tranarossan - 0.40ha. See map 6	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009) and the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Habitat was recorded from two sub-sites, giving a total estimated area of 0.50ha. 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 6 for known distribution	Based on data from Ryle et al. (2009) and Delaney et al. (2013). 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	Dunes are naturally dynamic systems that require continuous supply and circulation of sand. 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	Based on data from Ryle et al. (2009) and Delaney et al. (2013). See coastal habitats supporting document for further details
Vegetation composition: plant health of foredune grasses	Percentage cover	More than 95% of sand couch grass (*Elytrigia juncea*) 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) and Delaney et al. (2013). 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 with typical species: sand couch grass (*Elytrigia juncea*) and/or lyme grass (*Leymus arenarius*)	Based on data from Ryle et al. (2009) and Delaney et al. (2013). See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-native species) to represent less than 5% cover	Based on data from Ryle et al. (2009) and Delaney et al. (2013). 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. See coastal habitats supporting document for further details

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

To maintain the favourable conservation condition of Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes') in Tranarossan and Melmore 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 including erosion and succession. For sub-sites mapped: Melmore - 2.65ha; Tranarossan - 1.65ha. See map 6	Habitat was mapped during the Coastal Monitoring Project (CMP) (Ryle et al., 2009) and Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013) at two sub-sites, to give a total estimated area of 4.30ha. Habitat is difficult to map due to its highly 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 6 for known distribution	Based on data from Ryle et al. (2009) and Delaney et al. (2013). 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	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. 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 Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). 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) and Delaney et al. (2013). At Tranarossan, the CMP noted excessive cover of dead or unhealthy plant material which was attributed to limited sediment supply. 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) and Delaney et al. (2013). 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) and Delaney et al. (2013). 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. Both bracken (*Pteridium aquilinum*) and sea-buckthorn (*Hippophae rhamnoides*) were recorded from the Melmore sub-site. See coastal habitats supporting document for further details

2130 Fixed coastal dunes with herbaceous vegetation (grey dunes)

To maintain the favourable conservation condition of Fixed coastal dunes with herbaceous vegetation ('grey dunes') in Tranarossan and Melmore 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 including erosion and succession. For sub-sites mapped: Melmore - 20.18ha; Tranarossan - 13.40ha. See map 6	Based on data from the Coastal Monitoring Project (Ryle et al., 2009) and the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Habitat was recorded from two sub-sites, giving a total estimated area of 33.58ha. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 6 for known distribution	Based on data from Ryle et al. (2009) and Delaney et al. (2013). 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	Based on data from Ryle et al. (2009) and Delaney et al. (2013). 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), Ryle et al. (2009) and Delaney et al. (2013). See coastal habitats supporting document for further details
Vegetation structure: sward height	Centimetres	Maintain structural variation within sward	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). 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), Ryle et al. (2009) and Delaney et al. (2013). Low species diversity was recorded at Tranarossan. At Melmore a number of orchids were recorded in older parts of the fixed dune including pyramidal orchid (*Anacamptis pyramidalis*), frog orchid (*Coeloglossum viride*) and *Dactylorhiza* species. 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) and Delaney et al. (2013). 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. At Melmore, bracken (Pteridium aquilinum) and sea-buckthorn (Hippophae rhamnoides) were recorded. See coastal habitats supporting document for further details. 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) and Delaney et al. (2013). See coastal habitats supporting document for further details

2140 Decalcified fixed dunes with Empetrum nigrum

To maintain the favourable conservation condition of Decalcified fixed dunes with *Empetrum nigrum* in Tranarossan and Melmore 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 including erosion and succession	Based on data from the Coastal Monitoring Project (Ryle et al., 2009) and the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Habitat was not recorded from either sub-site in the SAC (Tranarossan or Melmore). Current status unknown. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes	Current distribution and status unknown. See coastal habitats supporting document for further details
Physical structure:f unctionality 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	Based on data from Ryle et al. (2009) and Delaney et al. (2013). 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), Ryle et al. (2009) and Delaney et al. (2013). See coastal habitats supporting document for further details
Vegetation composition: sward height	Centimeters	Maintain structural variation within sward	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). 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 Delaney et al. (2013)	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). 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	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. 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) and Delaney et al. (2013). See coastal habitats supporting document for further details

2170 Dunes with Salix repens ssp. argentea (Salicion arenariae)

To maintain the favourable conservation condition of Dunes with *Salix repens* ssp. *argentea* (Salicion arenariae) in Tranarossan and Melmore 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, including erosion and succession	Based on data from the Coastal Monitoring Project (Ryle et al., 2009) and the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Habitat was not recorded from either sub-site in the SAC (Tranarossan or Melmore). Current status unknown. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes	Current distribution and status unknown. 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	Based on data from Ryle et al. (2009) and Delaney et al. (2013). See coastal habitats supporting document for further details
Vegetation structure: bare ground	Percentage cover	Bare ground should not exceed 10% cover, subject to natural processes	Based on data from Ryle et al. (2009) and Delaney et al. (2013). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). 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), Ryle et al. (2009) and Delaney et al. (2013). See coastal habitats supporting document for further details
Vegetation composition: cover and height of *Salix repens*	Percentage cover; centimetres	Maintain more than 10% cover of creeping willow (*Salix repens*); vegetation height should be in the average range 5 - 20cm	Cover of creeping willow (*Salix repens*) is maintained through an appropriate grazing regime, which prevents the development of a coarse, rank vegetation cover. See coastal habitats supporting document for further details
Vegetation composition: negative indicator species (including *Hippophae rhamnoides).*	Percentage cover at a representative number of monitoring stops	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from CMP (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. See coastal habitats supporting document for further details
Vegetation composition: scrub/trees	Percentage cover	For trees and scrub other than creeping willow (*Salix repens*), there should be no more than 5% cover or their presence should be under control	Based on data from Ryle et al. (2009) and Delaney et al. (2013). See coastal habitats supporting document for further details

3140 Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.

To maintain the favourable conservation condition of Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. in Tranarossan and Melmore 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	The hard water lake habitat (3140) is found in Melmore Lough. Two measures of extent should be used: 1. the area of the lake itself and; 2. the extent of the vegetation communities/zones that typify the habitat. Data on the extent of the vegetation in Melmore Lough can be found in Roden (1999). Further information on this and other attributes is provided in the lake habitats supporting document for the purposes of site-specific conservation objectives and Article 17 reporting (O Connor, in prep.)
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 7	Melmore Lough was surveyed by N.F. Stewart, C.D. Preston, S.D. Webster, D. Doogue and R. Northridge for the aquatic plants atlas (Preston and Croft, 2001), as well as by Roden (1999). It contains the coastal, machair form of habitat 3140. The machair form is generally shallower, has cloudier water and is probably naturally more productive than typical hard water forms. Melmore Lough is deep, however, with steeply shelving rock shorelines. It is likely that the machair form of habitat 3140 inter-grades with or is related to lake habitats 3150 and 3130. More research is needed to characterise coastal lakes and the inter-relationships of lake habitats 3130, 3140 and 3150 within them
Typical species	Occurrence	Typical species present, in good condition, and demonstrating typical abundances and distribution	For lists of typical species (cyanobacteria, algae, higher plants and water beetles), see Article 17 habitat assessment for lake habitat 3140 (NPWS, 2013) and the lake habitats supporting document for the purposes of site-specific conservation objectives and Article 17 reporting (O Connor, in prep.). The machair form of the hard water lake habitat (3140) differs from more typical forms by having characteristic plants such as *Ranunculus baudotii* and *Potamogeton pectinatus*. The following species were recorded in Melmore Lough by N.F. Stewart and others in 1989 and/or Roden (1999): *Chara aspera, C. globularis, C. vulgaris, Littorella uniflora, Potamogeton crispus, P. friesii, P. natans* and *P. pectinatus*
Vegetation composition: characteristic zonation	Occurrence	All characteristic zones should be present, correctly distributed and in good condition	The characteristic zonation of lake habitat 3140 has been described (Roden and Murphy, 2013; in prep.). The zonation in machair forms of habitat 3140 differs from that of the clearer water forms (Roden and Murphy, in prep.)
Vegetation distribution: maximum depth	Metres	No change to maximum depth of vegetation, subject to natural processes	The maximum depth of vegetation is likely to be specific to the lake shoreline in question, but is typically expected to be deep in clear, hard water lakes. An indicative target of >6 m has been developed for hard water lakes (3140), but this may need to be modified based on the habitat sub-type/form and/or the specific lake in question (see Roden and Murphy, 2013, in prep.). Colonisation tends to be shallower in the machair form of hard water lakes, owing to cloudier water and shallower lake depth (Roden and Murphy, in prep.). Extremely clear marl lakes can have charophyte vegetation to far greater depths, such as Lough Rea (charophytes to 10-11 m), or Coolorta (>9 m) (Roden and Murphy, in prep.)

Hydrological regime: water level fluctuations	Metres	Maintain appropriate natural hydrological regime necessary to support the habitat	The hydrological regime of lakes with habitat 3140 is driven by groundwater flows. Groundwater can discharge directly to the lake, via springs or seepages, or to in-flowing rivers. Fluctuations in lake water level are typical in Ireland, but can be amplified by activities such as abstraction and drainage. Increased water level fluctuations can increase wave action, up-root vegetation, increase turbidity, alter the substratum and lead to release of nutrients from the sediment. The hydrological regime, particularly the groundwater contribution, must be maintained so that the area, distribution and depth of the lake habitat and its constituent/characteristic vegetation zones and communities are not reduced
Lake substratum quality	Various	Maintain appropriate substratum type, extent and chemistry to support the vegetation	The hard water lake habitat is associated with a range of base-rich substratum types, from marl and limestone bedrock, through rocks, cobbles, gravel, muds and even peat. Further research into substratum quality (notably calcium, iron and nutrient concentrations) in the hard water lake habitat would be beneficial
Water quality: transparency	Metres	Maintain appropriate Secchi transparency. There should be no decline in Secchi depth/transparency	Transparency relates to light penetration and, hence, to the depth of colonisation of vegetation. It can be affected by phytoplankton blooms, water colour and turbidity. A target has been set for hard water lakes (3140) of >6 m (Roden and Murphy, in prep.). The OECD fixed boundary system set transparency targets for oligotrophic lakes of ≥6m annual mean Secchi disk depth and ≥3m annual minimum Secchi disk depth. Hard water lakes typically have high transparency, particularly in the very clear and typical marl forms; however, transparency may be relatively lower in the machair form (Roden and Murphy, in prep.)
Water quality: nutrients	µg/l P or mg/l N	The concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition	Habitat 3140 is typically associated with high water quality, demonstrated by naturally low dissolved nutrients. However, some forms appear to be naturally more productive than others and the machair form may, naturally, be more nutrient-rich. The default target is Water Framework Directive (WFD) High Status or oligotrophic (OECD, 1982). Annual average TP concentration should be ≤10µg/l TP, average annual total ammonia concentration should be ≤0.040 mg/l N and annual 95th percentile for total ammonia should be ≤0.090mg/l N. For machair sites, where study demonstrates it can maintain favourable condition for the long-term, a target of 'good' status or mesotrophic can be applied: annual average TP ≤20µg/l TP and total ammonia ≤0.065mg/l N, total ammonia 95th percentile ≤0.140mg/l N. Where nutrient concentrations are lower than the targets, there should be no upward trend. For further information see the European Communities Environmental Objectives (Surface Water) Regulations 2009

Water quality: phytoplankton biomass	µg/l Chlorophyll *a*	Maintain appropriate water quality to support the habitat, including high chlorophyll *a* status	Habitat 3140 is associated with high water quality, as demonstrated by naturally low algal growth. As for nutrients, the default target is WFD High Status or oligotrophic (OECD, 1982). Average growing season (March-October) chlorophyll *a* concentration must be <5.8µg/l. Annual average chlorophyll *a* concentration should be <2.5µg/l and the annual peak should be <8.0µg/l. For machair sites, where study demonstrates it can maintain favourable condition for the long-term, a target of 'good' status or mesotrophic can be applied: average growing season chlorophyll *a*: <10µg/l, annual average <8.0 µg/l, annual peak <25 µg/l. Where chlorophyll *a* concentrations are lower than the targets, there should be no upward trend in phytoplankton biomass. For further information see the European Communities Environmental Objectives (Surface Water) Regulations 2009
Water quality: phytoplankton composition	EPA phytoplankton composition metric	Maintain appropriate water quality to support the habitat, including high phytoplankton composition status	The EPA has developed a phytoplankton composition metric for nutrient enrichment of Irish lakes. As for other water quality indicators, the default target for habitat 3140 is WFD high status
Water quality: attached algal biomass	Algal cover and EPA phytobenthos metric	Maintain trace/ absent attached algal biomass (<5% cover) and high phytobenthos status	Nutrient enrichment can favour epiphytic and epipelic algae that can out-compete the submerged vegetation. The cover abundance of attached algae in hard water lakes (3140) should, therefore, be trace/ absent (<5% cover). EPA phytobenthos can be used as an indicator of changes in attached algal biomass. As for other water quality indicators, the default target for habitat 3140 is high phytobenthos status
Water quality: macrophyte status	EPA macrophyte metric (The Free Index)	Maintain high macrophyte status	Nutrient enrichment can favour more competitive submerged macrophyte species that out-compete the typical and characteristic species for hard water lakes (3140). The EPA monitors macrophyte status for WFD purposes using the 'Free Index'. The target for habitat 3140 is high status or an Ecological Quality Ratio (EQR) for lake macrophytes of ≥0.90, as defined in Schedule Five of the European Communities Environmental Objectives (Surface Water) Regulations 2009
Acidification status	pH units, mg/l	Maintain appropriate water and sediment pH, alkalinity and cation concentrations to support the habitat, subject to natural processes	The specific requirements of habitat 3140, in terms of water and sediment pH, alkalinity and cation concentration, have not been fully determined. Acidification is not considered a threat to habitat 3140, however eutrophication can lead to at least temporary increases in pH to toxic levels (>9/9.5 pH units). Maximum pH should be <9.0 pH units, in line with the surface water standards. See the European Communities Environmental Objectives (Surface Water) Regulations 2009
Water colour	mg/l PtCo	Maintain appropriate water colour to support the habitat	Increased colour decreases light penetration and reduces the area of macrophyte habitat, particularly at the lower euphotic depths. Higher colour also appears to favour angiosperms over charophytes in hard water lakes (Roden and Murphy, in prep.). The primary source of increased colour in Ireland is peatland disturbance. No habitat-specific or national standards for water colour exist. Studies have shown median colour concentrations in Irish lakes of 38mg/l PtCo (Free et al., 2000) and 33mg/l PtCo (Free et al., 2006). Habitat 3140 is typically associated with very clear waters and expected colour would be <10 or, more likely, <5 mg/l PtCo. Higher colour is found in some hard water lakes with significant areas of peatland in their catchment, but it is not clear whether this is natural or the result of peatland degradation

Dissolved organic carbon (DOC)	mg/l	Maintain appropriate organic carbon levels to support the habitat	Dissolved (and particulate) organic carbon (OC) in the water column is linked to water colour and acidification (organic acids). Increasing DOC in water has been documented across the Northern Hemisphere, including afforested peatland catchments in Ireland. Damage and degradation of peatland, leading to decomposition of peat is likely to be the predominant source of OC in Ireland. OC in water promotes decomposition by fungi and bacteria that, in turn, releases dissolved nutrients. The increased biomass of decomposers can also impact directly on the characteristic lake communities through shading, competition, etc.
Turbidity	nephelometric turbidity units/ mg/l SS/ other appropriate unit	Maintain appropriate turbidity to support the habitat	Turbidity can significantly affect the quantity and quality of light reaching rooted and attached vegetation and can, therefore, impact on lake habitats. The settlement of higher loads of inorganic or organic material on lake vegetation communities may also have impacts on sensitive, delicate species. Turbidity can increase as a result of re-suspension of material within the lake, higher loads entering the lake, or eutrophication. Turbidity measurement and interpretation is challenging. As a result, it is likely to be difficult to set targets for turbidity in lakes
Fringing habitat: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the natural structure and functioning of habitat 3140	Most lake shorelines have fringing habitats such as reedswamp, other swamp, fen, marsh or wet grassland that intergrade with and support the structure and functions of the lake habitat. Equally, fringing habitats are dependent on the lake, particularly its water levels, and support wetland communities and species of conservation concern. Many of the fringing wetland habitats support higher invertebrate and plant species richness than the lake habitats themselves. Fringing fen habitats can be particularly important around hard water lakes and in this case, the Annex I habitat machair (21A0) occurs adjacent to the lake

4030 European dry heaths

To maintain the favourable conservation condition of European dry heaths in Tranarossan and Melmore 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	Total area of this habitat has not been calculated although it is distributed thoughout the SAC, usually occurring in mosaic with other habitats such as exposed rock, other heath types, and coastal grasslands. It is reported to be best developed at Melmore Hill, Melmore Head and on the slopes of Crocknasleigh (NPWS internal files)
Habitat distribution	Occurrence	No decline from current habitat distribution, subject to natural processes	See note above. The heath in this SAC is widely distributed (NPWS internal files)
Ecosystem function: soil nutrient status	Soil pH and nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	Changes to soil nutrient status can occur from high stock densities or supplementary feeding above appropriate levels
Vegetation composition: positive indicator species	Number and percentage cover at a representative number of monitoring stops	At least two positive indicator species, as listed in Perrin et al. (2014), with combined cover of at least 50%	Attribute and target based on Perrin et al. (2014). A positive species criterion is set to ensure that vegetation remains representative of this habitat and is not degrading or succeeding to a different habitat. Bell heather (*Erica cinerea*) and ling (*Calluna vulgaris*) are listed for the heath in this SAC (NPWS internal files)
Vegetation composition: bryophyte and non-crustose lichen species	Number at a representative number of monitoring stops	At least three bryophyte or non-crustose lichen species present, excluding *Campylopus* and *Polytrichum* moss species	Attribute and target based on Perrin et al. (2014)
Vegetation composition: rare/scarce species	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order 1999 and/or the red data book (Curtis and McGough, 1988)
Vegetation composition: dwarf shrub species	Percentage cover at a representative number of monitoring stops	Cover of bog myrtle (*Myrica gale*), creeping willow (*Salix repens*) and Western gorse *(Ulex gallii*) collectively less than 50%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: negative indicator weed species	Percentage cover at a representative number of monitoring stops	Cover of negative indicator weedy species collectively less than 1%	Attribute and target based on Perrin et al. (2014), where weed species are also listed
Vegetation composition: non-native species	Percentage cover at a representative number of monitoring stops and in local vicinity	Cover of non-native species less than 1%.	Attribute and target based on Perrin et al. (2014)
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity	Cover of scattered native trees and shrubs less than 20%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: bracken	Percentage cover in local vicinity	Cover of bracken (*Pteridium aquilinum*) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: soft rush	Percentage cover in local vicinity	Cover of soft rush (*Juncus effusus*) less than 10%	Attribute and target based on Perrin et al. (2014). Dense areas of soft rush can indicate disturbance
Vegetation structure: senescent ling	Percentage cover at a representative number of monitoring stops	Senescent proportion of ling (*Calluna vulgaris*) cover less than 50%	Attribute and target based on Perrin et al. (2014)

Vegetation structure: growth phases of ling	Percentage cover in local vicinity	Outside boundaries of sensitive areas, all growth phases of ling (*Calluna vulgaris*) should occur throughout, with at least 10% of cover in mature phase	Attribute and target based on Perrin et al. (2014), where sensitive areas and growth phases are defined
Vegetation structure: signs of browsing	Percentage at a representative number of monitoring stops	Last complete growing season's shoots of ericoids showing signs of browsing collectively less than 33%	Attribute and target based on Perrin et al. (2014). High levels of browsing of these dwarf shrubs would indicate undesirable levels of livestock/other grazers
Vegetation structure: burning	Occurrence in local vicinity	No signs of burning inside sensitive areas	Attribute and target based on 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%	Attribute and target based on Perrin et al. (2014). Disturbance can include hoof marks, wallows, human foot prints, vehicle and machinery tracks. Excessive disturbance can result in loss of characteristic species and presage erosion

4060 Alpine and Boreal heaths

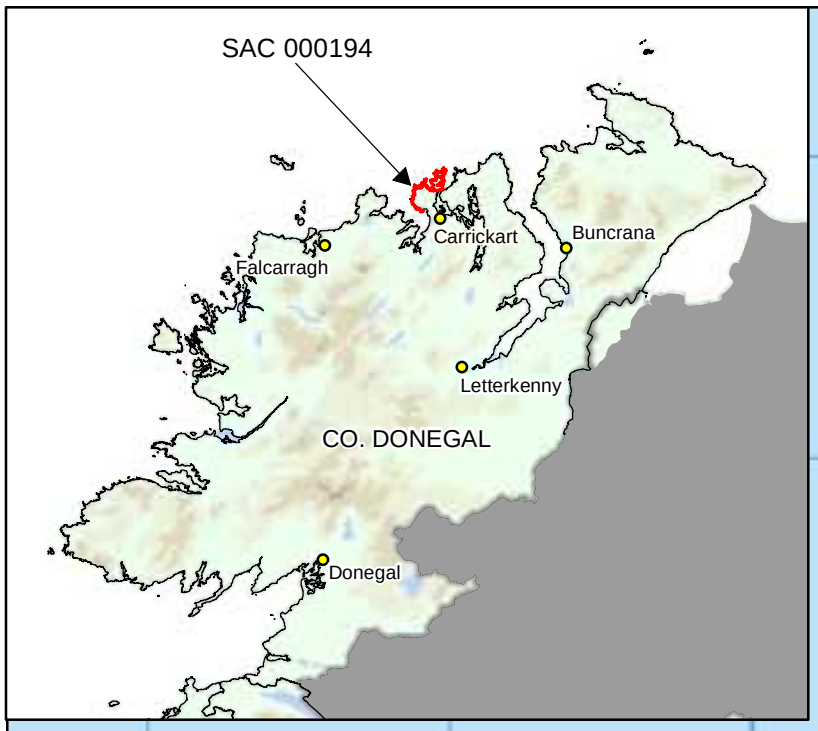
To maintain the favourable conservation condition of Alpine and Boreal heaths in Tranarossan and Melmore Lough SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Total area of this habitat has not been calculated. It is reported from the upper slopes of Crocknasleigh and Melmore Hill (NPWS internal files)
Habitat distribution	Occurrence	No decline, subject to natural processes	See notes for area above
Ecosystem function: soil nutrient status	Soil pH and nutrient levels at a representative number of monitoring stops	Maintain soil chemical status within natural range	Changes to soil nutrient status can occur from high stock densities or supplementary feeding above appropriate levels
Vegetation composition: lichens and bryophytes	Number of species at a representative number of monitoring stops	Number of bryophyte or non-crustose lichen species present at each monitoring stop is least three	Attribute and target based on Perrin et al. (2014). Alpine and boreal heaths are not necessarily rich in lichen and bryophyte species, but a minimum number should still be present
Vegetation composition: positive indicator species	Percentage cover at a representative number of monitoring stops	Cover of positive indicator species at least 66%	Attribute and target based on Perrin et al. (2014). A positive species criterion is set to ensure that vegetation remains representative of this habitat and is not degrading or succeeding to a different habitat. Crowberry (*Empetrum nigrum*), bell heather (*Erica cinerea*), ling (*Calluna vulgaris*), juniper (*Juniperus communis*) and the moss *Racomitrium lanuginosum* are recorded from this SAC (NPWS internal files)
Vegetation composition: dwarf-shrub species	Percentage cover at a representative number of monitoring stops	Cover of dwarf-shrub species at least 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: negative indicator species	Percentage cover at a representative number of monitoring stops	Total cover of negative indicator species less than 10%	Attribute and target based on Perrin et al. (2014) where negative species are listed
Vegetation composition: non-native species	Percentage cover at a representative number of monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). Non-native species can be invasive and have deleterious effects on native vegetation
Vegetation structure: signs of grazing	Percentage at a representative number of monitoring stops	Less than 10% collectively of live leaves of specific graminoids showing signs of grazing	Attribute and target based on Perrin et al. (2014). High levels of grazing of these species would indicate undesirable levels of livestock/other grazers
Vegetation structure: signs of browsing	Percentage at a representative number of monitoring stops	Less than 33% collectively of the last complete growing season's shoots of ericoids and crowberry (*Empetrum nigrum*) showing signs of browsing	Attribute and target based on Perrin et al. (2014). High levels of browsing of these dwarf shrubs would indicate undesirable levels of livestock/other grazers
Vegetation structure: burning	Occurrence in local vicinity	No signs of burning within the habitat	Attribute and target based on Perrin et al. (2014)
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014). Disturbance can include hoof marks, wallows, human foot prints, vehicle and machinery tracks. Excessive disturbance can result in loss of characteristic species and presage erosion

1395 Petalwort *Petalophyllum ralfsii*

To maintain the favourable conservation condition of Petalwort in Tranarossan and Melmore Lough 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 known population in this SAC occurs on unshaded damp sand with short vegetation on a south-facing slope (10-30º) above sandy bay on the north end of Rosses Strand. Data from NPWS surveys and Campbell (2013)
Population size	Number of individuals	No decline. Population estimated at c.270 thalli	Counts of thalli are based on the mean of number of thalli in two 1 x 1m plots, averaged for three counts between early April 2009 and April 2011: 13.5 thalli per m² (Campbell, 2013) in 20m² = 270 thalli
Area of suitable habitat	Hectares	No decline. Area of suitable habitat at Rosses Strand is estimated at c.0.002ha	The area of occupancy was mapped in three areas on the slope. The first was recorded by Holyoak in 2002 in an area c.8 x 1m; the second was recorded by Campbell (2013), using GPS, c.13m further down hillside on compact sandy humic soil with a slope of 23º and an area of c.7.5m²; the third was recorded by GPS c.60m to the east on a similar flushed slope with an area of c.4.1m², giving a total of c.20m²
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 sheep grazing and some trampling (by walkers). Campbell (2013) recorded a mean height of vegetation of 4.2cm, with bryophyte cover c.51-75% and bare ground c.4-10% (based on two 1 x 1m plots between 2009 and 2011)



MAP 1: TRANAROSSAN AND MELMORE LOUGH SAC CONSERVATION OBJECTIVES SAC DESIGNATION

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

SITE CODE:
SAC 000194; version 3. CO. DONEGAL

0 0.25 0.5 0.75 1 km

Legend

Tranarossan and Melmore Lough SAC 000194

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Map Version 1
Date: March 2015

SPA 004194

SAC 000194

SAC 001190

SAC 002159

Legend

- Tranarossan and Melmore Lough SAC 000194
- Sheephaven SAC 001190
- Mulroy Bay SAC 002159
- Horn Head to Fanad Head SPA 004194
- OSi Discovery Series County Boundary

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Department of Arts, Heritage and the Gaeltacht

MAP 2:
TRANAROSSAN AND MELMORE LOUGH SAC CONSERVATION OBJECTIVES ADJACENT / ADJOINING / OVERLAPPING DESIGNATIONS

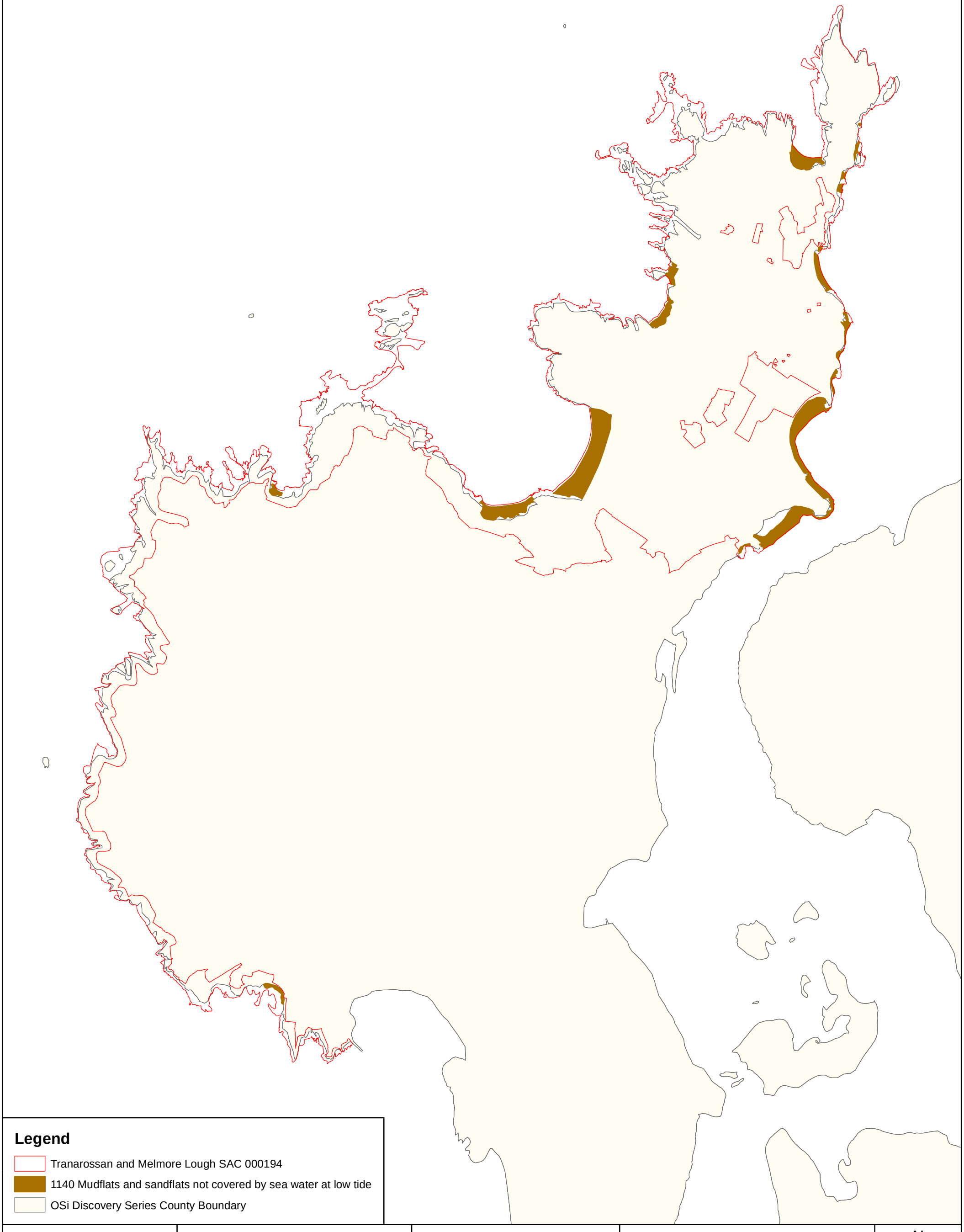
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000194; version 3, SAC 001190; version 3, SAC 002159; version 3.
SPA 004194; version 2.02. CO. DONEGAL

0 1 2 3 4 5 km

N

Map Version 1
Date: March 2015



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Department of Arts, Heritage and the Gaeltacht

MAP 3: TRANAROSSAN AND MELMORE LOUGH SAC CONSERVATION OBJECTIVES TIDAL MUDFLATS AND SANDFLATS

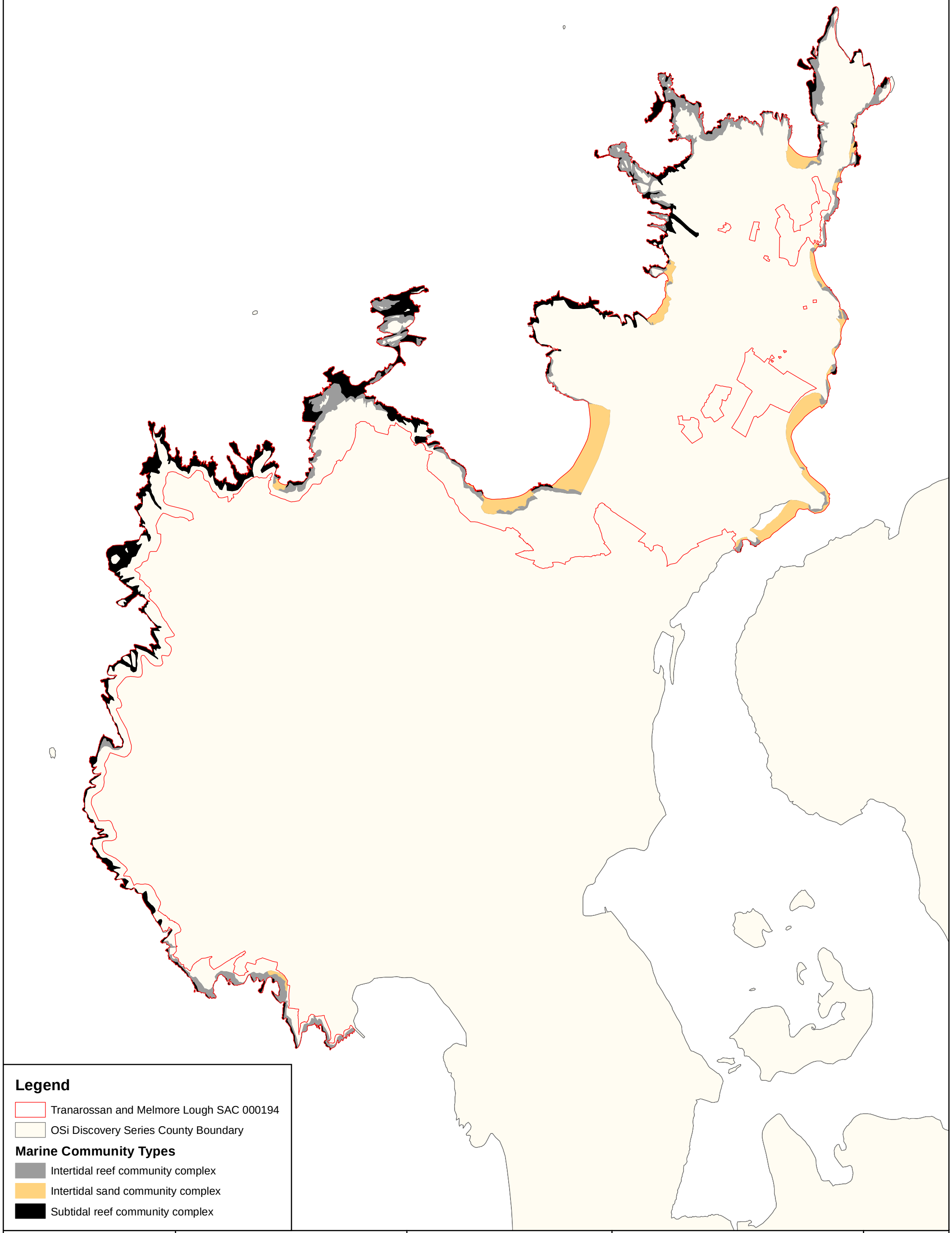
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000194; version 3. CO. DONEGAL

0 0.25 0.5 0.75 1 km

N

Map Version 1
Date: March 2015



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

MAP 4:
TRANAROSSAN AND MELMORE LOUGH SAC
CONSERVATION OBJECTIVES
MARINE COMMUNITY TYPES

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

SITE CODE:
SAC 000194; version 3. CO. DONEGAL

0 0.25 0.5 0.75 1 km

N

Map Version 1
Date: March 2015

Legend

- Tranarossan and Melmore Lough SAC 000194
- 1230 Vegetated sea cliffs of the Atlantic and Baltic coasts
- OSi Discovery Series County Boundary

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

MAP 5: TRANAROSSAN AND MELMORE LOUGH SAC CONSERVATION OBJECTIVES VEGETATED SEA CLIFFS

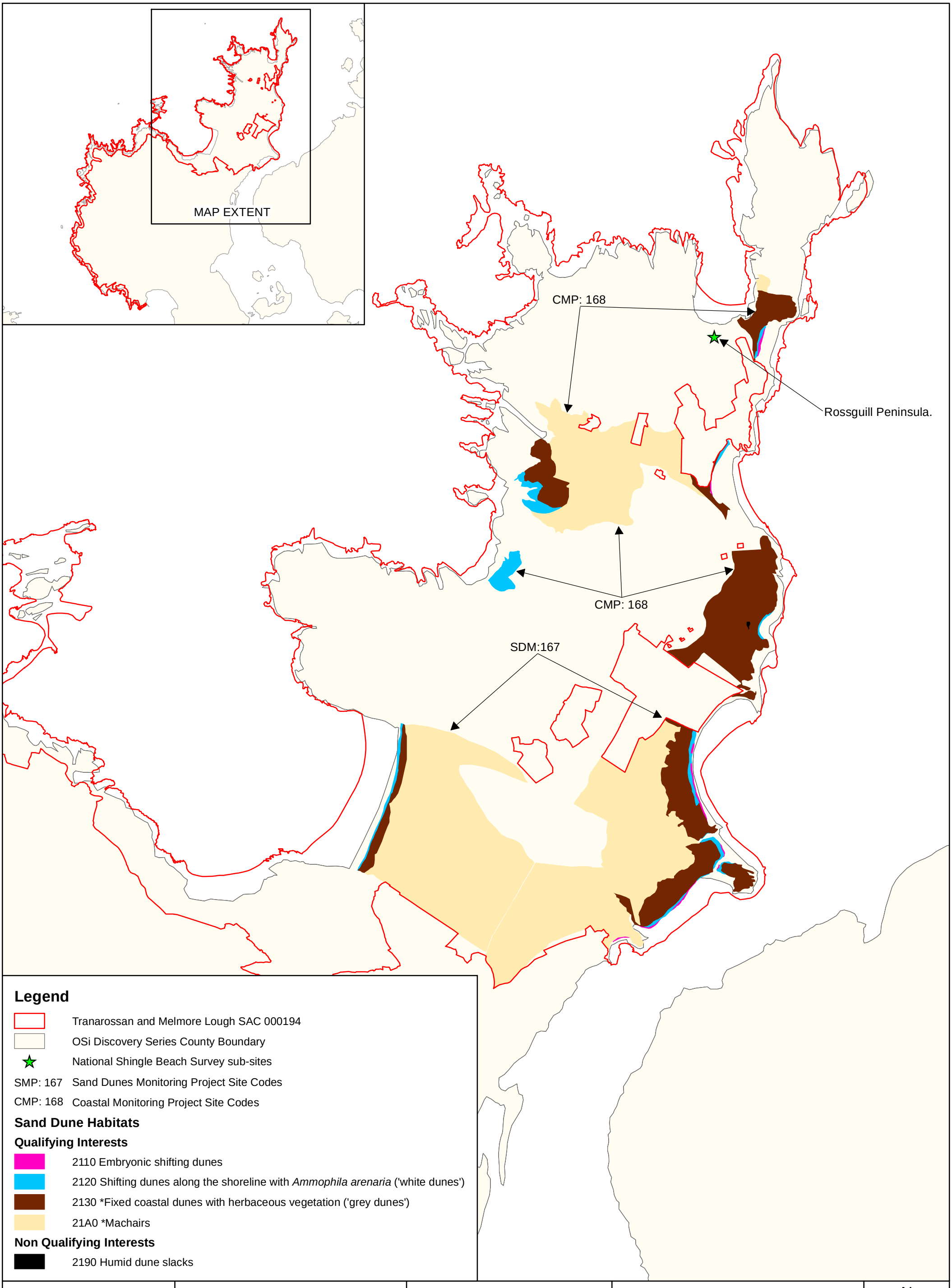
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000194; version 3. CO. DONEGAL

0 0.25 0.5 0.75 1 km

N

Map Version 1
Date: March 2015



Legend

- Tranarossan and Melmore Lough SAC 000194
- OSi Discovery Series County Boundary
- National Shingle Beach Survey sub-sites
- SMP: 167 Sand Dunes Monitoring Project Site Codes
- CMP: 168 Coastal Monitoring Project Site Codes

Sand Dune Habitats

Qualifying Interests

- 2110 Embryonic shifting dunes
- 2120 Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes')
- 2130 *Fixed coastal dunes with herbaceous vegetation ('grey dunes')
- 21A0 *Machairs

Non Qualifying Interests

- 2190 Humid dune slacks

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Department of Arts, Heritage and the Gaeltacht

MAP 6:
TRANAROSSAN AND MELMORE LOUGH SAC
CONSERVATION OBJECTIVES
SAND DUNE HABITATS /
ANNUAL VEGETATION OF DRIFT LINES &
PERRENNIAL VEGETATION OF STONY BANKS

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

SITE CODE:
SAC 000194; version 3. CO. DONEGAL

0 250 500 m

N

Map Version 1
Date: March 2015

Map Extent

Legend

- Tranarossan and Melmore Lough SAC 000194
- 3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.
- OSi Discovery Series County Boundary

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Department of Arts, Heritage and the Gaeltacht

MAP 7:
TRANAROSSAN AND MELMORE LOUGH SAC
CONSERVATION OBJECTIVES
LAKE HABITATS

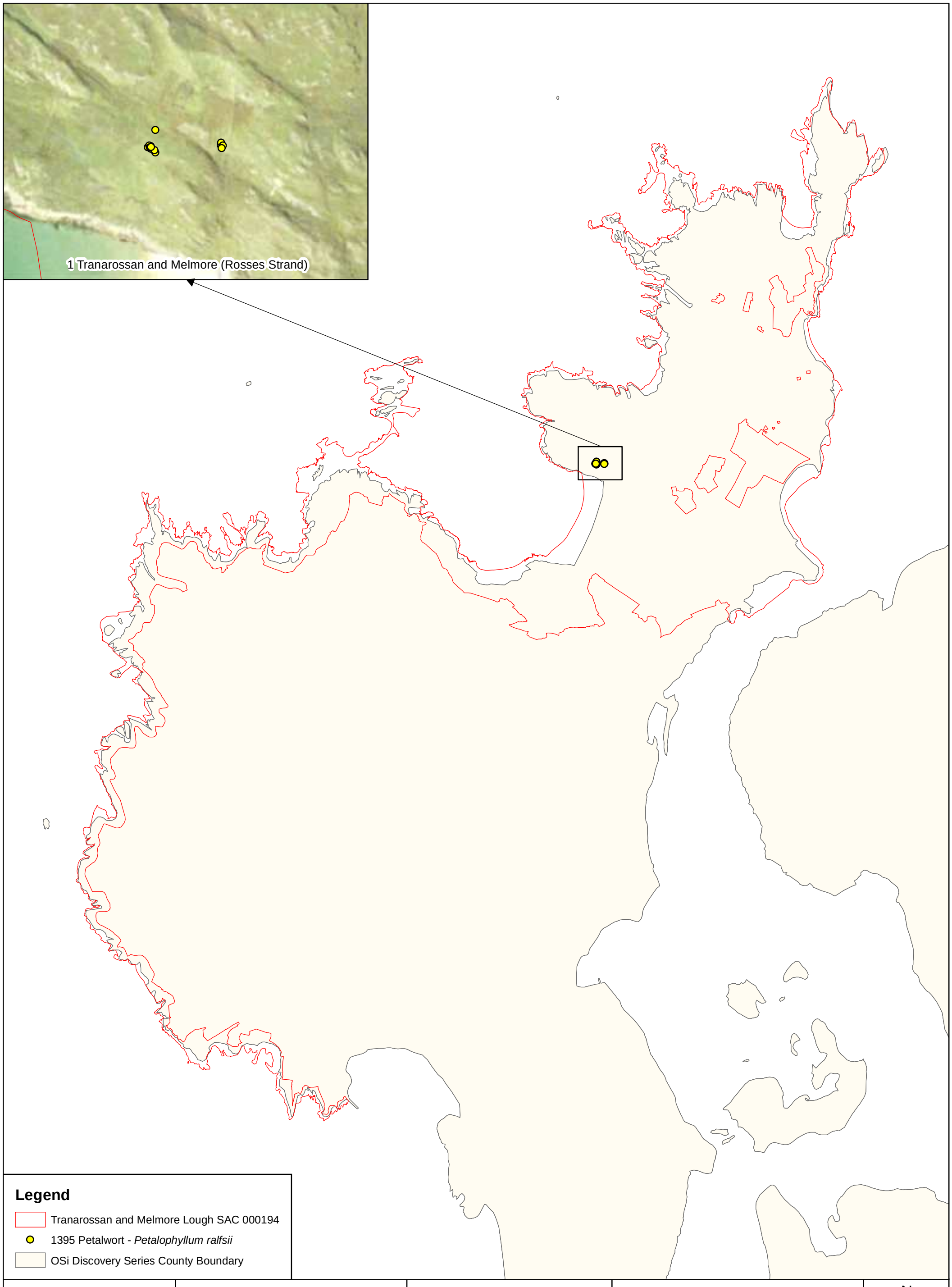
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000194; version 3. CO. DONEGAL

0 100 200 m

N

Map Version 1
Date: March 2015



Legend

- Tranarossan and Melmore Lough SAC 000194
- 1395 Petalwort - *Petalophyllum ralfsii*
- OSi Discovery Series County Boundary

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

MAP 8:
TRANAROSSAN AND MELMORE LOUGH SAC CONSERVATION OBJECTIVES PETALWORT

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

SITE CODE:
SAC 000194; version 3. CO. DONEGAL

0 0.25 0.5 0.75 1 km

N

Map Version 1
Date: March 2015

Conservation objectives for Horn Head to Fanad Head SPA [004194]

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
A009	Fulmar	*Fulmarus glacialis*
A017	Cormorant	*Phalacrocorax carbo*
A018	Shag	*Phalacrocorax aristotelis*
A045	Barnacle Goose	*Branta leucopsis*
A103	Peregrine	*Falco peregrinus*
A188	Kittiwake	*Rissa tridactyla*
A199	Guillemot	*Uria aalge*
A200	Razorbill	*Alca torda*

A346	Chough	*Pyrrhocorax pyrrhocorax*
A395	Greenland White-fronted Goose	*Anser albifrons flavirostris*

Citation: *NPWS (2018) Conservation objectives for Horn Head to Fanad Head SPA [004194]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

Conservation objectives for Fanad Head SPA [004148]

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
A122	Corncrake	*Crex crex*

Citation: *NPWS (2018) Conservation objectives for Fanad Head SPA [004148]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Lough Foyle SPA 004087

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,

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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***

004087 Lough Foyle SPA

A001	Red-throated Diver *Gavia stellata*
A005	Great Crested Grebe *Podiceps cristatus*
A037	Bewick's Swan *Cygnus columbianus bewickii*
A038	Whooper Swan *Cygnus cygnus*
A043	Greylag Goose *Anser anser*
A046	Brent Goose *Branta bernicla hrota*
A048	Shelduck *Tadorna tadorna*
A050	Wigeon *Anas penelope*
A052	Teal *Anas crecca*
A053	Mallard *Anas platyrhynchos*
A063	Eider *Somateria mollissima*
A069	Red-breasted Merganser *Mergus serrator*
A130	Oystercatcher *Haematopus ostralegus*
A140	Golden Plover *Pluvialis apricaria*
A142	Lapwing *Vanellus vanellus*
A143	Knot *Calidris canutus*
A149	Dunlin *Calidris alpina alpina*
A157	Bar-tailed Godwit *Limosa lapponica*
A160	Curlew *Numenius arquata*
A162	Redshank *Tringa totanus*
A179	Black-headed Gull *Chroicocephalus ridibundus*
A182	Common Gull *Larus canus*
A184	Herring Gull *Larus argentatus*
A999	Wetlands

Supporting documents, relevant reports & publications

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

NPWS Documents

Year :	2014
Title :	Lough Foyle SPA (site code: 4087) Conservation objectives supporting document V1
Author :	NPWS
Series :	Conservation objectives supporting document

A005 Great Crested Grebe *Podiceps cristatus*

To maintain the favourable conservation condition of Great Crested Grebe in Lough Foyle 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	No significant decrease in the range, timing or intensity of use of areas by great crested grebe, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A037 Bewick's Swan *Cygnus columbianus bewickii*

To maintain the favourable conservation condition of Bewick's Swan in Lough Foyle 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	No significant decrease in range, timing or intensity of use of areas by Bewick's swan, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A038 Whooper Swan *Cygnus cygnus*

To maintain the favourable conservation condition of Whooper Swan in Lough Foyle 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 conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by whooper swan, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part four of the conservation objectives supporting document

Conservation Objectives for : Lough Foyle SPA [004087]

A043 Greylag Goose *Anser anser*

To maintain the favourable conservation condition of Greylag Goose in Lough Foyle 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	No significant decrease in the range, timing or intensity of use of areas by greylag goose, other than that occurring from natural patterns of variation.	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

Conservation Objectives for : Lough Foyle SPA [004087]

A046 **Brent Goose *Branta bernicla hrota***

To maintain the favourable conservation condition of Light-bellied Brent Goose in Lough Foyle 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	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	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

Conservation Objectives for : Lough Foyle SPA [004087]

A048 **Shelduck *Tadorna tadorna***

To maintain the favourable conservation condition of Shelduck in Lough Foyle 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	No significant decrease in the range, timing or intensity of use of areas by shelduck, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A050 Wigeon *Anas penelope*

To maintain the favourable conservation condition of Wigeon in Lough Foyle 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	No significant decrease in the range, timing or intensity of use of areas by wigeon, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A052 Teal *Anas crecca*

To maintain the favourable conservation condition of Teal in Lough Foyle 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	No significant decrease in the range, timing or intensity of use of areas by teal, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

Conservation Objectives for : Lough Foyle SPA [004087]

A053 Mallard *Anas platyrhynchos*

To maintain the favourable conservation condition of Mallard in Lough Foyle 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	No significant decrease in the range, timing or intensity of use of areas by mallard, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

Conservation Objectives for : Lough Foyle SPA [004087]

A063 **Eider *Somateria mollissima***

To maintain the favourable conservation condition of Eider in Lough Foyle 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	No significant decrease in the range, timing or intensity of use of areas by eider, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A069 Red-breasted Merganser *Mergus serrator*

To maintain the favourable conservation condition of Red-breasted Merganser in Lough Foyle 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	No significant decrease in the range, timing or intensity of use of areas by red-breasted merganser, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

Conservation Objectives for : Lough Foyle SPA [004087]

A130 Oystercatcher *Haematopus ostralegus*

To maintain the favourable conservation condition of Oystercatcher in Lough Foyle 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	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by oystercatcher, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part four of the conservation objectives supporting document

Conservation Objectives for : Lough Foyle SPA [004087]

A140 **Golden Plover *Pluvialis apricaria***

To maintain the favourable conservation condition of Golden Plover in Lough Foyle 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	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by golden plover, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A142 Lapwing *Vanellus vanellus*

To maintain the favourable conservation condition of Lapwing in Lough Foyle 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	No significant decrease in the range, timing or intensity of use of areas by lapwing, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A143 **Knot *Calidris canutus***

To maintain the favourable conservation condition of Knot in Lough Foyle 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	No significant decrease in the range, timing or intensity of use of areas by knot, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A149 Dunlin *Calidris alpina alpina*

To maintain the favourable conservation condition of Dunlin in Lough Foyle 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	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by dunlin, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A157 Bar-tailed Godwit *Limosa lapponica*

To maintain the favourable conservation condition of Bar-tailed Godwit in Lough Foyle 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	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by bar-tailed godwit, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A160 Curlew *Numenius arquata*

To maintain the favourable conservation condition of Curlew in Lough Foyle 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	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by curlew, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A162 Redshank *Tringa totanus*

To maintain the favourable conservation condition of Redshank in Lough Foyle 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	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by redshank, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A179 Black-headed Gull *Chroicocephalus ridibundus*

To maintain the favourable conservation condition of Black-headed Gull in Lough Foyle 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	No significant decrease in the range, timing or intensity of use of areas used by black-headed gull other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

Conservation Objectives for : Lough Foyle SPA [004087]

A182 Common Gull *Larus canus*

To maintain the favourable conservation condition of Common Gull in Lough Foyle 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	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by common gull, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A184 Herring Gull *Larus argentatus*

To maintain the favourable conservation condition of Herring Gull in Lough Foyle 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	No significant decrease in the range, timing or intensity of use of areas by herring gull, other than that occurring from natural patterns of variation	Waterbird distribution from the 2011/2012 waterbird survey programme is discussed in part five of the conservation objectives supporting document

Conservation Objectives for : Lough Foyle SPA [004087]

A999 Wetlands

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

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 588 hectares, other than that occurring from natural patterns of variation	The wetland habitat area was estimated as 588ha using OSi data and relevant orthophotographs. For further information see part three of the conservation objectives supporting document

Legend

Lough Foyle SPA 004087

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

MAP 1:
LOUGH FOYLE SPA
CONSERVATION OBJECTIVES
SPA DESIGNATION

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

SITE CODE:
SPA 004087; version 2.01. CO. DONEGAL

0 0.5 1 km

N

Map Version 1
Date: Sep 2014

Conservation objectives for Lough Fern SPA [004060]

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
A059	Pochard	*Aythya ferina*

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 Fern SPA as a resource for the regularly-occurring migratory waterbirds that utilise it.

Citation: *NPWS (2018) Conservation objectives for Lough Fern SPA [004060]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

Conservation objectives for Derryveagh and Glendowan Mountains SPA [004039]

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
A001	Red-throated Diver	*Gavia stellata*
A098	Merlin	*Falco columbarius*
A103	Peregrine	*Falco peregrinus*
A140	Golden Plover	*Pluvialis apricaria*
A466	Dunlin	*Calidris alpina schinzii*

Citation: *NPWS (2018) Conservation objectives for Derryveagh and Glendowan Mountains SPA [004039]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

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National Parks and Wildlife Service

Conservation Objectives Series

River Finn SAC 002301

An Roinn Ealaíon, Oidhreachta,
Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta

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

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Citation:

NPWS (2017) Conservation Objectives: River Finn SAC 002301. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

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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***

002301	River Finn SAC
1106	Salmon *Salmo salar*
1355	Otter *Lutra lutra*
3110	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)
4010	Northern Atlantic wet heaths with *Erica tetralix*
7130	Blanket bogs (* if active bog)
7140	Transition mires and quaking bogs

Please note that this SAC overlaps with Derryveagh and Glendowan Mountains SPA (004039) and Lough Derg (Donegal) SPA (004057) and adjoins Meentygrannagh Bog SAC (000173), Dunragh Loughs/Pettigo Plateau SAC (001125) and Cloghernagore Bog and Glenveagh National Park SAC (002047). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping and adjoining sites as appropriate.

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

NPWS Documents

Year :	1990
Title :	A survey to locate lowland blanket bogs of scientific interest in county Donegal and upland blanket bogs in counties Cavan, Leitrim and Roscommon
Author :	Douglas, C.; Dunnells, D.; Scally, L.; Wyse Jackson, M.
Series :	Unpublished report to NPWS
Year :	2006
Title :	Otter survey of Ireland 2004/2005
Author :	Bailey, M.; Rochford, J.
Series :	Irish Wildlife Manual No. 23
Year :	2007
Title :	Supporting documentation for the Habitats Directive Conservation Status Assessment - backing documents. Article 17 forms and supporting maps
Author :	NPWS
Series :	Unpublished report to NPWS
Year :	2012
Title :	Ireland Red List No. 8: Bryophytes
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	Ireland Red List series, NPWS
Year :	2013
Title :	National otter survey of Ireland 2010/12
Author :	Reid, N.; Hayden, B.; Lundy, M.G.; Pietravalle, S.; McDonald, R.A.; Montgomery, W.I.
Series :	Irish Wildlife Manual No. 76
Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 2. Habitats assessments
Author :	NPWS
Series :	Conservation assessments
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 :	Habitats Directive Annex I lake habitats: a working interpretation for the purposes of site-specific conservation objectives and Article 17 reporting
Author :	O Connor, Á.
Series :	Unpublished document by NPWS
Year :	2016
Title :	Ireland Red List No. 10: Vascular Plants
Author :	Wyse Jackson, M.; FitzPatrick, Ú.; Cole, E.; Jebb, M.; McFerran, D.; Sheehy Skeffington, M.; Wright, M.
Series :	Ireland Red Lists series, NPWS
Year :	2017
Title :	River Finn SAC (site code: 2301) Conservation objectives supporting document- blanket bog and associated habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	1934
Title :	The Botanist in Ireland
Author :	Praeger, R.L.
Series :	Hodges, Figgis and Co., Dublin
Year :	1982
Title :	Otter survey of Ireland
Author :	Chapman, P.J.; Chapman, L.L.
Series :	Unpublished report to Vincent Wildlife Trust
Year :	1982
Title :	Eutrophication of waters. Monitoring assessment and control
Author :	OECD
Series :	OECD, Paris
Year :	1991
Title :	The spatial organization of otters (*Lutra lutra*) in Shetland
Author :	Kruuk, H.; Moorhouse, A.
Series :	Journal of Zoology, 224: 41-57
Year :	2000
Title :	Colour in Irish lakes
Author :	Free, G.; Allott, N.; Mills, P.; Kennelly, C.; Day, S.
Series :	Verhandlungen Internationale Vereinigung für theoretische und angewandte Limnologie, 27: 2620-2623
Year :	2002
Title :	Deterioration of Atlantic soft water macrophyte communities by acidification, eutrophication and alkalinisation
Author :	Arts, G.H.P.
Series :	Aquatic Botany, 73: 373-393
Year :	2006
Title :	Otters - ecology, behaviour and conservation
Author :	Kruuk, H.
Series :	Oxford University Press
Year :	2006
Title :	A reference-based typology and ecological assessment system for Irish lakes. Preliminary investigations. Final report. Project 2000-FS-1-M1 Ecological assessment of lakes pilot study to establish monitoring methodologies EU (WFD)
Author :	Free, G.; Little, R.; Tierney, D.; Donnelly, K.; Coroni, R.
Series :	EPA, Wexford
Year :	2008
Title :	Water Quality in Ireland 2004-2006
Author :	Clabby, K.J.; Bradley, C.; Craig, M.; Daly, D.; Lucey, J.; McGarrigle, M.; O'Boyle, S.; Tierney, D.; Bowman, J.
Series :	EPA, Wexford
Year :	2009
Title :	The identification, characterization and conservation value of isoetid lakes in Ireland
Author :	Free, G.; Bowman, J.; McGarrigle, M.; Little, R.; Coroni, R.; Donnelly, K.; Tierney, D.; Trodd, W.
Series :	Aquatic Conservation: Marine and Freshwater Ecosystems, 19 (3): 264–273

Year :	2010
Title :	Otter tracking study of Roaringwater Bay
Author :	De Jongh, A.; O'Neill, L.
Series :	Unpublished draft report to NPWS
Year :	2010
Title :	Water quality in Ireland 2007-2009
Author :	McGarrigle, M.; Lucey, J.; Ó Cinnéide, M.
Series :	EPA, Wexford
Year :	2015
Title :	Water quality in Ireland 2010-2012
Author :	Bradley, C.; Byrne, C.; Craig, M.; Free, G.; Gallagher, T.; Kennedy, B.; Little, R.; Lucey, J.; Mannix, A.; McCreesh, P.; McDermott, G.; McGarrigle, M.; Ní Longphuirt, S.; O'Boyle, S.; Plant, C.; Tierney, D.; Trodd, W.; Webster, P.; Wilkes, R.; Wynne, C.
Series :	EPA, Wexford
Year :	2016
Title :	The Status of Irish Salmon Stocks in 2015 with Precautionary Catch Advice for 2016
Author :	SSCS (Standing Scientific Committee on Salmon)
Series :	Independent Scientific Report to Inland Fisheries Ireland

Spatial data sources

Year :	2008
Title :	OSi 1:5000 IG vector dataset
GIS Operations :	WaterPolygons feature class clipped to the SAC boundary. Expert opinion used to identify Annex I habitat and to resolve any issues arising
Used For :	3110 (map 3)
Year :	2010
Title :	OSi 1:5000 IG vector dataset
GIS Operations :	Creation of 80m buffer on the aquatic side of lake data; creation of 10m buffer on the terrestrial side of lake data. These datasets combined with the derived OSi Discovery Series river and canal datasets. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising. Creation of 250m buffer on aquatic side of the lake boundary to highlight potential commuting points
Used For :	1355 (map 4)
Year :	2005
Title :	OSi Discovery series vector data
GIS Operations :	Creation of a 10m buffer on the terrestrial side of river banks data; creation of 20m buffer applied to canal centreline data. Creation of 20m buffer applied to river and stream centreline data; These datasets combined with the derived OSI 1:5000 vector lake buffer data. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1355 (no map)

3110 Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)

To restore the favourable conservation condition of Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) in River Finn 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	Lake habitat 3110 is likely to occur in the larger lakes in River Finn SAC, such as Loughs Derg, Finn and Belshade. Lake habitat 3130 may also occur in Loughs Derg and Finn. The exact distribution of lake habitat 3110 in the SAC is unknown however, as little specific information on the lake vegetation is currently available. Lake habitat 3110 may co-occur with lake habitat 3160 in small and upland lakes. In line with Article 17 reporting (NPWS, 2013), all lakes larger than 1ha have been mapped as 'potential 3110' (see map 3). Two measures of extent should be used: 1. the area of the lake itself and; 2. the extent of the vegetation communities/zones that typify the habitat. Further information relating to all attributes is provided in the lake habitats supporting document for the purposes of site-specific conservation objectives and Article 17 reporting (O Connor, 2015)
Habitat distribution	Occurrence	No decline, subject to natural processes	As noted above, the exact distribution of lake habitat 3110 in River Finn SAC is not known. In map 3, all lakes larger than 1ha (based on 1:5,000 data) have been mapped as potential 3110
Typical species	Occurrence	Typical species present, in good condition, and demonstrating typical abundances and distribution	For lists of typical plant species, see the Article 17 habitat assessment for lake habitat 3110 (NPWS, 2013) and the lake habitats supporting document (O Connor, 2015). The moss *Fontinalis antipyretica*, quillwort (*Isoetes lacustris*), bulbous rush (*Juncus bulbosus*), shoreweed (*Littorella uniflora*), water lobelia (*Lobelia dortmanna*), broad-leaved pondweed (*Potamogeton natans*) and floating bur-reed (*Sparganium angustifolium*) have been recorded in Lough Derg (Praeger, 1934; internal NPWS and EPA files). Environmental Protection Agency (EPA) biologists have also recorded slender naiad (*Najas flexilis*) in Lough Derg, suggesting lake habitat 3130 may occur. EPA records for stonewort (*Chara* sp.), intermediate water starwort (*Callitriche hamulata*) and pondweeds (*Potamogeton berchtoldii, P. gramineus* and *P. perfoliatus*) in Lough Finn are also indicative of lake habitat 3130
Vegetation composition: characteristic zonation	Occurrence	All characteristic zones should be present, correctly distributed and in good condition	Further work is necessary to describe the characteristic zonation and other spatial patterns in lake habitat 3110 (see O Connor, 2015)
Vegetation distribution: maximum depth	Metres	Maintain maximum depth of vegetation, subject to natural processes	The maximum depth of vegetation is likely to be specific to the lake shoreline in question. Further work is necessary to develop indicative targets for lake habitat 3110. Water clarity is expected to be high in upland 3110 lakes, resulting in a large maximum depth of vegetation
Hydrological regime: water level fluctuations	Metres	Maintain appropriate natural hydrological regime necessary to support the habitat	Fluctuations in lake water level are typical in Ireland, but can be amplified by activities such as abstraction and drainage. Increased water level fluctuations can increase wave action, up-root vegetation, increase turbidity, alter the substratum and lead to release of nutrients from the sediment. The hydrological regime of the lakes must be maintained so that the area, distribution and depth of the lake habitat and its constituent/characteristic vegetation zones and communities are not reduced

Lake substratum quality	Various	Maintain appropriate substratum type, extent and chemistry to support the vegetation	Research is required to further characterise the substratum types (particle size and origin) and substratum quality (notably pH, calcium, iron and nutrient concentrations) favoured by each of the five Annex I lake habitats in Ireland. It is likely that lake habitat 3110 is associated with a range of nutrient-poor substrates, from stones, cobble and gravel, through sands, silt, clay and peat. Substratum particle size is likely to vary with depth and along the shoreline within a single lake
Water quality: transparency	Metres	Maintain appropriate Secchi transparency. There should be no decline in Secchi depth/transparency	Transparency relates to light penetration and, hence, to the depth of colonisation of vegetation. It can be affected by phytoplankton blooms, water colour and turbidity. Specific targets have yet to be established for lake habitat 3110 (O Connor, 2015). Habitat 3110 is associated with very clear water, particularly upland examples. The OECD fixed boundary system set transparency targets for oligotrophic lakes of ≥6m annual mean Secchi disk depth, and ≥3m annual minimum Secchi disk depth. Free et al. (2009) found high isoetid abundance in lakes with Secchi depths of more than 3m
Water quality: nutrients	µg/l P; mg/l N	Maintain the concentration of nutrients in the water column at sufficiently low levels to support the habitat and its typical species	As a nutrient-poor habitat, oligotrophic and Water Framework Directive (WFD) 'high' status targets apply. Where a lake has nutrient concentrations that are lower than these targets, there should be no decline within class, i.e. no upward trend in nutrient concentrations. For lake habitat 3110, annual average total phosphorus (TP) concentration should be ≤10µg/l TP, average annual total ammonia concentration should be ≤0.040mg/l N and annual 95th percentile for total ammonia should be ≤0.090mg/l N. See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009
Water quality: phytoplankton biomass	µg/l Chlorophyll *a*	Maintain appropriate water quality to support the habitat, including high chlorophyll *a* status	Oligotrophic and WFD 'high' status targets apply to lake habitat 3110. Where a lake has a chlorophyll *a* concentration that is lower than this target, there should be no decline within class, i.e. no upward trend in phytoplankton biomass. The average growing season (March-October) chlorophyll *a* concentration must be <5.8µg/l. The annual average chlorophyll *a* concentration should be <2.5µg/l and the annual peak chlorophyll *a* concentration should be ≤8.0µg/l. See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009
Water quality: phytoplankton composition	EPA phytoplankton composition metric	Maintain appropriate water quality to support the habitat, including high phytoplankton composition status	The EPA has developed a phytoplankton composition metric for nutrient enrichment of Irish lakes. As for other water quality indicators, lake habitat 3110 requires WFD high status
Water quality: attached algal biomass	Algal cover and EPA phytobenthos metric	Maintain trace/absent attached algal biomass (<5% cover) and high phytobenthos status	Nutrient enrichment can favour epiphytic and epipelic algae that can out-compete the submerged vegetation. The cover abundance of attached algae in lake habitat 3110 should, therefore, be trace/absent (<5% cover). EPA phytobenthos can be used as an indicator of changes in attached algal biomass. As for other water quality indicators, lake habitat 3110 requires high phytobenthos status
Water quality: macrophyte status	EPA macrophyte metric (The Free Index)	Maintain high macrophyte status	Nutrient enrichment can favour more competitive submerged macrophyte species that out-compete the typical and characteristic species for the lake habitat. The EPA monitors macrophyte status for WFD purposes using the 'Free Index'. The target for lake habitat 3110 is high status or an Ecological Quality Ratio (EQR) for lake macrophytes of ≥0.90, as defined in Schedule Five of the European Communities Environmental Objectives (Surface Waters) Regulations 2009

Acidification status	pH units; mg/l	Maintain appropriate water and sediment pH, alkalinity and cation concentrations to support the habitat, subject to natural processes	Acidification can impact on species abundance and composition in soft water lake habitats. In Europe, acidification of isoetid lakes can lead to loss of isoetids and dominance by submerged *Sphagnum* mosses and *Juncus bulbosus* (Arts, 2002). The specific requirements of lake habitat 3110, in terms of water and sediment pH, alkalinity and cation concentration, have not been determined. For lake habitat 3110, and adopting a precautionary approach based on Arts (2002), minimum pH should not be <5.5 pH units. Maximum pH should be <9.0 pH units, in line with the surface water standards established for soft waters (where water hardness is ≤100mg/l calcium carbonate). See Schedule Five of the European Communities Environmental Objectives (Surface Waters) Regulations 2009
Water colour	mg/l PtCo	Maintain appropriate water colour to support the habitat	Increased water colour and turbidity decrease light penetration and can reduce the area of available habitat for lake macrophytes, particularly at the lower euphotic depths. The primary source of increased water colour in Ireland is disturbance to peatland. No habitat-specific or national standards for water colour currently exist. Studies have shown median colour concentrations in Irish lakes of 38mg/l PtCo (Free et al., 2000) and 33mg/l PtCo (Free et al., 2006). It is likely that the water colour in all Irish lake habitats would naturally be <50mg/l PtCo. Water colour can be very low (<20mg/l PtCo or even <10mg/l PtCo) in lake habitat 3110, where the peatland in the lake's catchment is intact
Dissolved organic carbon (DOC)	mg/l	Maintain appropriate organic carbon levels to support the habitat	Dissolved (and particulate) organic carbon (OC) in the water column is linked to water colour and acidification (organic acids). Increasing DOC in water has been documented across the Northern Hemisphere, including afforested peatland catchments in Ireland. Damage and degradation of peatland, leading to decomposition of peat is likely to be the predominant source of OC in Ireland. OC in water promotes decomposition by fungi and bacteria that, in turn, releases dissolved nutrients. The increased biomass of decomposers can also impact directly on the characteristic lake communities through shading, competition, etc.
Turbidity	Nephelometric turbidity units/ mg/l SS/ other appropriate units	Maintain appropriate turbidity to support the habitat	Turbidity can significantly affect the quantity and quality of light reaching rooted and attached vegetation and can, therefore, impact on lake habitats. The settlement of higher loads of inorganic or organic material on lake vegetation communities may also have impacts on sensitive, delicate species. Turbidity can increase as a result of re-suspension of material within the lake, higher loads entering the lake, or eutrophication. Turbidity measurement and interpretation is challenging. As a result, it is likely to be difficult to set habitat-specific targets for turbidity in lakes
Fringing habitat: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the natural structure and functioning of habitat 3110	Most lake shorelines have fringing habitats of reedswamp, other swamp, fen, marsh or wet woodland that intergrade with and support the structure and functions of the lake habitat. In River Finn SAC, active blanket bog and heath, transition mire, fen, flush or grassland could also occur. Equally, fringing habitats are dependent on the lake, particularly its water levels, and support wetland communities and species of conservation concern. Many of the fringing wetland habitats support higher invertebrate and plant species richness than the lake habitats themselves

4010 Northern Atlantic wet heaths with Erica tetralix

To restore the favourable conservation condition of Northern Atlantic wet heaths with *Erica tetralix* in River Finn 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	Northern Atlantic wet heaths with *Erica tetralix* has not been mapped in detail for River Finn SAC but from current available data the total area of the qualifying habitat is estimated to be approximately 187ha, covering 3% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the River Finn SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	Wet heath occurs in association with blanket bog, upland grassland and exposed rock within the SAC. It occupies shallower peats and better drained slopes. It occurs quite widely at Owendoo/ Cloghervaddy (Douglas et al., 1990; NPWS internal files). Further information can be found within Douglas et al. (1990), NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	A variety of wet heath vegetation communities have been recorded in this SAC (Douglas et al., 1990; NPWS internal files), three of which correspond to communities recorded in the National Survey of Upland Habitats and listed in the provisional list of vegetation communities described in Perrin et al. (2014). Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: cross-leaved heath	Occurrence within 20m of a representative number of monitoring stops	Cross-leaved heath (*Erica tetralix*) present within a 20m radius of each monitoring stop	Attribute and target based on Perrin et al. (2014)
Vegetation composition: positive indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of positive indicator species at least 50%	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: lichens and bryophytes	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of *Cladonia* and *Sphagnum* species, *Racomitrium lanuginosum* and pleurocarpous mosses at least 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: ericoid species and crowberry	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of ericoid species and crowberry (*Empetrum nigrum*) at least 15%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: dwarf shrub species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of dwarf shrubs less than 75%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented

Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). The non-native moss *Campylopus introflexus* has been recorded from the SAC (Douglas et al., 1990), but this species cannot be assigned specifically to wet heath
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 20%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: bracken	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of bracken (*Pteridium aquilinum*) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: soft rush	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of soft rush (*Juncus effusus*) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: *Sphagnum* condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up	Attribute and target based on Perrin et al. (2014)
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Less than 33% collectively of the last complete growing season's shoots of ericoids, crowberry (*Empetrum nigrum*) and bog-myrtle (*Myrica gale*) showing signs of browsing	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Attribute and target based on Perrin et al. (2014)
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: drainage	Percentage area in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 (FPO) and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016). There is a historic record for the FPO listed and Vulnerable marsh clubmoss (*Lycopodiella inundata*) (Wyse Jackson et al., 2016) from Lough Belshade in the SAC (NPWS internal files), but this species cannot be assigned specifically to wet heath

7130 Blanket bogs (* if active bog)

To restore the favourable conservation condition of Blanket bogs (*if active bog) in River Finn 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	Blanket bog has not been mapped in detail for River Finn SAC but from current available data the total area of the qualifying habitat is estimated to be approximately 519ha, covering 9% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the River Finn SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	Blanket bog is documented to occur throughout much of the upland areas of the SAC and along the edges of the river. The most extensive examples are found at Tullytresna and Owendoo/Cloghervaddy. A valley bog is present to the north-east of Lough Finn (Douglas et al., 1990; NPWS internal files). Further information can be found within Douglas et al. (1990), NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Ecosystem function: peat formation	Active blanket bog as a proportion of the total area of Annex I blanket bog habitat	At least 99% of the total Annex I blanket bog area is active	See the blanket bogs and associated habitats supporting document for further details
Ecosystem function: hydrology	Flow direction, water levels, occurrence of drains and erosion gullies	Natural hydrology unaffected by drains and erosion	Further details and a brief discussion of restoration potential is presented in the blanket bogs and associated habitats supporting document
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	A variety of blanket bog vegetation communities have been recorded in this SAC (Douglas et al., 1990; NPWS internal files), four of which correspond to communities recorded in the National Survey of Upland Habitats and listed in the provisional list of vegetation communities described in Perrin et al. (2014). Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: positive indicator species	Number of species at a representative number of 2m x 2m monitoring stops	Number of positive indicator species present at each monitoring stop is at least seven	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: lichens and bryophytes	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of bryophytes or lichens, excluding *Sphagnum fallax*, at least 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: potential dominant species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of each of the potential dominant species less than 75%	Attribute and target based on Perrin et al. (2014). See the blanket bogs and associated habitats supporting document for the list of potential dominant species
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). The non-native moss *Campylopus introflexus* has been recorded from the SAC (Douglas et al., 1990), but this species cannot be assigned specifically to blanket bog

Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: *Sphagnum* condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up	Attribute and target based on Perrin et al. (2014)
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Last complete growing season's shoots of ericoids, crowberry (*Empetrum nigrum*) and bog-myrtle (*Myrica gale*) showing signs of browsing collectively less than 33%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas for this habitat is also presented
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: drainage	Percentage area in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: erosion	Percentage area in local vicinity of a representative number of monitoring stops	Less than 5% of the greater bog mosaic comprises erosion gullies and eroded areas	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 (FPO) and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016). There is a historic record for the FPO listed and Vulnerable marsh clubmoss (*Lycopodiella inundata*) (Wyse Jackson et al., 2016) from Lough Belshade in the SAC (NPWS internal files), but this species cannot be assigned specifically to blanket bog

7140 Transition mires and quaking bogs

To restore the favourable conservation condition of Transition mires and quaking bogs in River Finn 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	Transition mires and quaking bogs have not been mapped in detail for River Finn SAC and thus total area of the qualifying habitat is unknown. Further details on this and the following attributes can be found in the River Finn SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	The habitat occurs at the interface between bog and waterbodies. An extensive area of this habitat is found at Owendoo/Cloghervaddy to the west of the Owendoo River. It is also though to occur in quaking areas associated with Cronakerny and Cronamuck. Other locations that support this habitat include Tullytresna and the lake edges of Lough Fad, Lough Finn, Lough Gulladuff and the small lakes south of Lough Belshade (Douglas et al., 1990; NPWS internal files). Further information can be found within Douglas et al. (1990), NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	A variety of transition mire vegetation communities have been recorded in this SAC (NPWS internal files), two of which correspond to communities recorded in the National Survey of Upland Habitats and listed in the provisional list of vegetation communities described in Perrin et al. (2014). Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: number of positive indicator species	Vegetation composition: number of positive indicator species	Number of positive indicator species at each monitoring stop is at least three for infilling pools and flushes and at least six for fens	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: number of core positive indicator species	Number of species at a representative number of 2m x 2m monitoring stops	At least one core positive indicator species present	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: cover of positive indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of positive indicator species is at least 25%	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014)

Vegetation structure: height	Percentage of leaves/shoots at a representative number of 2m x 2m monitoring stops	Proportion of live leaves and/or flowering shoots of vascular plants that are more than 15cm above the ground surface should be at least 50%	Attribute and target based on Perrin et al. (2014). This attribute is only applicable to fen and flush examples of the habitat, not to infilling pool examples
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: drainage	Percentage area in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016)

1106 Salmon *Salmo salar*

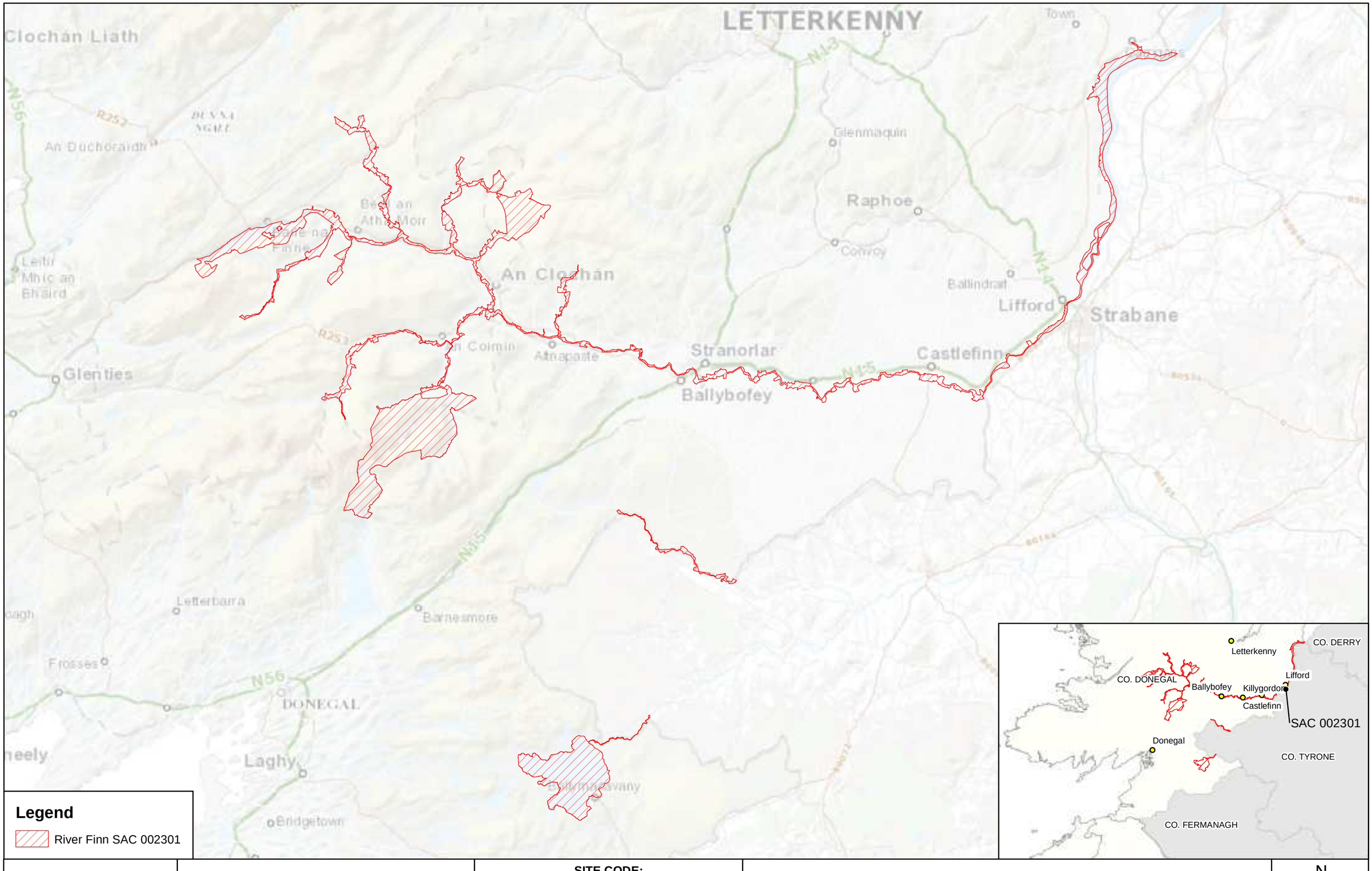
To maintain the favourable conservation condition of Atlantic Salmon in River Finn SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	Percentage of river accessible	100% of river channels down to second order accessible from estuary	Artificial barriers block salmons' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas
Adult spawning fish	Number	Conservation limit (CL) for each system consistently exceeded	A conservation limit (CL) is defined by the North Atlantic Salmon Conservation Organisation (NASCO) as "the spawning stock level that produces long-term average maximum sustainable yield as derived from the adult to adult stock and recruitment relationship". The target is based on the Standing Scientific Committee on Salmon (SSCS) annual model output of CL attainment levels. See SSCS (2016). Attainment of CL estimates are derived from direct counts of adults (rod catch, fish counter) or indirectly by fry abundance counts
Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 minutes sampling	The target is the threshold value for rivers currently exceeding their conservation limit (CL)
Out-migrating smolt abundance	Number	No significant decline	Smolt abundance can be negatively affected by a number of impacts such as estuarine pollution, predation and sea lice (*Lepeophtheirus salmonis*)
Number and distribution of redds	Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes	Salmon spawn in clean gravels
Water quality	EPA Q value	At least Q4 at all sites sampled by EPA	Q values based on triennial water quality surveys carried out by the Environmental Protection Agency (EPA)

1355 Otter *Lutra lutra*

To maintain the favourable conservation condition of Otter in River Finn SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Percentage positive survey sites	No significant decline	Measure based on standard otter survey technique. Favourable Conservation Status (FCS) target, based on 1980/81 survey findings, is 88% in SACs. Current range is estimated at 93.6% (Reid et al., 2013)
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 390ha along river banks/lake shoreline/ around ponds	No field survey. Areas mapped to include 10m terrestrial buffer along river banks and around water bodies identified as critical for otters (NPWS, 2007)
Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 182.2km	No field survey. River length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (Chapman and Chapman, 1982)
Extent of freshwater (lake) habitat	Hectares	No significant decline. Area mapped and calculated as 354ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (NPWS, 2007)
Couching sites and holts	Number	No significant decline	Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk and Moorhouse, 1991; Kruuk, 2006)
Fish biomass available	Kilograms	No significant decline	Broad diet that varies locally and seasonally, but dominated by fish, in particular salmonids, eels and sticklebacks in freshwater (Bailey and Rochford, 2006; Reid et al., 2013)
Barriers to connectivity	Number	No significant increase. For guidance, see map 4	Otters will regularly commute across stretches of open water up to 500m e.g. between the mainland and an island; between two islands; across an estuary (De Jongh and O'Neill, 2010). It is important that such commuting routes are not obstructed



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

MAP 1:
RIVER FINN SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

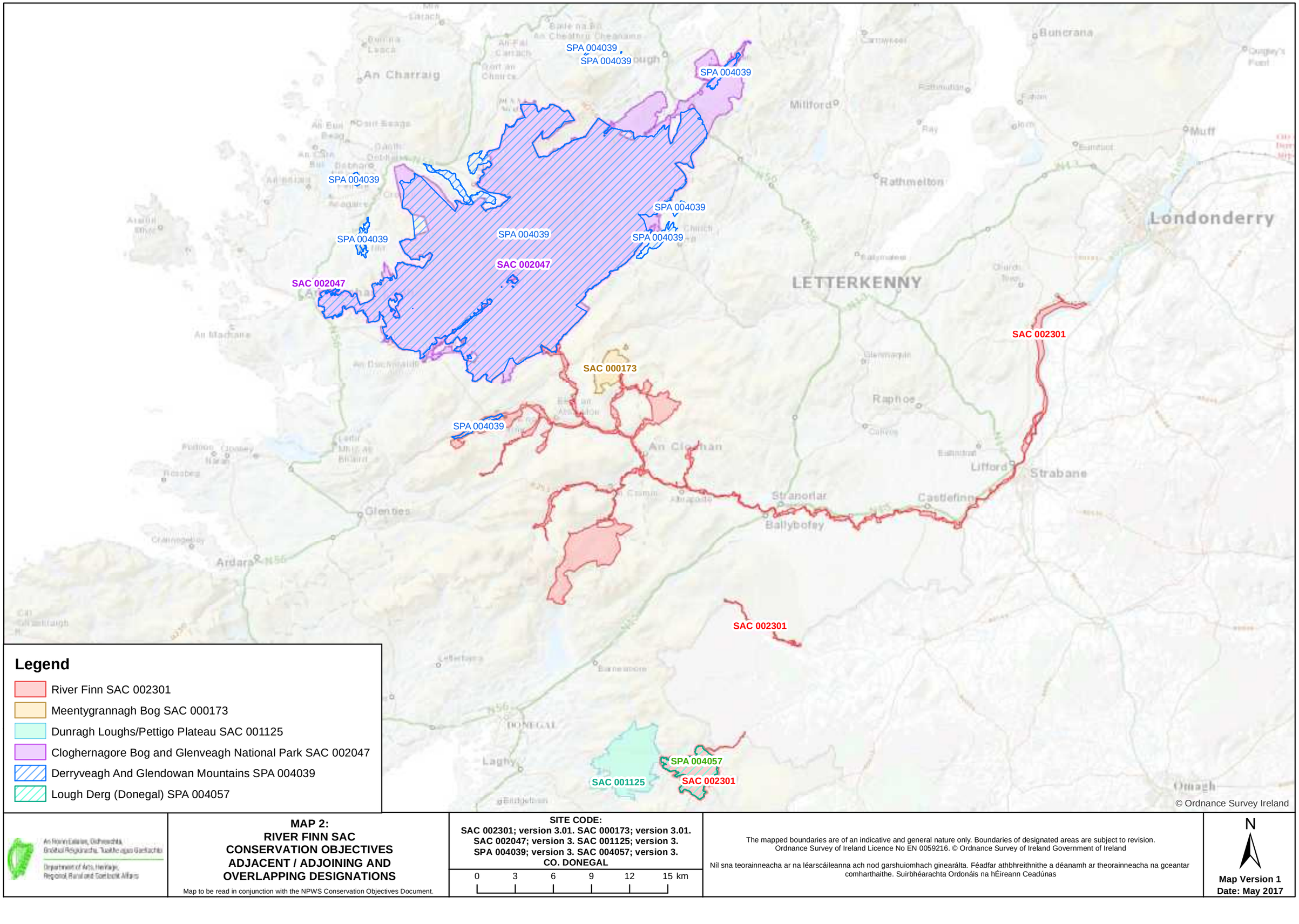
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002301; version 3.01
CO. DONEGAL

0 2 4 6 8 km

N

Map Version 1
Date: May 2017



Legend

- River Finn SAC 002301
- Meentygrannagh Bog SAC 000173
- Dunragh Loughs/Pettigo Plateau SAC 001125
- Cloghernagore Bog and Glenveagh National Park SAC 002047
- Derryveagh And Glendowan Mountains SPA 004039
- Lough Derg (Donegal) SPA 004057

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

MAP 2:
RIVER FINN SAC
CONSERVATION OBJECTIVES
ADJACENT / ADJOINING AND
OVERLAPPING DESIGNATIONS

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

SITE CODE:
SAC 002301; version 3.01. SAC 000173; version 3.01.
SAC 002047; version 3. SAC 001125; version 3.
SPA 004039; version 3. SAC 004057; version 3.
CO. DONEGAL

0 3 6 9 12 15 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: May 2017

An Loch Sifneach

Lough Finn

Lough Belshade

Loughinisland

Lough Gulladuff

Lough Derg

Legend

River Finn SAC 002301

Potential 3110 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)

Potential 3110 / Potential 3130 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) / Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*

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MAP 3:
RIVER FINN SAC
CONSERVATION OBJECTIVES
INDICATIVE LAKE HABITATS

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

SITE CODE:
SAC 002301; version 3.01.
CO. DONEGAL

0 2 4 6 8 10 km

N

Map Version 1
Date: May 2017

Legend

- 1355 Otter *Lutra lutra* Commuting
- River Finn SAC 002301
- OSi Discovery Series County Boundary
- Northern Ireland

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MAP 4:
RIVER FINN SAC
CONSERVATION OBJECTIVES
OTTER COMMUTING

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

SITE CODE:
SAC 002301; version 3.01
CO. DONEGAL

0 1.5 3 4.5 6 7.5 km

N

Map Version 1
Date: May 2017

National Parks and Wildlife Service

Conservation Objectives

Lough Swilly SAC 002287
Lough Swilly SPA 004075

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

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***

002287 Lough Swilly SAC

QI	Description
1130	Estuaries
1150	* Coastal lagoons
1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
1355	Otter *Lutra lutra*
91A0	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

004075 Lough Swilly SPA

QI	Description	
A005	Great Crested Grebe *Podiceps cristatus*	wintering
A028	Grey Heron *Ardea cinerea*	wintering
A038	Whooper Swan *Cygnus cygnus*	wintering
A043	Greylag Goose *Anser anser*	wintering
A048	Shelduck *Tadorna tadorna*	wintering
A050	Wigeon *Anas penelope*	wintering
A052	Teal *Anas crecca*	wintering
A053	Mallard *Anas platyrhynchos*	wintering
A056	Shoveler *Anas clypeata*	wintering
A062	Scaup *Aythya marila*	wintering
A067	Goldeneye *Bucephala clangula*	wintering
A069	Red-breasted Merganser *Mergus serrator*	wintering
A125	Coot *Fulica atra*	wintering
A130	Oystercatcher *Haematopus ostralegus*	wintering
A143	Knot *Calidris canutus*	wintering
A149	Dunlin *Calidris alpina*	wintering
A160	Curlew *Numenius arquata*	wintering
A162	Redshank *Tringa totanus*	wintering
A164	Greenshank *Tringa nebularia*	wintering
A179	Black-headed Gull *Chroicocephalus ridibundus*	breeding
A182	Common Gull *Larus canus*	wintering
A191	Sandwich Tern *Sterna sandvicensis*	breeding
A193	Common Tern *Sterna hirundo*	breeding
A395	Greenland White-fronted goose *Anser albifrons flavirostris*	wintering
A999	Wetlands & Waterbirds	

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

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

Title: Seabird Monitoring Programme (SMP) Database
Year: 2011
Author: JNCC
Series: http://jncc.defra.gov.uk/smp/Default.aspx

Title: Lough Swilly SAC (002287): Conservation objectives supporting document - coastal habitats [Version 1]
Year: 2011
Author: NPWS
Series: Unpublished Report to NPWS

Title: Lough Swilly SPA (004075): Conservation objectives supporting document [Version 1]
Year: 2011
Author: NPWS
Series: Unpublished Report to NPWS

Title: Lough Swilly SAC (002287): Conservation objectives supporting document - marine habitats [Version 1]
Year: 2011
Author: NPWS
Series: Unpublished Report to NPWS

Title: Otter tracking study of Roaringwater Bay
Year: 2010
Author: De Jongh, A.; O'Neill, L.
Series: Unpublished Draft Report to NPWS

Title: A provisional inventory of ancient and long-established woodland in Ireland
Year: 2010
Author: Perrin, P.M.; Daly, O.H.
Series: Irish Wildlife Manuals No. 46

Title: Saltmarsh Monitoring Report 2007-2008
Year: 2009
Author: McCorry, M.; Ryle, T.
Series: Unpublished Report to NPWS

Title: National Survey of Native Woodlands 2003-2008
Year: 2008
Author: Perrin, P.; Martin, J.; Barron, S.; O'Neill, F.; McNutt, K.; Delaney, A.
Series: Unpublished Report to NPWS

Title: Saltmarsh Monitoring Report 2006
Year: 2007
Author: McCorry, M.
Series: Unpublished Report to NPWS

Title: Supporting documentation for the Habitats Directive Conservation Status Assessment - backing documents, Article 17 forms and supporting maps

Year: 2007

Author: NPWS

Series: Unpublished Report to NPWS

Title: Inventory of Irish coastal lagoons

Year: 2007

Author: Oliver, G.

Series: Unpublished Report to NPWS

Title: Otter Survey of Ireland 2004/2005

Year: 2006

Author: Bailey, M.; Rochford, J.

Series: Irish Wildlife Manuals No. 23

Title: Otters - ecology, behaviour and conservation

Year: 2006

Author: Kruuk, H.

Series: Oxford University Press

Title: Seabird Populations of Britain and Ireland

Year: 2004

Author: Mitchell, P.I.; Newton, S.F.; Ratcliffe, N.; Dunn, T.E.

Series: Poyser, London

Title: Reversing the habitat fragmentation of British woodlands

Year: 2002

Author: Peterken, G.

Series: WWF-UK, London

Title: Diet of Otters *Lutra lutra* on Inishmore, Aran Islands, west coast of Ireland

Year: 1999

Author: Kingston, S.; O'Connell, M.; Fairley, J.S.

Series: Biol & Environ Proc R Ir Acad B 99B:173–182

Title: Seabird monitoring handbook for Britain and Ireland: a compilation of methods for survey and monitoring of breeding seabirds.

Year: 1995

Author: Walsh, P.; Halley, D.J.; Harris, M.P.; del Nevo, A.; Sim, I.M.W.; Tasker, M.L.

Series: JNCC, Peterborough

Title: The spatial organization of otters (*Lutra lutra*) in Shetland

Year: 1991

Author: Kruuk, H.; Moorhouse, A.

Series: J. Zool, 224: 41-57

Title: Otter survey of Ireland

Year: 1982

Author: Chapman, P.J.; Chapman, L.L.

Series: Unpublished Report to Vincent Wildlife Trust

Spatial data sources

Year:	2010
Title:	EPA transitional waterbody data
GIS operations:	Clipped to SAC boundary
Used for:	1130 (map 2)

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; Saltmarsh and Sand Dune datasets erased out
Used for:	Marine community types base data (map 3)

Year:	Interpolated 2011
Title:	Intertidal/subtidal surveys 2009, 2010
GIS operations:	Polygon feature classes from marine community types base data sub-divided based on interpolation of marine survey data
Used for:	Marine community types (map 3)

Year:	Revision 2011
Title:	Inventory of Irish Coastal Lagoons. Version 3
GIS operations:	Clipped to SAC boundary
Used for:	1150 (map 4)

Year:	Revision 2010
Title:	Saltmarsh Monitoring Project 2007-2008. Version 1
GIS operations:	QI selected; clipped to SAC boundary
Used for:	1330 (map 5)

Year:	Revision 2010
Title:	National Survey of Native Woodlands 2003-2008. Version 1
GIS operations:	QIs selected; clipped to SAC boundary
Used for:	91A0 (map 6)

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; saltmarsh data for site combined to HWM and LWM polygon feature class; resulting polygon feature class unioned with SPA boundary; resulting polygon feature class clipped to SPA boundary; bird use zone attributes assigned to each polygon
Used for:	Bird use zones (map 7)

Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	Creation of an 80m buffer on the marine side of the high water mark (HWM); creation of a 10m buffer on the terrestrial side of the HWM; combination of 80m and 10m HWM buffer datasets; creation of a 10m buffer on the landward side of the river banks data; creation of a 20m buffer applied to river centerline and stream data; combination of 10m river banks and 20m river and stream centerline buffer datasets; combined river and stream buffer dataset clipped to HWM; combination of HWM buffer dataset with river and stream buffer dataset; overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary
Used for:	1355 (no map)

1130 Estuaries

To maintain the favourable conservation condition of Estuaries in Lough Swilly 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 at 6118ha using OSI data and the defined Transitional Water Body area under the Water Framework Directive. See marine habitats supporting document for further information
Community distribution	Hectares	The following communities should be conserved in a natural condition: Fine sand community complex; Intertidal mixed sediment with polychaetes; Subtidal mixed sediment with polychaetes and bivalves; Muddy fine sand with *Thyasira flexuosa*; Mud community complex and *Ostrea edulis* dominated community. See map 3	The communities were derived from the 2009 and 2010 intertidal survey and 2009 subtidal survey. See marine habitats supporting document for further information

1150 * Coastal lagoons

To restore the favourable conservation condition of Lagoons in Lough Swilly 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 206ha- Inch Lough 176ha; Blanket Nook 30ha. See map 4	Areas calculated from spatial data derived from Oliver, 2007. Two lagoons are identified
Salinity regime	Practical salinity units (psu)	Maintain median annual salinity within natural ranges: Inch 0.1 - 3.0psu; Blanket Nook 10 - 20psu	Inch is one if the largest oligohaline (low salinity) lagoons in Ireland and most of the waterbody should have a salinity of 0.5 to 3.0 for most of the time but locally, fresh water may occur and at depth salinities of over 20 psu have been recorded. Blanket Nook is a mesohaline (medium salinity) lagoon. See Oliver (2007) for further information
Hydrological regime	Metres	Maintain current annual water level fluctuations and minima	Both lagoons are shallow- Inch only 2m and Blanket Nook 1m deep (Oliver, 2007). Small changes in summer levels would result in major losses of lagoonal area. Need to investigate normal fluctuations and set specific targets
Barrier	Sluice function	Maintain permeability, including appropriate management of sluices	Both lagoons are artificial with embankment barriers containing sluices. Need to identify main saline inputs and ensure that they, or equivalent, saline inputs are retained
Water quality: Chlorophyll a	µg/L	Reduce annual median chlorophyll a to less than 2.5µg/L at Inch; less than 5µg/L at Blanket Nook	These limits are needed to ensure that excessive shading from phytoplankton does not restrict macrophytes colonisation in the lagoons (J. Ryan, pers comm)
Water quality: Molybdate Reactive Phosphorus (MRP)	mg/L	Reduce annual median MRP to less than 0.01mg/L at Inch; less than 0.02mg/L at Blanket Nook	These limits are needed to ensure that excessive shading from phytoplankton does not restrict macrophytes colonisation in the lagoons (J. Ryan, pers comm)
Water quality: Dissolved Inorganic Nitrogen (DIN)	mg/L	Reduce annual median DIN to less than 0.15mg/L at Inch; less than 0.4mg/L at Blanket Nook	These limits are needed to ensure that excessive shading from phytoplankton does not restrict macrophytes colonisation in the lagoons (J. Ryan, pers comm)
Depth of macrophyte colonisation	Metres	Increase colonisation to maximum depth of both lagoons	Increased depth of colonisation increases both the extent and diversity of submergent macrophytes. This is especially important in Inch where, as well as being of major interest in their own right, the presence of a healthy submerged macrophyte sward is also important for the achievement of the SPA objectives
Typical plant species	Number and m²	Maintain number and extent of listed lagoonal specialists, subject to natural variation	Species listed in Oliver (2007), especially *Chara canescens*, *Ruppia* spp. and *Zannichellia palustris* in Inch

1150 * Coastal lagoons

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

Attribute	Measure	Target	Notes
Typical invertebrate species	Number	Maintain listed lagoon specialists, subject to natural variation	Species listed in Oliver (2007), especially *Jaera ischiosetosa* (an isopod crutacean) in Blanket Nook
Negative indicator species	Number and % cover	Negative indicator species absent or under control	Because of eutrophication and the shallowness of both lagoons there is a danger that the cover of emergents and/or floating algal mats might increase at the expense of submerged macrophytes

1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

To restore the favourable conservation condition of Atlantic salt meadows in Lough Swilly 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: Fahan - 7.29ha, Green Hill - 2.02ha, Lower Lough Swilly - 8.44ha, Rathmelton - 10.01ha, Ray - 0.05ha. See map 5	Based on data from the Saltmarsh Monitoring Project (McCorry, 2007; McCorry and Ryle, 2009). Five sub-sites were mapped and additional areas of potential saltmarsh were identified from an examination of aerial photographs, giving a total estimated area of Atlantic salt meadow of 38.98ha. NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 5 for known distribution	See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain/restore natural circulation of sediments and organic matter, without any physical obstructions	See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession	Based on data from McCorry (2007) and McCorry and Ryle (2009). Creek and pan structure is well developed at Rathmelton, but poorly developed or absent at all other sub-sites. Significant drainage has occurred at Green Hill. See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of saltmarsh habitat zonations including transitional zones, subject to natural processes including erosion and succession. See map 5	Based on data from McCorry (2007) and McCorry and Ryle (2009). Most of the saltmarsh habitat in Lough Swilly is Atlantic salt meadow, although *Salicornia* mudflats have been recorded at Lower Lough Swilly and Rathmelton. Mediterranean salt meadow has also been recorded at Rathmelton. See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from McCorry (2007) and McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated	Based on data from the Saltmarsh Monitoring Project (McCorry, 2007; McCorry and Ryle, 2009). See coastal habitats supporting document for further details

1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

To restore the favourable conservation condition of Atlantic salt meadows in Lough Swilly SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with characteristic species listed in Saltmarsh Monitoring Project (McCorry & Ryle, 2009)	See coastal habitats supporting document for further details
Vegetation composition: negative indicator species - *Spartina anglica*	Hectares	No significant expansion of *Spartina*. No new sites for this species and an annual spread of less than 1% where it is already known to occur	Based on data from McCorry (2007) and McCorry and Ryle (2009). Significantly large stands of *Spartina* have been recorded at Rathmelton, Lower Lough Swilly and Green Hill. The evidence suggests that there has been recent spread of *Spartina* at Green Hill and parts of Rathmelton, while it may have been planted at Lower Lough Swilly. See coastal habitats supporting document for further details

1355 Otter *Lutra lutra*

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

Attribute	Measure	Target	Notes
Distribution	Percentage positive survey sites	No significant decline	Measure based on standard otter survey technique. FCS target, based on 1980/81 survey findings, is 88% in SACs. Current range in north-west estimated at 65% (Bailey and Rochford, 2006)
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 95.7ha above high water mark (HWM); 44.0ha along river banks/ around pools	No field survey. Areas mapped to include 10m terrestrial buffer along shoreline (above HWM and along river banks) identified as critical for otters (NPWS, 2007)
Extent of marine habitat	Hectares	No significant decline. Area mapped and calculated as 839.5ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (HWM) (NPWS, 2007; Kruuk, 2006)
Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 15.5km	No field survey. River length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (Chapman and Chapman, 1982)
Extent of freshwater (lake/lagoon) habitat	Hectares	No significant decline. Area mapped and calculated as 83.7ha	No field survey. Lagoons have been included with other freshwater habitat as they are low/medium salinity. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (NPWS, 2007)
Couching sites and holts	Number	No significant decline	Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk, 2006; Kruuk and Moorhouse, 1991)
Fish biomass available	Kilograms	No significant decline	Broad diet that varies locally and seasonally, but dominated by fish, in particular salmonids, eels and sticklebacks in freshwater (Bailey and Rochford, 2006) and wrasse and rockling in coastal waters (Kingston et al., 1999)
Barriers to connectivity	Number	No significant increase	Otters will regularly commute across stretches of open water up to 500m. e.g. between the mainland and an island; between two islands; across an estuary (De Jongh and O'Neill, 2010) . It is important that such commuting routes are not obstructed

91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

To restore the favourable conservation condition of Old oak woodland with Ilex and Blechnum in Lough Swilly 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, at least 58.68ha for sub-sites surveyed: Rathmullen wood - 26.00ha; Salt Pans wood - 13.47ha; Ballynarry wood - 15.61ha; Carrow Cashel wood - 3.60ha. See map 6	Area based on Perrin et al. (2008) - site codes 1420, 1430, 1434 and 1695 and internal NPWS reports. NB further unsurveyed areas maybe present within the site
Habitat distribution	Occurrence	No decline. Surveyed locations shown on map 6	Distribution based on Perrin et al. (2008) - site codes 1420, 1430, 1434 and 1695 and internal NPWS reports. NB further unsurveyed areas maybe present within the site
Woodland size	Hectares	Large woods at least 25ha in size and "small" woods at least 3ha in size	The sizes of at least some of the existing woodlands need to be increased in order to reduce habitat fragmentation and benefit those species requiring 'deep' woodland conditions (Peterken, 2002). Topographical constraints may restrict expansion
Woodland structure: cover and height	Percentage and metres	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi-mature trees and shrubs; and well-developed herb layer	Described in Perrin et al. (2008) - site codes 1420, 1430, 1434 and 1695 and internal NPWS reports
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types, including oak-ash; alder-ash in seepage areas and alongside streams; oak-birch; willow-alder-ash	Described in Perrin et al. (2008) - site codes 1420, 1430, 1434 and 1695 and internal NPWS reports
Woodland structure: natural regeneration	Seedling:sapling:pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	Oak regenerates poorly. In suitable sites ash can regenerate in large numbers although few seedlings reach pole size
Woodland structure: dead wood	m^3 per hectare; number per hectare	At least 30m^3/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem
Woodland structure: veteran trees	Number per hectare	No decline	Mature and veteran trees are important habitats for bryophytes, lichens, saproxylic organisms and some bird species. Their retention is important to ensure continuity of habitats/niches and propagule sources

91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

To restore the favourable conservation condition of Old oak woodland with Ilex and Blechnum in Lough Swilly SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Woodland structure: indicators of local disctinctiveness	Occurrence	No decline	Includes ancient or long-established (i.e. pre-1840s) woodlands, archaeological and geological features as well as red-listed and other rare or localised species. Perrin and Daly (2010) list Rathmullen wood, Salt pans wood and Ballynarry wood as potential ancient/long established woodlands
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover not less than 95%	Species reported in Perrin et al. (2008) - site codes 1420, 1430, 1434 and 1695 and internal NPWS reports
Vegetation composition: typical species	Occurrence	A variety of typical native species present, depending on woodland type, including oak (*Quercus petraea*) and birch (*Betula pubescens)*	Species listed in Perrin et al. (2008)
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control	Species reported in Perrin et al. (2008) - site codes 1420, 1430, 1434 and 1695 and internal NPWS reports

A005 Great Crested Grebe *Podiceps cristatus*

To maintain the favourable conservation condition of Great Crested Grebe in Lough Swilly 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A028 Grey Heron *Ardea cinerea*

To maintain the favourable conservation condition of Grey Heron in Lough Swilly 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A038 Whooper Swan *Cygnus cygnus*

To maintain the favourable conservation condition of Whooper Swan in Lough Swilly 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A043 Greylag Goose *Anser anser*

To maintain the favourable conservation condition of Greylag Goose in Lough Swilly 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A048 Shelduck *Tadorna tadorna*

To maintain the favourable conservation condition of Shelduck in Lough Swilly 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A050 Wigeon *Anas penelope*

To maintain the favourable conservation condition of Wigeon in Lough Swilly 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A052 Teal *Anas crecca*

To maintain the favourable conservation condition of Teal in Lough Swilly 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A053 Mallard *Anas platyrhynchos*

To maintain the favourable conservation condition of Mallard in Lough Swilly 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A056 Shoveler *Anas clypeata*

To maintain the favourable conservation condition of Shoveler in Lough Swilly 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A062 Scaup *Aythya marila*

To maintain the favourable conservation condition of Scaup in Lough Swilly 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A067 Goldeneye *Bucephala clangula*

To maintain the favourable conservation condition of Goldeneye in Lough Swilly 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A069 Red-breasted Merganser *Mergus serrator*

To maintain the favourable conservation condition of Red-breasted Merganser in Lough Swilly 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A125 Coot *Fulica atra*

To maintain the favourable conservation condition of Coot in Lough Swilly 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A130 Oystercatcher *Haematopus ostralegus*

To maintain the favourable conservation condition of Oystercatcher in Lough Swilly 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A143 Knot *Calidris canutus*

To maintain the favourable conservation condition of Knot in Lough Swilly 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A149 Dunlin *Calidris alpina*

To maintain the favourable conservation condition of Dunlin in Lough Swilly 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A160 Curlew *Numenius arquata*

To maintain the favourable conservation condition of Curlew in Lough Swilly 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A162 Redshank *Tringa totanus*

To maintain the favourable conservation condition of Redshank in Lough Swilly 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A164 Greenshank *Tringa nebularia*

To maintain the favourable conservation condition of Greenshank in Lough Swilly 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	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A179 Black-headed Gull *Chroicocephalus ridibundus*

To maintain the favourable conservation condition of Black-headed Gull in Lough Swilly SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Breeding population abundance: apparently occupied nests (AONs)	Number	No significant decline	Measure based on standard gull survey methods (see Walsh et al., 1995). Mitchell et al. (2004) provides summary population information. The Seabird Monitoring Programme (CMP) also provides background data (JNCC, 2011)
Productivity rate: fledged young per breeding pair	Mean number	No significant decline	Measure based on standard gull survey methods (see Walsh et al., 1995).
Distribution: breeding colonies	Number; location; area (Hectares)	No significant decline	

A182 Common Gull *Larus canus*

To maintain the favourable conservation condition of Common Gull in Lough Swilly 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	Population trend assessment using (Generalised Additive Modelling (GAM)) could not be undertaken for this species due to an incomplete dataset. A measure of population change was calculated using the 'generic threshold' method. See Section 4 of the SPA conservation objectives supporting document for more details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A191 Sandwich Tern *Sterna sandvicensis*

To maintain the favourable conservation condition of Sandwich Tern in Lough Swilly SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Breeding population abundance: apparently occupied nests (AONs)	Number	No significant decline	Measure based on standard tern survey methods (see Walsh et al., 1995). Mitchell et al. (2004) provides summary population information. The Seabird Monitoring Programme (CMP) also provides background data (JNCC, 2011)
Productivity rate: fledged young per breeding pair	Mean number	No significant decline	Measure based on standard tern survey methods (see Walsh et al., 1995)
Distribution: breeding colonies	Number; location; area (Hectares)	No significant decline	The only known breeding site is on Inch Island

A193 Common Tern *Sterna hirundo*

To maintain the favourable conservation condition of Common Tern in Lough Swilly SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Breeding population abundance: apparently occupied nests (AONs)	Number	No significant decline	Measure based on standard tern survey methods (see Walsh et al., 1995). Mitchell et al. (2004) provides summary population information. The Seabird Monitoring Programme (CMP) also provides background data (JNCC, 2011)
Productivity rate: fledged young per breeding pair	Mean number	No significant decline	Measure based on standard tern survey methods (see Walsh et al., 1995)
Distribution: breeding colonies	Number; location; area (Hectares)	No significant decline	

A395 Greenland White-fronted goose *Anser albifrons flavirostris*

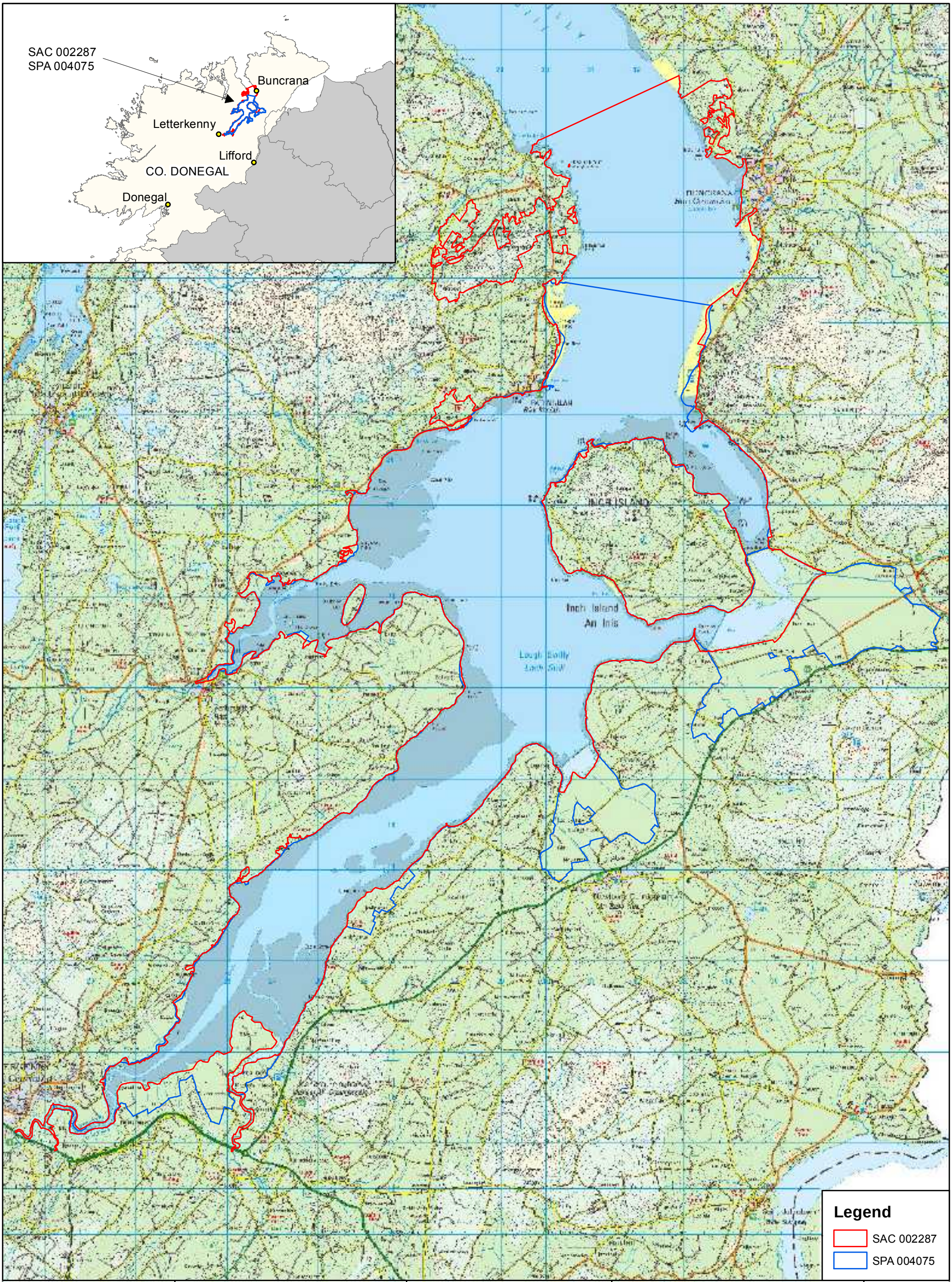
To maintain the favourable conservation condition of Greenland White-fronted Goose in Lough Swilly SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trend assessment (Generalised Additive Modelling (GAM)) was undertaken using waterbird count data collected through the Irish Wetland Bird Survey and other surveys. See the the SPA conservation objectives supporting document for further details
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by waterbird species, 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 Section 5 of the SPA conservation objectives supporting document

A999 Wetlands & Waterbirds

To maintain the favourable conservation condition of the wetland habitat in Lough Swilly SPA as a resource for the regularly-occurring migratory waterbirds that utilise it. This is defined by the following attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent area occupied by the wetland habitat is stable and not significantly less than the areas of 4,162, 2,419, 201 and 317 hectares for subtidal, intertidal, supratidal and lagoon (and associated) habitats respectively, other than that occurring from natural patterns of variation. See map 7	Wetland areas defined as follows: subtidal- seaward extent of SPA boundary up to MLWM; intertidal- MLWM to MHWM; supratidal- MHWM to SPA boundary minus the area of terrestrial habitat; lagoon (and associated) habitats- lagoon extent and adjacent wetland habitat as defined by embankments



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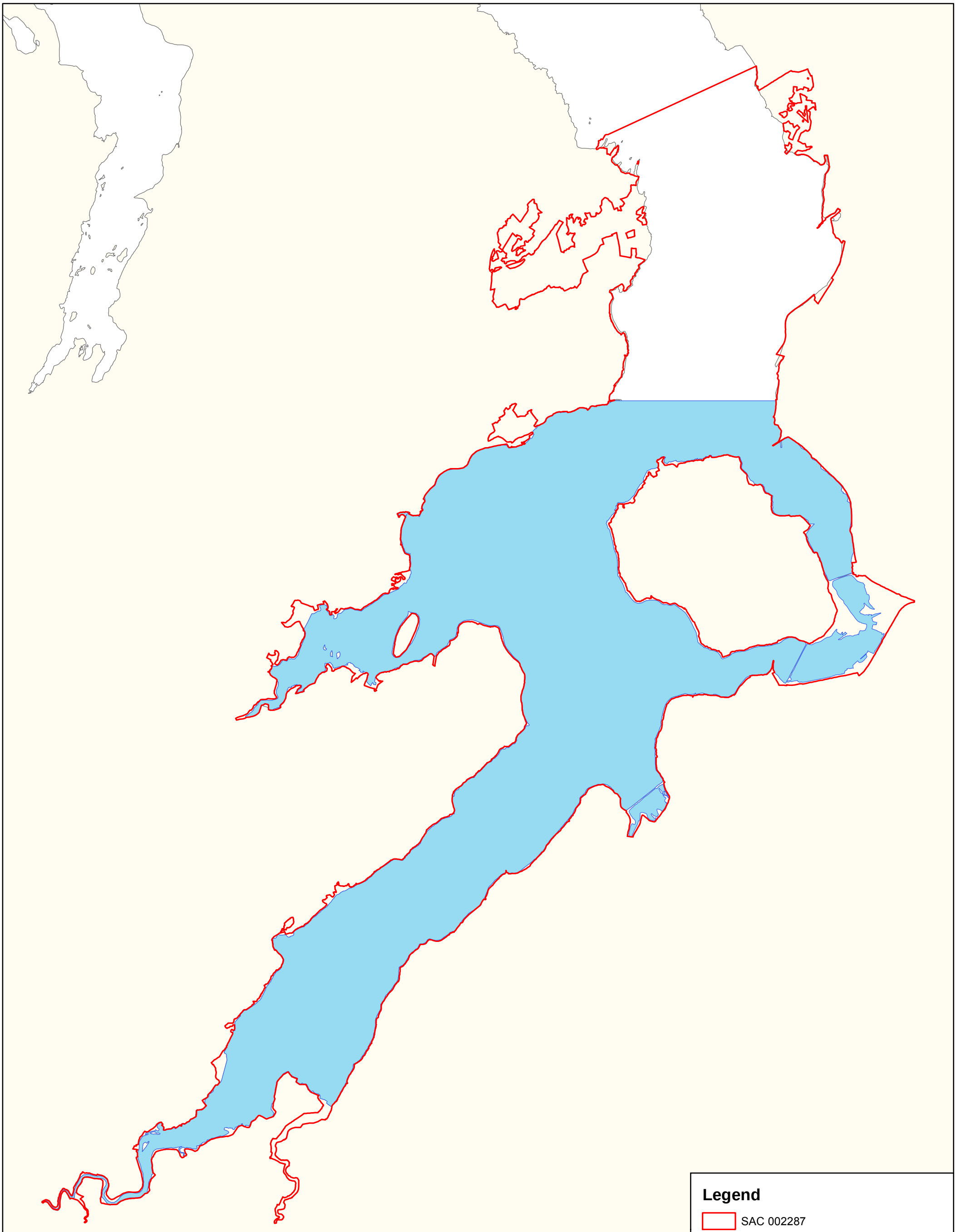
MAP 1: LOUGH SWILLY CONSERVATION OBJECTIVES SAC & SPA DESIGNATIONS

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

CO. DONEGAL

SITE CODE
SAC 002287
Version 1.01
SPA 004075
Version 1.04
Map Version 1
Date: March 2011



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MAP 2: LOUGH SWILLY CONSERVATION OBJECTIVES ESTUARIES

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

CO. DONEGAL

0 1 2 3 km

N

SITE CODE

SAC 002287
Version 1.01

Map Version 1
Date: March 2011

Legend

- SAC 002287
- SPA 004075
- OSi Discovery Series County Boundary

Marine Community Types

- Fine sand community complex
- Intertidal Mixed sediment with polychaetes
- Mud community complex
- Muddy fine sand with *Thyasira flexuosa*
- *Ostrea edulis* dominated community
- Subtidal mixed sediment with polychaetes and bivalves

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MAP 3:
LOUGH SWILLY
CONSERVATION OBJECTIVES
MARINE COMMUNITY TYPES

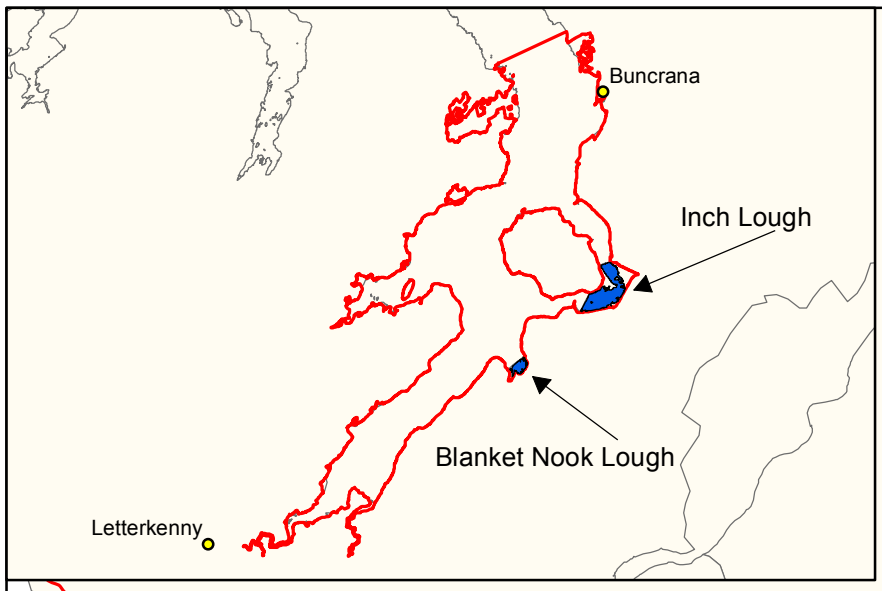
Map to be read in conjunction with the NPWS Conservation Objectives Document.

CO. DONEGAL

0 1 2 3 km

N

SITE CODE
SAC 002287
Version 1.01
SPA 004075
Version1.04
Map Version 1
Date: March 2011



Legend

- SAC 002287
- 1150 * Coastal Lagoons
- OSi Discovery Series County Boundary

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MAP 4: LOUGH SWILLY CONSERVATION OBJECTIVES COASTAL LAGOONS

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

CO. DONEGAL

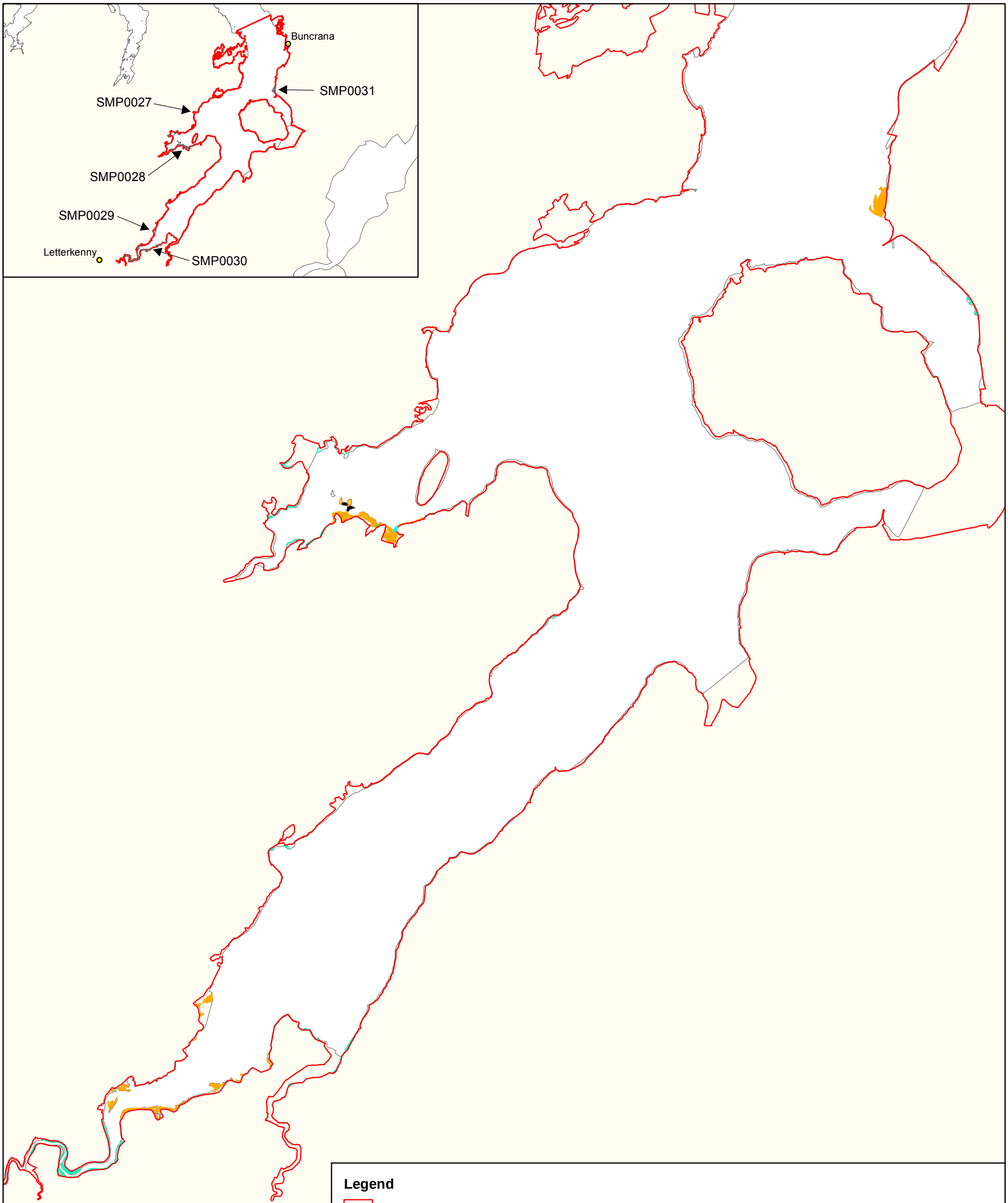
N

0 0.25 0.5 0.75 1 km

SITE CODE

SAC 002287
Version 1.01

Map Version 1
Date: March 2011



Legend

- SAC 002287
- OSi Discovery Series County Boundary

Saltmarsh Habitats

- 1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) Qualifying Interest
- 1330 / 1410 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) Qualifying Interest / Mediterranean salt meadows (Juncetalia maritimi)
- Potential 1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) Qualifying Interest
- 1310 Salicornia and other annuals colonising mud and sand
- 1410 Mediterranean salt meadows (Juncetalia maritimi)

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MAP 5: LOUGH SWILLY CONSERVATION OBJECTIVES SALTMARSH HABITATS

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

CO. DONEGAL

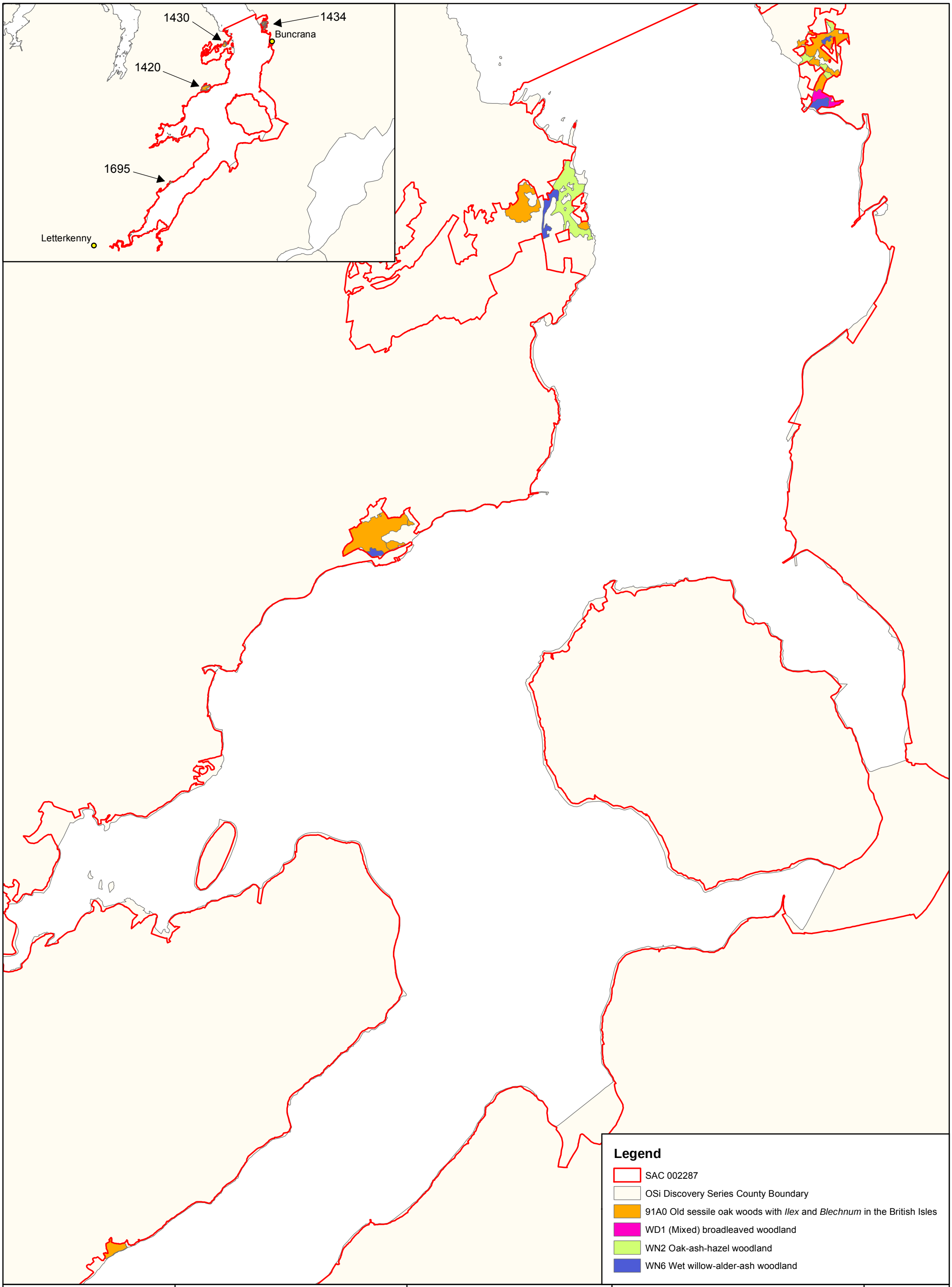
0 0.5 1 1.5 2 km

N

SITE CODE

SAC 002287
Version 1.01

Map Version 1
Date: March 2011



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MAP 6: LOUGH SWILLY CONSERVATION OBJECTIVES OLD OAK WOODLANDS

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

CO. DONEGAL

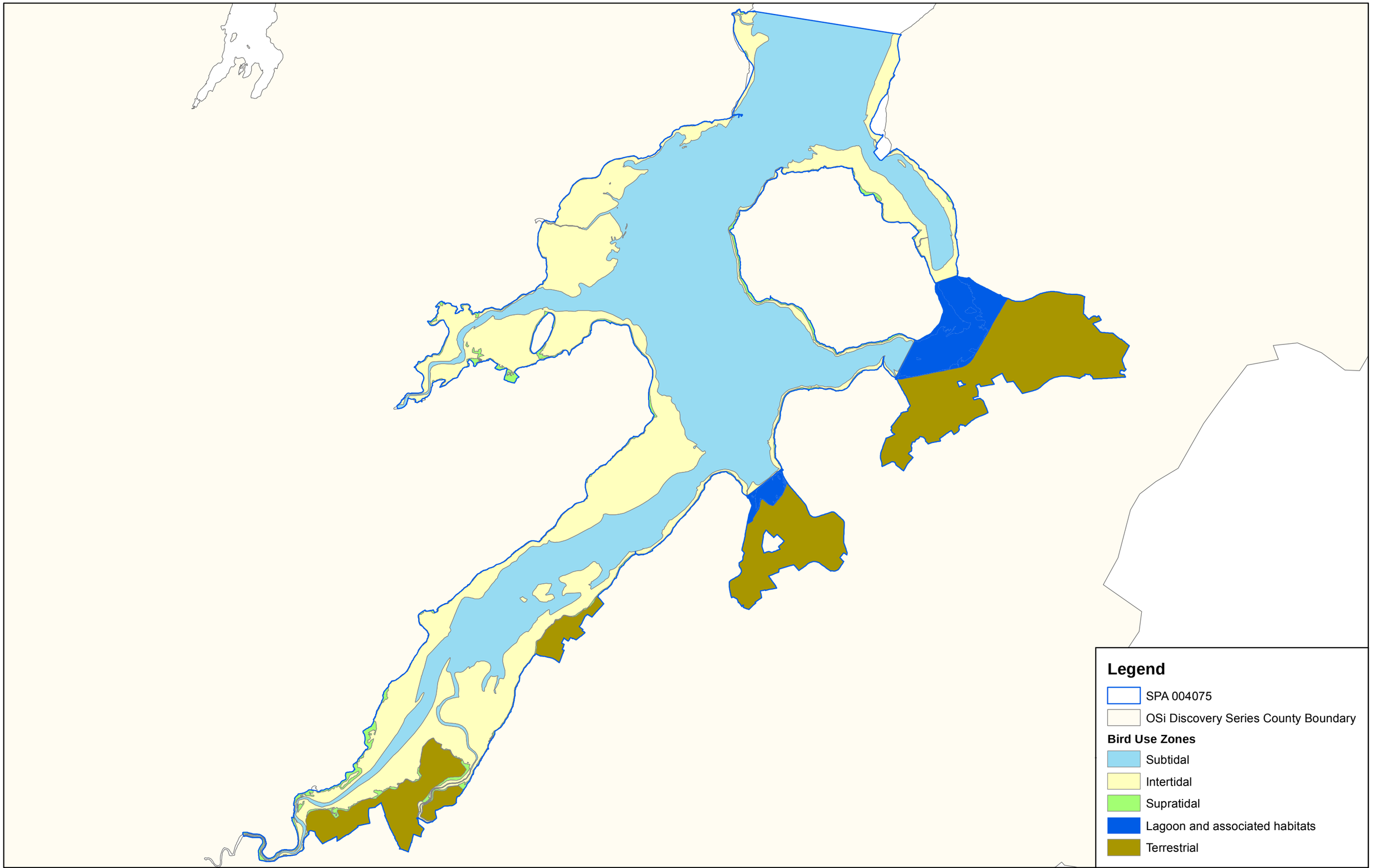
0 0.5 1 1.5 2 km

N

SITE CODE

SAC 002287
Version 1.01

Map Version 1
Date: March 2011



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MAP 7
LOUGH SWILLY
CONSERVATION OBJECTIVES
WETLANDS AND WATERBIRDS
BIRD USE ZONES

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

CO. DONEGAL

0 1 2 3 4 km

N

SITE CODE

SPA 004075
Version 1.04

Map Version 1
Date: March 2011

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Department of
Arts, Heritage and the Gaeltacht

Produced by: National Parks and Wildlife Service,
Department of Arts, Heritage and the Gaeltacht,
7 Ely Place, Dublin 2, Ireland.
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E-mail: natureconservation@environ.ie

Citation:
NPWS (2011) Conservation Objectives: Lough Swilly SAC 002287 and Lough Swilly SPA 004075. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

Series Editors: Rebecca Jeffrey & Naomi Kingston

ISSN 2009-4086

Conservation objectives for Leannan River SAC [002176]

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
3110	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)
3130	Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea

* denotes a priority habitat

Code	Common Name	Scientific Name
1029	Freshwater Pearl Mussel	*Margaritifera margaritifera*
1106	Salmon	*Salmo salar*
1355	Otter	*Lutra lutra*

1833	Slender Naiad	*Najas flexilis*

Citation: *NPWS (2018) Conservation objectives for Leannan River SAC [002176]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Mulroy Bay SAC 002159

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,

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Citation:
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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***

002159	Mulroy Bay SAC
1160	Large shallow inlets and bays
1170	Reefs
1355	Otter *Lutra lutra*

Please note that this SAC overlaps with Greers Isle SPA (004082). It also adjoins Lough Nagreany Dunes SAC (000164), Tranarossan and Melmore Lough SAC (000194), Sheephaven SAC (001190), Ballyhooriskey Point to Fanad Head SAC (001975) and Horn Head to Fanad Head SPA (004194). 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: Mulroy Bay SAC (002159). Conservation objectives supporting document - marine habitats. [Version 1]

Year: 2012

Author: NPWS

Series: Unpublished Report to NPWS

Title: Subtidal Benthic Investigations in Mulroy Bay cSAC (cSAC Site Code: IE002159) Co. Donegal

Year: 2011l·

Author: Aquafact

Series: Unpublished Report to NPWS & MI

Title: Reef Investigations in Mulroy Bay cSAC (cSAC Site Code: IE002159) Co. Donegal

Year: 2011ō

Author: Aquafact

Series: Unpublished Report to NPWS & MI

Title: Otter tracking study of Roaringwater Bay

Year: 2010

Author: De Jongh, A.; O'Neill, L.

Series: Unpublished Draft Report to NPWS

Title: Survey of Mulroy Bay SAC for the Stalked Sea squirt *Styela clava*

Year: 2008ō

Author: MERC

Series: Unpublished Report to NPWS & MI

Title: Survey of sensitive subtidal benthic marine communities

Year: 2008l·

Author: MERC

Series: Unpublished Report to NPWS & MI

Title: Supporting documentation for the Habitats Directive Conservation Status Assessment - backing documents, Article 17 forms and supporting maps

Year: 2007

Author: NPWS

Series: Unpublished Report to NPWS

Title: Otter Survey of Ireland 2004/2005

Year: 2006

Author: Bailey, M.; Rochford, J.

Series: Irish Wildlife Manuals No. 23

Title: Otters - ecology, behaviour and conservation

Year: 2006

Author: Kruuk, H.

Series: Oxford University Press

Title: The BioMar biotope viewer: a guide to marine habitats, fauna and flora in Britain and Ireland
Year: 1997
Author: Picton, B.E.; Costello, M.J.
Series: Trinity College Dublin

Title: The spatial organization of otters (*Lutra lutra*) in Shetland
Year: 1991
Author: Kruuk, H.; Moorhouse, A.
Series: J. Zool, 224: 41-57

Title: Otter survey of Ireland
Year: 1982
Author: Chapman, P.J.; Chapman, L.L.
Series: Unpublished Report to Vincent Wildlife Trust

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 3)
Year:	Interpolated 2012
Title:	Benthic and reef surveys 2008, 2010; 1993 BioMar 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:	Marine community types, 1170 (maps 4 and 5)
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 5)
Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	Creation of an 80m buffer on the marine side of the high water mark (HWM); creation of a 10m buffer on the terrestrial side of the HWM; combination of 80m and 10m HWM buffer datasets; creation of a 10m buffer on the terrestrial side of the river banks data; creation of 20m buffer applied to canal centreline data. These datasets are combined with the derived EPA WFD Waterbodies data for the 1355 CO. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising. Creation of 250m buffer on marine side of HWM to highlight potential commuting points
Used for:	1355 (map 6)
Year:	2010
Title:	EPA WFD Waterbodies data
GIS operations:	Creation of a 20m buffer applied to river and stream centreline data; creation of 80m buffer on the aquatic side of lake data; creation of 10m buffer on the terrestrial side of lake data. These datasets are combined with the derived OSi data for the 1355 CO. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	1355 (no map)

1160 Large shallow inlets and bays

To maintain the favourable conservation condition of Large shallow inlets and bays in Mulroy Bay 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 3170ha using OSi data and the Transitional Water Body Area as defined under the Water Framework Directive
Community extent	Hectares	Maintain the extent of the *Zostera*-dominated community complex; maërl-dominated community; and *Limaria hians* associated community, subject to natural processes. See map 5	The likely extent of the *Zostera*-dominated community complex, the maërl-dominated community and the *Limaria hians* associated community was derived from a dive survey undertaken in 2008 (MERC, 2008). See marine supporting document for further details
Community structure: *Zostera* density	Shoots per m^2	Conserve the high quality of the *Zostera*-dominated community, subject to natural processes. See map 5	Established from diver observation and underwater viewer (MERC, 2008a). See marine supporting document for further details
Community structure	Biological composition	Conserve the high quality of the maërl-dominated community, subject to natural processes. See map 5	Established from diver observation and underwater viewer (MERC, 2008a). See marine supporting document for further details
Community structure: *Limaria hians* density	Individuals per m^2	Conserve the high quality of the *Limaria hians* associated community, subject to natural processes. See map 5	Established from diver observation and underwater viewer (MERC, 2008a). See marine supporting document for further details
Community distribution	Hectares	Conserve the following community types in a natural condition: Sand dominated by *Nephtys cirrosa* and *Bathyporeia* sp. community complex; Gravel to mixed sediment with nematodes community complex; Gravelly sand with bivalves, polychaetes and nemerteans community complex; *Laminaria*-dominated community complex and Reef community complex. See map 5	The likely area of communities was derived from a combination of data obtained during the 1993 BioMar survey (Picton and Costello, 1997); subtidal data obtained in 2008 (MERC, 2008a, b) and 2010 (Aquafact, 2011a, b); and an intertidal walkover August 2012. See marine supporting document for further details

1170 Reefs

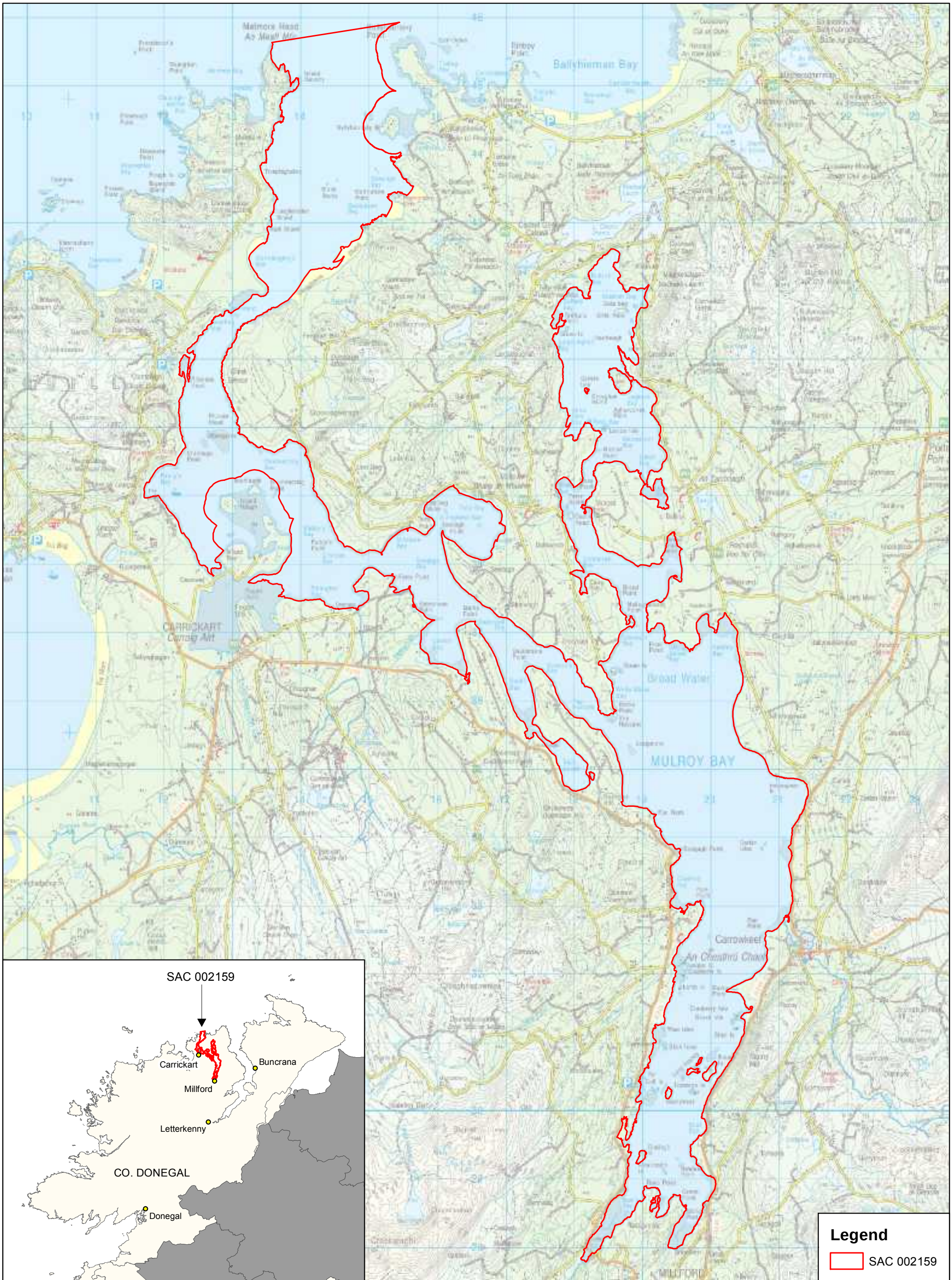
To maintain the favourable conservation condition of Reefs in Mulroy Bay SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Occurrence	The distribution of reefs is stable or increasing, subject to natural processes. See map 4	Distribution was derived from the 1993 BioMar survey (Picton and Costello, 1997) and subtidal reef survey in 2010 (Aquafact, 2011b)
Habitat area	Hectares	The permanent area is stable or increasing, subject to natural processes. See map 4	Habitat area was estimated as 43ha from the 1993 BioMar survey (Picton and Costello, 1997) and subtidal reef survey in 2010 (Aquafact, 2011b)
Community structure	Biological composition	Conserve the following community types in a natural condition: *Laminaria*-dominated community complex; and Reef community complex. See map 5	The likely area of reef communities was derived from the 1993 BioMar survey (Picton and Costello, 1997) and subtidal reef survey in 2010 (Aquafact, 2011b). See marine supporting document for further details

1355 Otter *Lutra lutra*

To restore the favourable conservation condition of Otter in Mulroy Bay SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Percentage positive survey sites	No significant decline	Measure based on standard otter survey technique. FCS target, based on 1980/81 survey findings, is 88% in SACs. Current range in the north-west estimated at 65% (Bailey and Rochford, 2006)
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 32.4ha above high water mark (HWM); 0.9ha along river banks	No field survey. Areas mapped to include 10m terrestrial buffer along shoreline (above HWM and along river banks) identified as critical for otters (NPWS, 2007)
Extent of marine habitat	Hectares	No significant decline. Area mapped and calculated as 800.2ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (HWM) (NPWS, 2007; Kruuk, 2006)
Extent of freshwater (river) habitat	Kilometers	No significant decline. Length mapped and calculated as 0.5km	No field survey. River length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (Chapman and Chapman, 1982)
Couching sites and holts	Number	No significant decline	Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk, 2006; Kruuk and Moorhouse, 1991)
Fish biomass available	Kilograms	No significant decline	Broad diet that varies locally and seasonally, but dominated by fish, in particular salmonids, eels and sticklebacks in freshwater (Bailey and Rochford, 2006) and wrasse and rockling in coastal waters (Kingston et al., 1999)
Barriers to connectivity	Number	No significant increase. For guidance, see map 6	Otters will regularly commute across stretches of open water up to 500m. e.g. between the mainland and an island; between two islands; across an estuary (De Jongh and O'Neill, 2010). It is important that such commuting routes are not obstructed



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Department of Arts, Heritage and the Gaeltacht

MAP 1:
MULROY BAY SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

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

SITE CODE:
SAC 002159 CO.DONEGAL; version 1

0 0.5 1 1.5 2 km

N

Map Version 1
Date: Sep 2012

SPA 004194

SPA 004194

SAC 002159

SAC 001975

SPA 004082

SAC 000194

SAC 000164

SAC 001190

SAC 002159

Legend

- 002159 Mulroy Bay SAC
- 000164 Lough Nagreany Dunes SAC
- 000194 Tranarossan and Melmore Lough SAC
- 001190 Sheephaven SAC
- 001975 Ballyhoorisky Point to Fanad Head SAC
- 004082 Greers Isle SPA
- 004194 Horn Head to Fanad Head SPA
- OSi Discovery Series County Boundaries

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MAP 2:
MULROY BAY SAC
CONSERVATION OBJECTIVES
ADJOINING / OVERLAPPING DESIGNATIONS

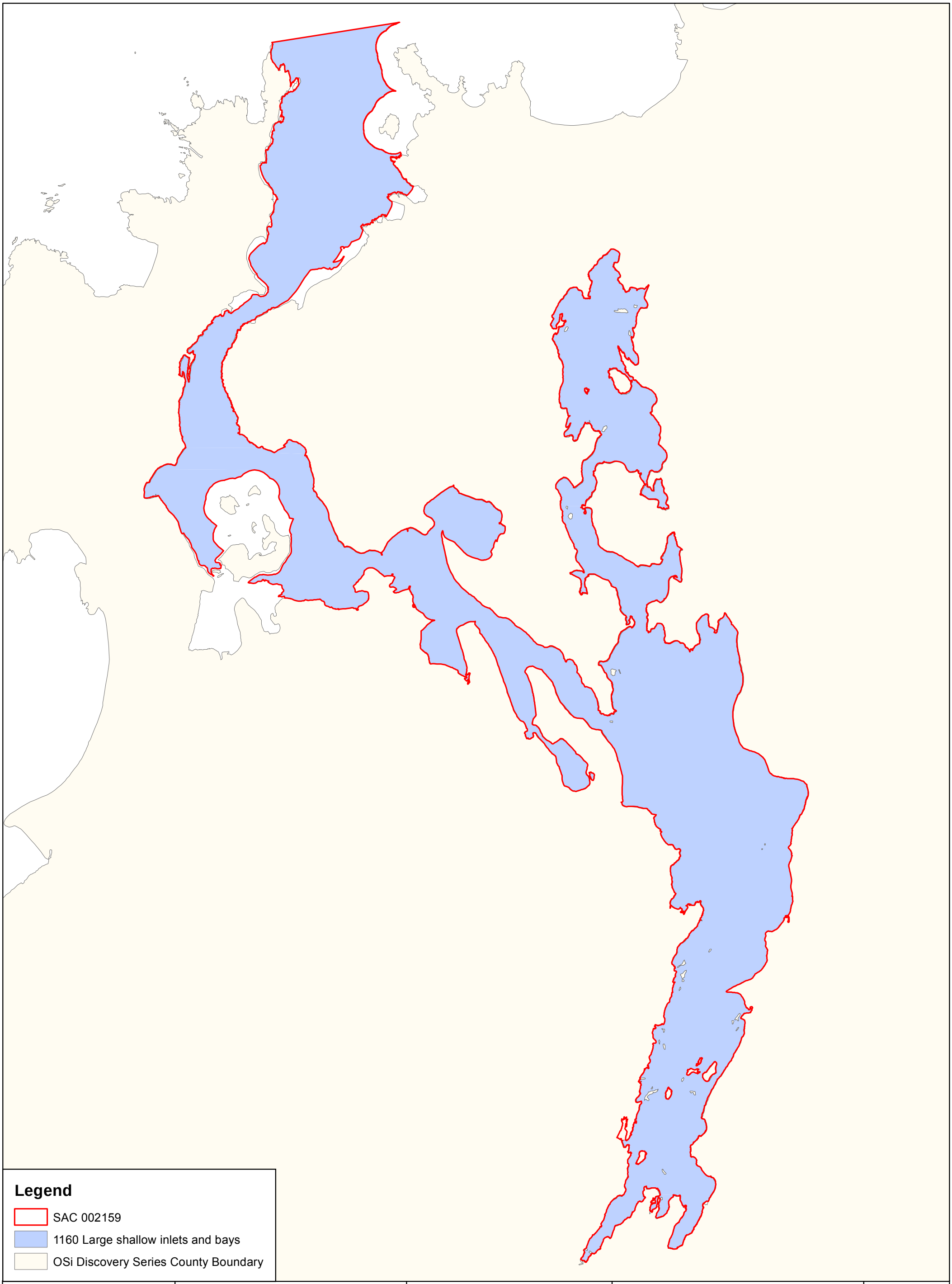
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002159 CO. DONEGAL; v 1, SAC 000164 CO. DONEGAL; v 1.01,
SAC 000194 CO. DONEGAL; v 1.01, SAC 001190 CO. DONEGAL; v 1.03,
SAC 001975 CO. DONEGAL; V 1.01
SPA 004082 CO. DONEGAL; v 2, SPA 004194 CO. DONEGAL; v 2.02

0 1 2 3 4 5 km

N

Map Version 1
Date: Sept 2012



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MAP 3:
MULROY BAY SAC
CONSERVATION OBJECTIVES
LARGE SHALLOW INLETS AND BAYS

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

SITE CODE:
SAC 002159 CO.DONEGAL; version 1

0 0.5 1 1.5 2 km

N

Map Version 1
Date: Sep 2012

Legend

- SAC 002159
- 1170 Reefs
- OSi Discovery Series County Boundary

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Department of Arts, Heritage and the Gaeltacht

MAP 4:
MULROY BAY SAC
CONSERVATION OBJECTIVES
REEFS

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

SITE CODE:
SAC 002159 CO.DONEGAL; version 1

0 0.5 1 1.5 2 km

N

Map Version 1
Date: Sep 2012

Legend

- SAC 002159
- OSi Discovery Series County Boundary

Marine Community Types

- Gravel to mixed sediment with nematodes community complex
- Gravelly sand with bivalves, polychaetes and nemerteans community complex
- *Laminaria*-dominated community complex
- *Limaria hians* associated community
- Maërl-dominated community
- Maërl-dominated community / *Zostera*-dominated community complex
- Reef community complex
- Sand dominated by *Nephtys cirrosa* and *Bathyporeia* sp. community complex
- *Zostera*-dominated community complex

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MAP 5:
MULROY BAY SAC
CONSERVATION OBJECTIVES
MARINE COMMUNITY TYPES

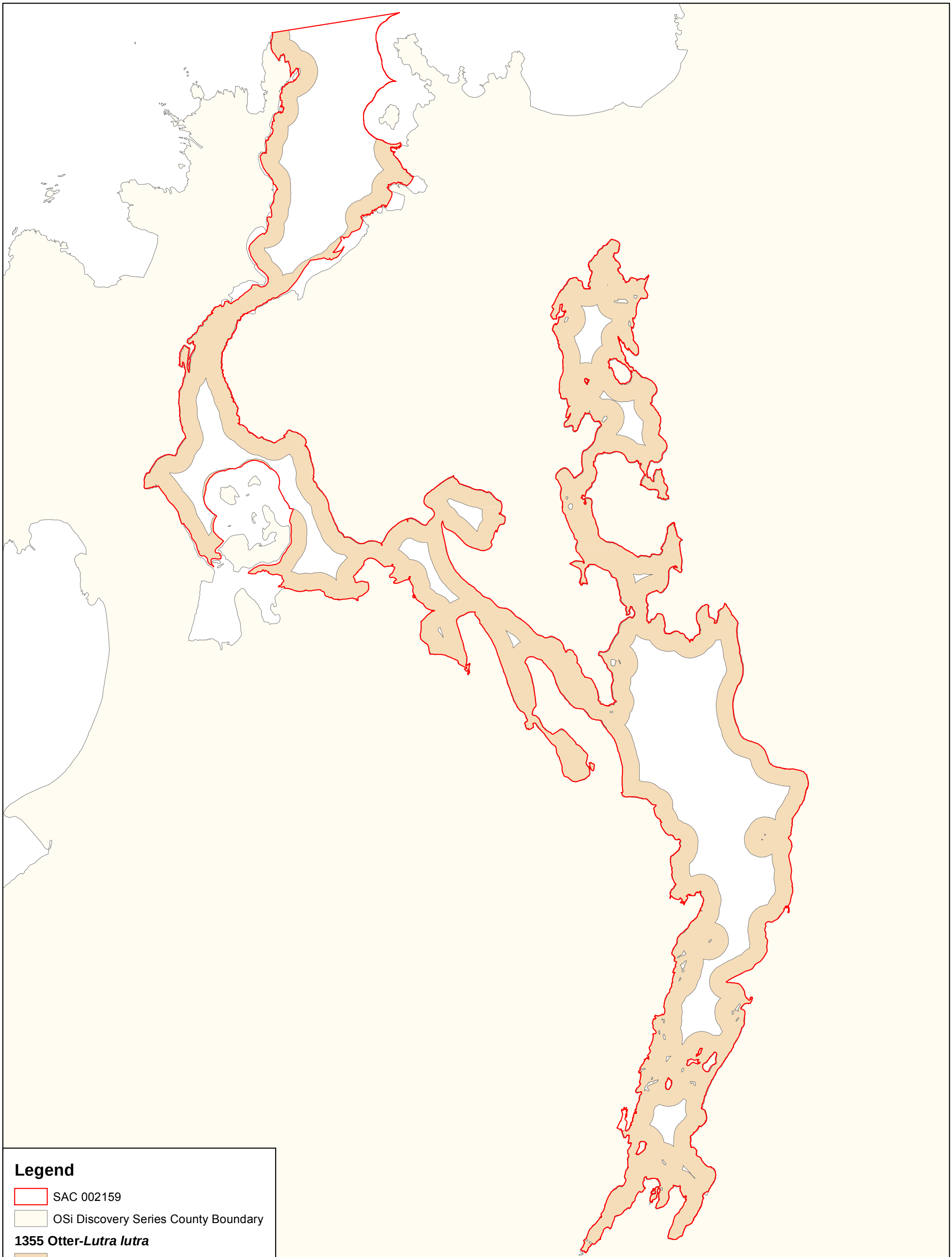
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002159 CO.DONEGAL; version 1

0 0.5 1 1.5 2 km

N

Map Version 1
Date: Sep 2012



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

MAP 6: MULROY BAY SAC CONSERVATION OBJECTIVES OTTER

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

SITE CODE:
SAC 002159 CO.DONEGAL; version 1

0 0.5 1 1.5 2 km

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Map Version 1
Date: Sep 2012

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Conservation Objectives Series

North Inishowen Coast SAC 002012

An Roinn
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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***

002012	North Inishowen Coast SAC
1014	Narrow-mouthed Whorl Snail *Vertigo angustior*
1140	Mudflats and sandflats not covered by seawater at low tide
1220	Perennial vegetation of stony banks
1230	Vegetated sea cliffs of the Atlantic and Baltic coasts
1355	Otter *Lutra lutra*
2130	Fixed coastal dunes with herbaceous vegetation (grey dunes)*
21A0	Machairs (* in Ireland)
4030	European dry heaths

Please note that this SAC overlaps with Trawbreaga Bay SPA (004034) and Malin Head SPA (004146). See map 2. The conservation objectives for this site should be used in conjunction with those for overlapping sites as appropriate.

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 :	1998
Title :	An inventory of Mollusca in potential SAC sites with special reference to *Vertigo angustior*, *V. moulinsiana* and *V. geyeri*: 1998 survey
Author :	Moorkens, E.
Series :	Unpublished report to NPWS
Year :	1999
Title :	National Shingle Beach Survey of Ireland 1999
Author :	Moore, D.; Wilson, F.
Series :	Unpublished Report to NPWS
Year :	2006
Title :	Otter survey of Ireland 2004/2005
Author :	Bailey, M.; Rochford, J.
Series :	Irish Wildlife Manual No. 23
Year :	2007
Title :	A Survey of Intertidal Mudflats and Sandflats in Ireland
Author :	Aquatic Services Unit
Series :	Unpublished report to NPWS
Year :	2007
Title :	Supporting documentation for the Habitats Directive Conservation Status Assessment - backing documents. Article 17 forms and supporting maps
Author :	NPWS
Series :	Unpublished report to NPWS
Year :	2009
Title :	Coastal Monitoring Project 2004-2006
Author :	Ryle, T.; Murray, A.; Connolly, K.; Swann, M.
Series :	Unpublished report to NPWS
Year :	2009
Title :	Saltmarsh monitoring project 2007-2008
Author :	McCorry, M.; Ryle, T.
Series :	Unpublished report to NPWS
Year :	2011
Title :	National survey and assessment of the conservation status of Irish sea cliffs
Author :	Barron, S.J.; Delaney, A.; Perrin, P.M.; Martin, J.; O'Neill, F.
Series :	Irish Wildlife Manual No. 53
Year :	2011
Title :	Monitoring and condition assessment of populations of *Vertigo geyeri*, *Vertigo angustior* and *Vertigo moulinsiana* in Ireland
Author :	Moorkens, E.; Killeen, I.
Series :	Irish Wildlife Manual No. 55

Year :	2013
Title :	National otter survey of Ireland 2010/12
Author :	Reid, N.; Hayden, B.; Lundy, M.G.; Pietravalle, S.; McDonald, R.A.; Montgomery, W.I.
Series :	Irish Wildlife Manual No. 76
Year :	2013
Title :	Monitoring survey of Annex I sand dune habitats in Ireland
Author :	Delaney, A.; Devaney, F.M; Martin, J.M.; Barron, S.J.
Series :	Irish Wildlife Manual No. 75
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 :	2014
Title :	North Inishowen Coast SAC (site code: 2012) Conservation objectives supporting document-marine habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document
Year :	2014
Title :	North Inishowen Coast SAC (site code: 2012) Conservation objectives supporting document-coastal habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	1982
Title :	Otter survey of Ireland
Author :	Chapman, P.J.; Chapman, L.L.
Series :	Unpublished report to Vincent Wildlife Trust
Year :	1991
Title :	The spatial organization of otters (*Lutra lutra*) in Shetland
Author :	Kruuk, H.; Moorhouse, A.
Series :	J. Zool, 224: 41-57
Year :	2006
Title :	Otters - ecology, behaviour and conservation
Author :	Kruuk, H.
Series :	Oxford University Press
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 :	2010
Title :	Otter tracking study of Roaringwater Bay
Author :	De Jongh, A.; O'Neill, L.
Series :	Unpublished draft report to NPWS
Year :	2013
Title :	Benthic survey services framework- Trawbreaga Bay intertidal surveys 2009 & 2010
Author :	RPS
Series :	Unpublished report to the Marine Institute and NPWS

Spatial data sources

Year :	Interpolated 2014
Title :	Intertidal surveys 2007, 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 :	1140, 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 :	2011
Title :	National survey and assessment of the conservation status of Irish sea cliffs
GIS Operations :	Clipped to SAC boundary
Used For :	1230 (map 5)
Year :	Revision 2014
Title :	National Shingle Beach Survey
GIS Operations :	Clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1220 (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 :	2130, 21A0 (map 6)
Year :	2013
Title :	Sand Dune Monitoring Project 2011. 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, 21A0 (map 6)
Year :	2012
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 :	1014 (map 7)
Year :	2005
Title :	OSi Discovery series vector data
GIS Operations :	Creation of an 80m buffer on marine side of high water mark (HWM); creation of a 10m buffer on terrestrial side of the HWM; combination of 80m and 10m HWM buffer datasets; creation of a 10m buffer on terrestrial side of river banks data. Datasets combined with derived EPA WFD Waterbodies data for the 1355 CO. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising. Creation of 250m buffer on marine side of HWM to highlight potential commuting points
Used For :	1355 (map 8)
Year :	2010
Title :	EPA WFD Waterbodies data
GIS Operations :	Creation of a 20m buffer to river and stream centreline data; creation of 80m buffer on aquatic side of lake data; creation of 10m buffer on terrestrial side of lake data. Datasets combined with derived OSi data for the 1355 CO. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1355 (map 8)

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 North Inishowen Coast 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 using OSi data as 988ha
Community extent	Hectares	Maintain the extent of the *Zostera*-dominated community, subject to natural processes. See map 4	Based on an intertidal walkover undertaken in 2013. See marine supporting document for further details
Community structure: *Zostera* density	Shoots/m²	Conserve the high quality of the *Zostera*-dominated community, subject to natural processes	Based on an intertidal walkover undertaken in 2013. See marine supporting document for further details
Community distribution	Hectares	Conserve the following community types in a natural condition: Fine to medium sand with *Eurydice pulchra* community complex; Muddy sand to coarse sediment with *Pygospio elegans* community complex; Sand with *Angulus tenuis* and *Scoloplos* (*Scoloplos*) *armiger* community complex. See map 4	Based on intertidal surveys undertaken in 2007 (ASU, 2007), 2009 and 2010 (RPS, 2013). See marine supporting document for further details

1220 Perennial vegetation of stony banks

To maintain the favourable conservation condition of Perennial vegetation of stony banks in North Inishowen Coast 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: Culdaff - 0.02ha; Doagh Isle - 1.21ha; Lag - 0.09ha; Lenankeel - 0.01ha; White Strand - 1.33ha. See map 6	Entire area within the SAC is unknown. 18 sub-sites (Tramone Bay; Slievebane; Bulbin; Portmore; Bulbinbeg; Esky Bay; Pebble Strand; Ineuran Bay; Whitestrand Bay; Whitestrand Bay - Culoort; Back Strand; Doaghmore Point; Lagacurry, Doagh Strand, Bincree, Binderg; Pollan Bay; Tullagh Bay and Tullan Point; Rockstown Harbour; Dunaff Bay; Lehan Bay) were surveyed during the National Shingle Beach Survey (NSBS) (Moore and Wilson, 1999) but extent is not recorded. The habitat was also recorded and mapped by the Coastal Monitoring Project (CMP) at Culdaff; Doagh Isle; Lag; Lenankeel and White Strand sub-sites, covering a total area of 3.46ha (Ryle et al., 2009). See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 6 for surveyed locations	Complete distribution currently unknown. The best shingle formations in the county are found on the Inishowen Peninsula and on Doagh Isle (Moore and Wilson, 1999). 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 Moore and Wilson (1999). Shingle features are relatively stable in the long term. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Moore and Wilson (1999). Transitions from shingle to intertidal shingle, rocky shore, shingle-based grassland, cliff, sand dunes and machair occur in this SAC. 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 with typical species: sea sandwort (*Honckenya peploides*), sea beet (*Beta vulgaris* ssp *maritima*), rock samphire (Crithmum maritimum), sea mayweed (*Tripleurospermum maritimum*), yellow-horned poppy (*Glaucium flavum*) and sea campion (*Silene uniflora*)	Based on data from Moore and Wilson (1999). Lichens were recorded at White Strand Bay-Culoort, Doaghmore Point, Tullagh Bay and Tullagh Point and Rockstown Harbour and are an indication of stabilisation. All sub-sites containing the habitat were rated of high interest except Doaghmore Point which was rated medium interest owing to damage caused by extraction. The rare and protected oysterplant (*Mertensia maritima*) was recorded at two sub-sites: White Strand Bay-Culoort and Tullagh Bay and Tullagh Point. 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 Moore and Wilson (1999). Negative indicators include non-native species indicative of changes in nutrient status and species not considered characteristic of the habitat. Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. The negative indicator species, ragwort (*Senecio jacobaea*) and montbretia (*Crocosmia x crocosmiiflora*) were recorded in vegetated shingle at White Strand by Ryle et al. (2009) See coastal habitats supporting document for further details

1230 Vegetated sea cliffs of the Atlantic and Baltic coasts

To maintain the favourable conservation condition of Vegetated sea cliffs of the Atlantic and Baltic coasts in North Inishowen Coast SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat length	Kilometres	Area stable, subject to natural processes, including erosion. For sub-sites mapped: Glengad - 21.5km; Altnadarrow - 4.4km; Binbane - 1.2km; Carrickabraghy - 1.9km; Binnion - 3.3km; Dunaff - 6.4km; Lenan - 0.7km; Lederg - 3.7km; Mossy Glen - 15.7km; Tirmacroragh - 5.6km; Stookanillar and Five Fingers - 3.3km. See map 5	Based on data from the Irish Sea Cliff Survey (ISCS) (Barron et al., 2011). 11 sub-sites were identified using a combination of aerial photos and the DCENR helicopter viewer. Two of the sub-sites at Stookanillar and Five Fingers, and Dunaff were surveyed in the field by the ISCS and assessed using remote survey methodology. A further undocumented site at Dunree was also identified. Cliffs are linear features and are therefore measured in kilometres. Total length of cliff section mapped within SAC: 68.0km. Length of cliff likely to be underestimated. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 5	Based on data from Barron et al. (2011). Cliffs are distributed throughout the SAC with the best examples to be found in the west of the site (Dunree to Leenan Head and Dunaff Head) and in the area north-west of Glengad Head. Hard cliffs are the dominant cliff type, however occasional soft cliffs were also recorded within the site. See coastal habitats supporting document for further details
Physical structure: functionality and hydrological regime	Occurrence of artificial barriers	No alteration to natural functioning of geomorphological and hydrological processes due to artificial structures	Based on data from Barron et al. (2011). Maintaining natural geomorphological processes including natural erosion is important for the health of a vegetated sea cliff. Hydrological processes maintain flushes and in some cases tufa formations that can be associated with sea cliffs. Within this SAC, hydrological features, such as gullies, streams and cascades, were associated with the following sub-sites: Mossy Glen, Stookanillar and Five Fingers, Binnion, Dunaff, Lenan, Lederg, Tirmacroragh and Glengad. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of sea cliff habitat zonations including transitional zones, subject to natural processes including erosion and succession	Based on data from Barron et al. (2011). At Stookanillar and Five Fingers the following zones were recorded: scree, crevice ledge, heath and grazed coastal grassland on hard cliffs. At Dunaff three zones were recorded: Splash zone, crevice ledge and ungrazed coastal grassland on hard cliffs. See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from Barron et al. (2011). 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 the Irish Sea Cliff Survey (Barron et al., 2011)	Based on data from Barron et al. (2011). Rare species that occur on sea cliffs at this SAC include Scot's lovage (*Ligusticum scoticum*), moss campion (*Silene acaulis*), purple saxifrage (*Saxifraga oppositifolia*), ivy broomrape (*Orobanche hederae*) and roseroot (*Sedum rosea*). See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from Barron et al. (2011). See coastal habitats supporting document for further details

Vegetation composition: bracken and woody species	Percentage	Cover of bracken (*Pteridium aquilinum*) on grassland and/or heath less than 10%. Cover of woody species on grassland and/or heath less than 20%	Based on data from Barron et al. (2011). 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 North Inishowen Coast 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: Crummies Bay - 11.92ha; Culdaff - 17.03ha; Doagh Isle - 324.53ha; Lag - 103.17ha; Lenankeel - 6.27ha; Tullagh - 30.81ha; White Strand - 2.33ha. See map 6	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009) and the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Habitat was mapped at seven sub-sites, giving a total estimated area of 496.06ha. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 6 for known distribution	Based on data from Ryle et al. (2009) and Delaney et al. (2013). Fixed dunes were recorded at all of the seven sub-sites. 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) and Delaney et al. (2013). Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation resulting in increased rates of erosion. At Lenankeel, rock armour affects the natural build up of the sand dune system. Extraction was noted from Tullagh and Doagh Isle sub-sites. Coastal protection works at Lag will cause a disruption to the natural functioning of the system over the longterm. 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) and Delaney et al. (2013). 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), Ryle et al. (2009) and Delaney et al. (2013). See coastal habitats supporting document for further details
Vegetation structure: sward height	Centimetres	Maintain structural variation within sward	Based on data from Ryle et al. (2009) and Delaney et al. (2013). At Crummies Bay, the absence of grazers has produced a rank sward with low species diversity. At Tullagh, heavy grazing and poaching occur. Undergrazing is a feature of Culdaff. Both undergrazing and over grazing occur at Doagh Isle. 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 Delaney et al. (2013)	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). The seven sub-sites support a characteristic dune flora. 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) and Delaney et al. (2013). 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. Negative indicator species bracken (*Pteridium aquilinum*) and montbretia (*Crocosmia x crocosmiiflora*) were recorded at Culdaff. At Lagg, creeping thistle (*Cirsium arvense*) and nettle (*Urtica dioica*) were associated with ring feeders. At Tullagh, bracken (*Pteridium aquilinuim*) occurs in the fixed dune. 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) and Delaney et al. (2013). At Culdaff there are several areas of dense scrub. Scrub also occurs in wet and dry areas at Crummies Bay. See coastal habitats supporting document for further details

21A0 Machairs (* in Ireland)

To restore the favourable conservation condition of Machairs in North Inishowen Coast 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: Doagh Isle - 90.11ha; Lenankeel - 12.15ha; Tullagh - 15.42ha, White Strand - 0.25ha. See map 6	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009) and the Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Four sub-sites (Doagh Isle, Lenankeel, Tullagh and White Strand) were mapped, giving a total estimated area of 117.96ha. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 6 for known distribution	The largest machair site is at Doagh Isle. 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) and Delaney et al. (2013). Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation resulting in increased rates of erosion. At Lenankeel, rock armour affects the natural build up of the sand system. Extraction was noted from Tullagh and Doagh Isle sub-sites. 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), Delaney et al. (2013), 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) and Delaney et al. (2013). 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) and Delaney et al. (2013). See coastal habitats supporting document for further details
Vegetation structure: sward height	Centimeters	Maintain structural variation within sward	Based on data from Ryle et al. (2009) and Delaney et al. (2013). At Tullagh, heavy grazing and poaching occur. Both undergrazing and overgrazing occur at Doagh Isle. 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 Delaney et al. (2013)	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). The four sub-sites support a characteristic machair flora. 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) and Delaney et al. (2013). 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: bryophytes	Percentage cover	Should always be at least an occasional component of the vegetation	Based on data from Ryle et al. (2009) and Delaney et al. (2013). See coastal habitats supporting document for further details

4030 European dry heaths

To maintain the favourable conservation condition of European dry heaths in North Inishowen Coast 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	Total area of this habitat has not been calculated, but estimated to cover more than 10% of the SAC. It occurs in mosaic with other habitats such as wet heath/blanket bog and exposed rock (NPWS internal files) and is a component of the vegetation of the Annex I habitat: Vegetated sea cliffs of the Atlantic and Baltic coasts (1230)- see the coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline from current habitat distribution, subject to natural processes	The heath in this SAC is widely distributed along the hard coastline and also occurs at higher altitudes such as on Binnion, Urris and Dunaff Hills (NPWS internal files)
Ecosystem function: soil nutrient status	Soil pH and nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	Changes to soil nutrient status can occur from high stock densities or supplementary feeding above appropriate levels
Vegetation composition: positive indicator species	Number and percentage cover at a representative number of monitoring stops	At least two positive indicator species, as listed in Perrin et al. (2014), with combined cover of at least 50%	Attribute and target based on Perrin et al. (2014). Bell heather (*Erica cinerea*), ling (*Calluna vulgaris*), crowberry (*Empetrum nigrum*) and bilberry (*Vaccinium myrtillus*) are listed for the heath in this SAC (NPWS internal files)
Vegetation composition: bryophyte and non-crustose lichen species	Number at a representative number of monitoring stops	At least three bryophyte or non-crustose lichen species present, excluding *Campylopus* and *Polytrichum* moss species	Attribute and target based on Perrin et al. (2014)
Vegetation composition: rare/scarce species	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	
Vegetation composition: dwarf-shrub species	Percentage cover at a representative number of monitoring stops	Cover of bog myrtle (*Myrica gale*), creeping willow (*Salix repens*) and Western gorse (*Ulex gallii*) collectively less than 50%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: negative indicator weed species	Pecentage cover at a representative number of monitoring stops	Cover of negative indicator weed species collectively less than 1%	Attribute and target based on Perrin et al. (2014) where weed species are also listed
Vegetation composition: non-native species	Pecentage cover at a representative number of monitoring stops and in local vicinity	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: native trees and shrubs	Pecentage cover in local vicinity	Cover of scattered native trees and shrubs less than 20%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: bracken	Percentage cover in local vicinity	Cover of bracken (*Pteridium aquilinum*) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: soft rush	Percentage cover in local vicinity	Cover of soft rush (*Juncus effusus*) less than 10%	Attribute and target based on Perrin et al. (2014). Dense areas of soft rush can indicate disturbance
Vegetation structure: senescent ling	Percentage cover at a representative number of monitoring stops	Senescent proportion of ling (*Calluna vulgaris*) cover, less than 50%	Attribute and target based on Perrin et al. (2014)

Vegetation structure: growth phases of ling	Percentage cover in local vicinity	Outside boundaries of sensitive areas, all growth phases of ling (*Calluna vulgaris*) should occur throughout, with at least 10% of cover in mature phase	Attribute and target based on Perrin et al. (2014), where sensitive areas and growth phases are defined
Vegetation structure: signs of browsing	Percentage cover at a representative number of monitoring stops	Last complete growing season's shoots of ericoids showing signs of browsing collectively less than 33%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity	No signs of burning inside sensitive areas	Attribute and target based on Perrin et al. (2014), where sensitive areas are defined
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% (but if peat soil less than 5%)	Attribute and target based on Perrin et al. (2014)

1014 Narrow-mouthed Whorl Snail *Vertigo angustior*

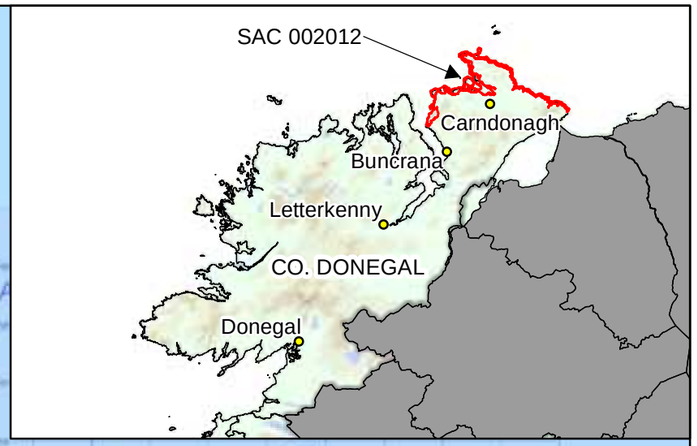
To maintain the favourable conservation condition of Narrow-mouthed Whorl Snail in North Inishowen Coast SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: occupied sites	Number	No decline. There are two known sites for this species in this SAC, which overlaps with three 1km squares. See map 7	The species has been recorded from the sand dunes in the townlands of Lag and Drung behind Back Strand (site VaCAM12) as well as at Tullagh Bay (Moorkens, 1998; Moorkens and Killeen, 2011)
Presence: sampled locations	Percentage	Adult or sub-adult snails are present at 50% of sampled locations with suitable sub-optimal or better quality habitat at confirmed sites	There are two known sites within this SAC
Presence on transect	Occurrence	Adult or sub-adult snails are present in three of the eight maritime grassland zones on the transect with optimal or sub-optimal habitat	Transect established at Lag as part of condition assessment monitoring at this site (Moorkens and Killeen, 2011). See habitat extent target below for definition of optimal and sub-optimal habitat
Abundance	Number per sample	At least two samples on the transect should have more than 20 *V. angustior* individuals	From Moorkens and Killeen (2011)
Transect habitat quality	Metres	At least 40m of habitat along the transect is classed as optimal and at least another 55m as sub-optimal or optimal	From Moorkens and Killeen (2011). See habitat extent target below for definition of optimal and sub-optimal habitat
Transect optimal wetness	Metres	Soils, at time of sampling, are damp (optimal wetness) and covered with a layer of humid thatch for at least 55m along the transect	From Moorkens and Killeen (2011)
Habitat extent	Hectares	At least 30-35ha of the site at Lag/Drung comprises a mosaic of sub-optimal and optimal habitat. Adequate suitable habitat should also be present at Tullagh Bay	Optimal habitat is defined as fixed dune, species-rich grassland dominated by red fescue (*Festuca rubra*) and marram grass (*Ammophila arenaria*), with sparse lady's bedstraw (*Galium verum*), mouse-ear-hawkweed (*Pilosella officinarum*) and other low growing herbs. Vegetation height 10-30cm. Habitat growing on damp, friable soil covered with a layer of humid, open structured thatch. Sub-optimal habitat is as optimal habitat but with a higher proportion of white clover (*Trifolium repens*), and either vegetation height is less than 10cm or between 30 and 50cm, or the soil is dry and sandy, or the thatch is wetter with a denser structure. From Moorkens and Killeen (2011). Habitat at Tullagh Bay has not been described in detail

1355 Otter *Lutra lutra*

To maintain the favourable conservation condition of Otter in North Inishowen Coast SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Percentage positive survey sites	No significant decline	Measure based on standard otter survey technique. FCS target, based on 1980/81 survey findings, is 88% in SACs. Current range is estimated at 93.6% (Reid et al., 2013)
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 146.6ha above high water mark (HWM); 61.3ha along river banks/ around ponds	No field survey. Areas mapped to include 10m terrestrial buffer along shoreline (above HWM and along river banks) identified as critical for otters (NPWS, 2007)
Extent of marine habitat	Hectares	No significant decline. Area mapped and calculated as 1099.2ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (HWM) (NPWS, 2007; Kruuk, 2006)
Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 30.9km	No field survey. River length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (Chapman and Chapman, 1982)
Extent of freshwater (lake/lagoon) habitat	Hectares	No significant decline. Area mapped and calculated as 2.7ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (NPWS, 2007)
Couching sites and holts	Number	No significant decline	Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk, 2006; Kruuk and Moorhouse, 1991)
Fish biomass available	Kilograms	No significant decline	Broad diet that varies locally and seasonally, but dominated by fish, in particular salmonids, eels and sticklebacks in freshwater (Bailey and Rochford, 2006; Reid et al., 2013) and wrasse and rockling in coastal waters (Kingston et al., 1999)
Barriers to connectivity	Number	No significant increase. For guidance, see map 8	Otters will regularly commute across stretches of open water up to 500m e.g. between the mainland and an island; between two islands; across an estuary (De Jongh and O'Neill, 2010). It is important that such commuting routes are not obstructed



Legend

North Inishowen Coast SAC 002012

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MAP 1:
NORTH INISHOWEN COAST SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

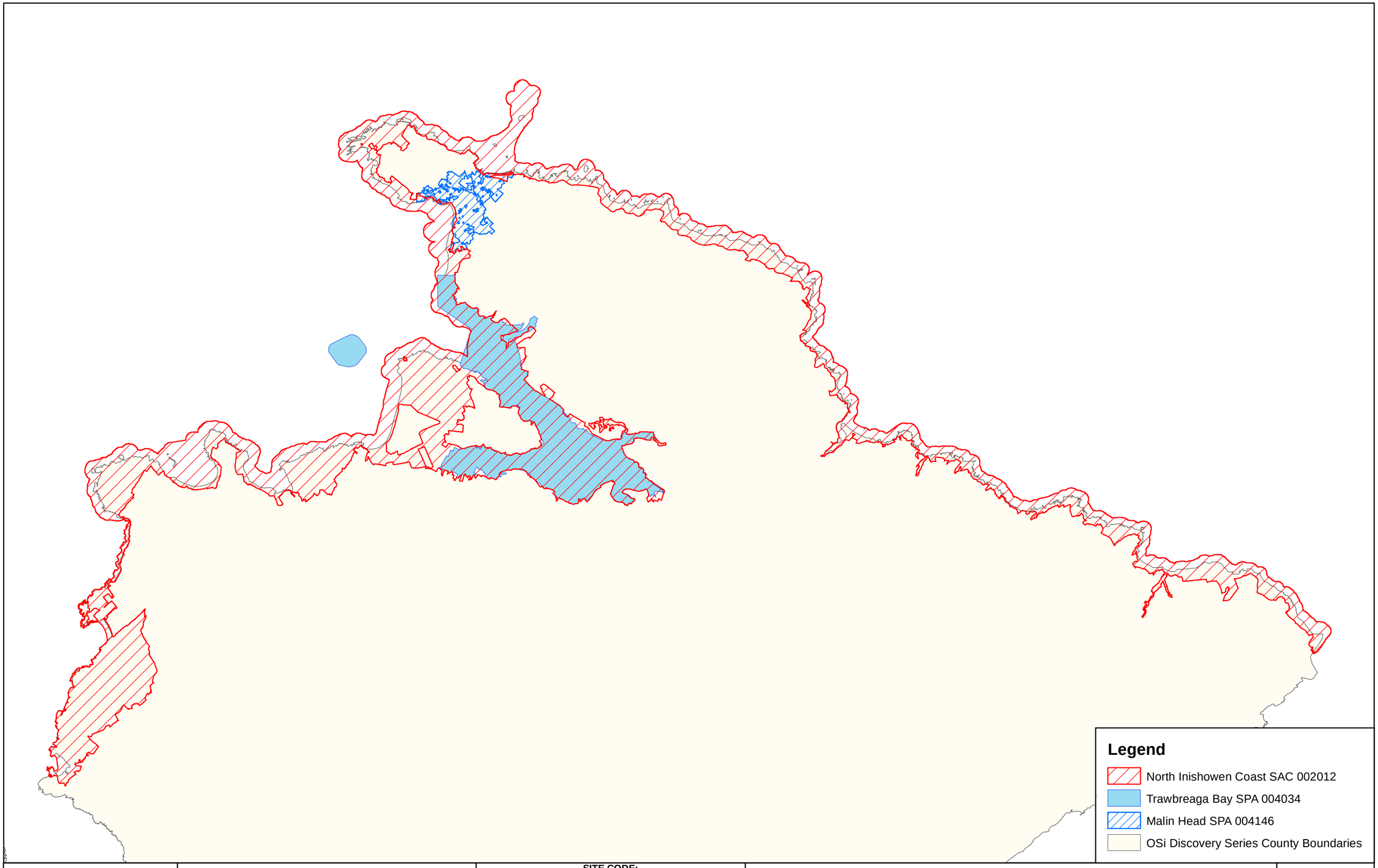
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002012; version 3. CO. DONEGAL

0 1 2 3 4 5 km

N

Map Version 1
Date: Nov 2014



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Department of Arts, Heritage and the Gaeltacht

MAP 2:
NORTH INISHOWEN COAST SAC
CONSERVATION OBJECTIVES
ADJOINING / OVERLAPPING DESIGNATIONS

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

SITE CODE:
SAC 002012; version 3.
SPA 004034; version 1.05,
SPA 004146; version 1.03. CO. DONEGAL

0 1 2 3 4 5 km

N

Map Version 1
Date: Nov 2014

Legend

- North Inishowen Coast SAC 002012
- 1140 Mudflats and sandflats not covered by sea water at low tide
- OSi Discovery Series County Boundaries

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MAP 3:
NORTH INISHOWEN COAST SAC
CONSERVATION OBJECTIVES
TIDAL MUDFLATS AND SANDFLATS

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

SITE CODE:
SAC 002012; version 3. CO. DONEGAL

0 1 2 3 4 5 km

N

Map Version 1
Date: Nov 2014

Legend

North Inishowen Coast SAC 002012

OSi Discovery Series County Boundaries

Marine Community Types

Fine to medium sand with *Eurydice pulchra* community complex

Muddy sand to coarse sediment with *Pygospio elegans* community complex

Reef community complex

Sand with *Angulus tenuis* and *Scoloplos (Scoloplos) armiger* community complex

Zostera-dominated community

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MAP 4:
NORTH INISHOWEN COAST SAC
CONSERVATION OBJECTIVES
MARINE COMMUNITY TYPES

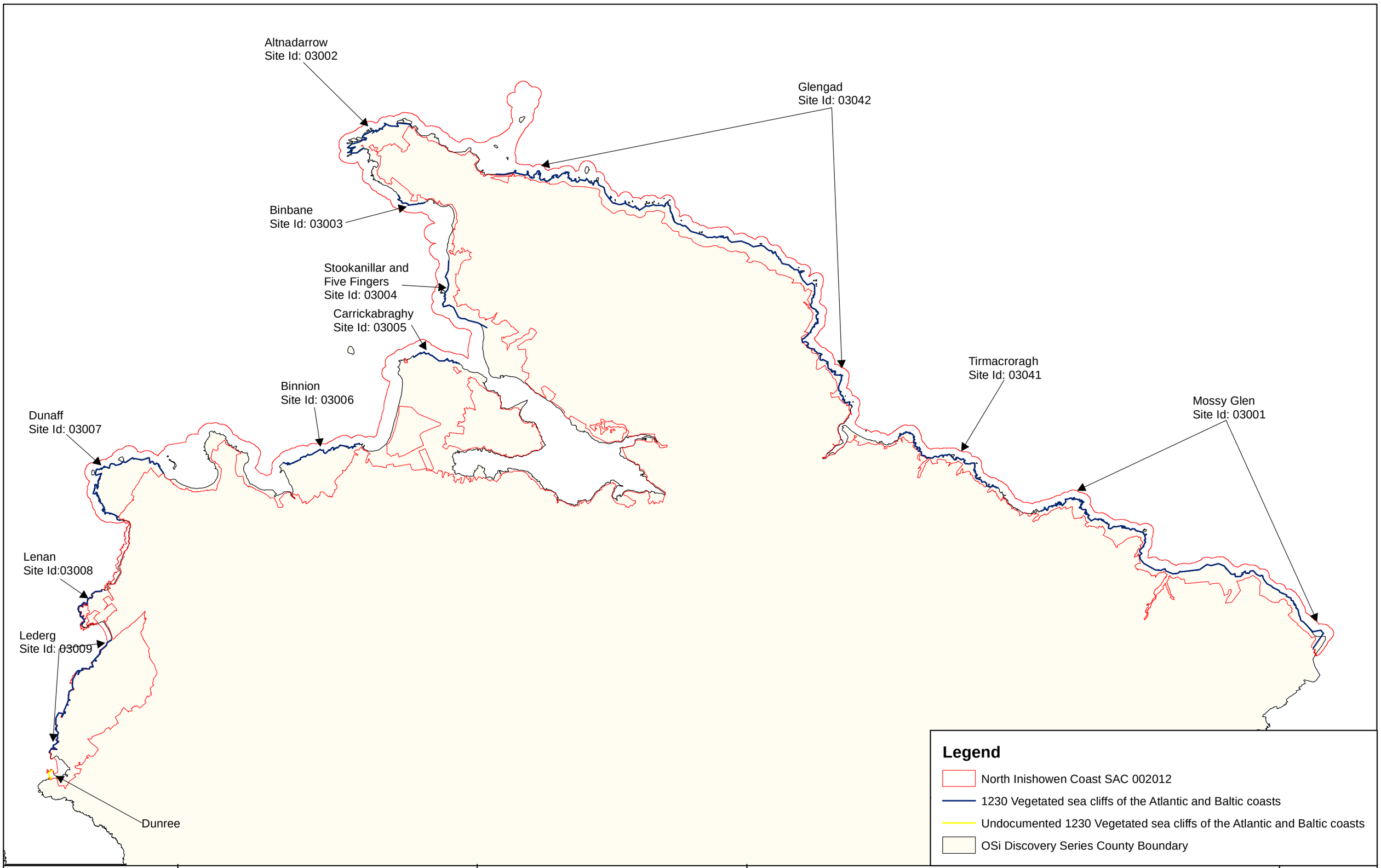
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002012; version 3. CO. DONEGAL

0 1 2 3 4 5 km

N

Map Version 1
Date: Nov 2014



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Department of Arts, Heritage and the Gaeltacht

MAP 5:
NORTH INISHOWEN COAST SAC
CONSERVATION OBJECTIVES
VEGETATED SEA CLIFFS

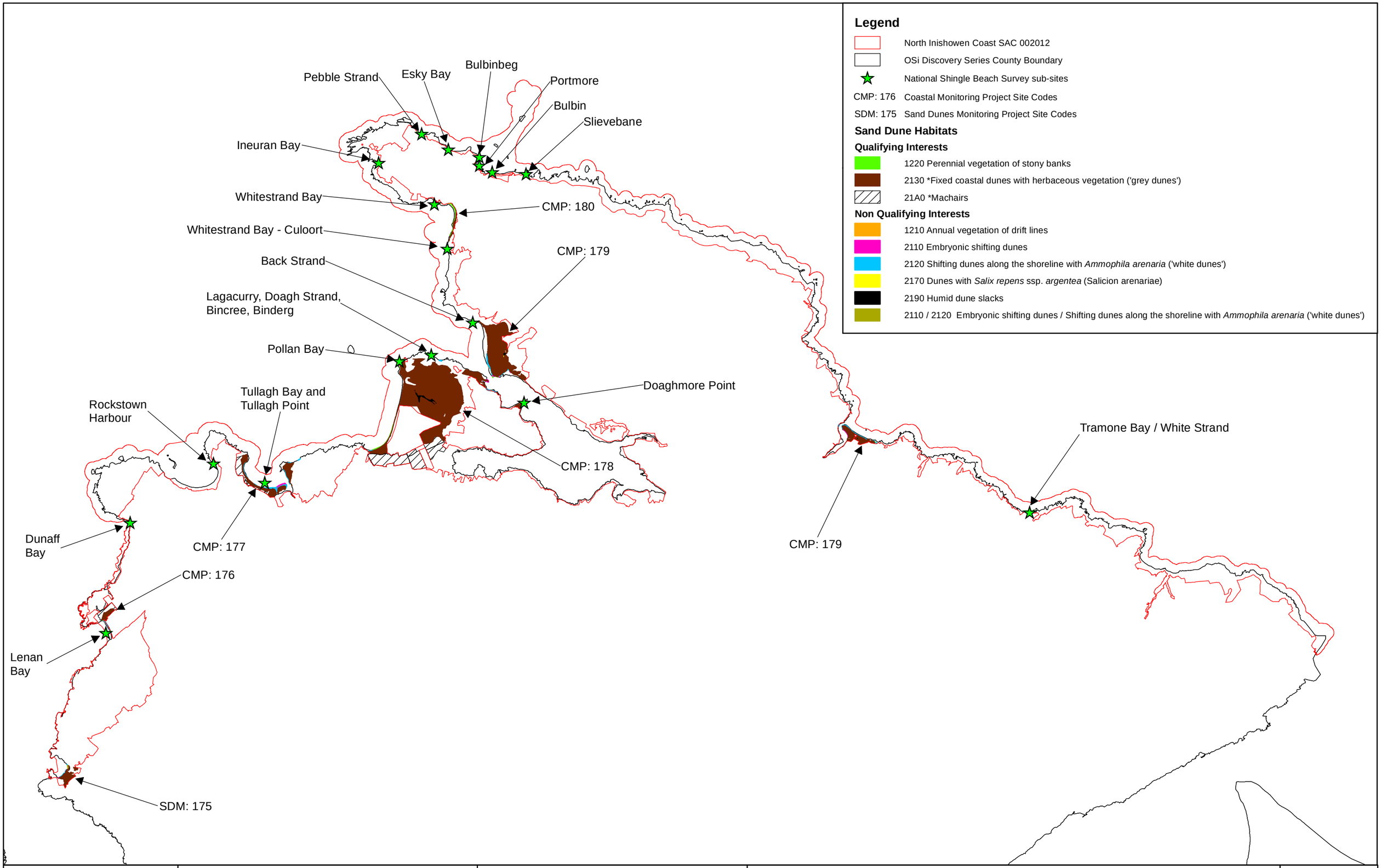
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002012; version 3. CO. DONEGAL

0 1 2 3 4 5 km

N

Map Version 1
Date: Nov 2014



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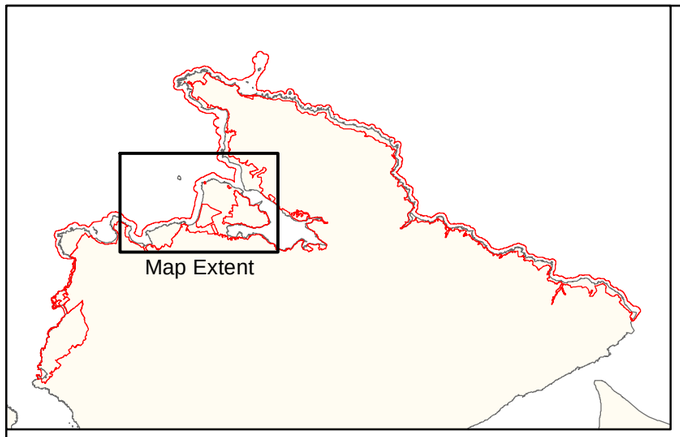
MAP 6:
NORTH INISHOWEN COAST SAC
CONSERVATION OBJECTIVES
SAND DUNE HABITATS &
PERENNIAL VEGETATION OF STONY BANKS
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002012; version 3. CO. DONEGAL

0 1 2 3 4 5 km

N

Map Version 1
Date: Nov 2014



C4253

C4252

C3548

Legend

- North Inishowen Coast SAC 002012
- 1014 Narrow-Mouthed Whorl Snail - *Vertigo angustior*
- OSi Discovery Series County Boundary

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MAP 7:
NORTH INISHOWEN COAST SAC
CONSERVATION OBJECTIVES
NARROW-MOUTHED WHORL SNAIL

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

SITE CODE:
SAC 002012; version 3. CO. DONEGAL

0 0.2 0.4 0.6 0.8 1 km

N

Map Version 1
Date: Nov 2014

Legend

North Inishowen Coast SAC 002012

OSi Discovery Series County Boundaries

1355 Otter-*Lutra lutra*

Otter Commuting 250m HWM buffer

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MAP 8:
NORTH INISHOWEN COAST SAC
CONSERVATION OBJECTIVES
OTTER COMMUTING

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

SITE CODE:
SAC 002012; version 3. CO. DONEGAL

0 1 2 3 4 5 km

N

Map Version 1
Date: Nov 2014

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Ballyhoorisky Point to Fanad Head SAC 001975

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta

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

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 (2017) Conservation Objectives: Ballyhoorisky Point to Fanad Head SAC 001975. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

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***

001975	Ballyhoorisky Point to Fanad Head SAC
1014	Narrow-mouthed Whorl Snail *Vertigo angustior*
1220	Perennial vegetation of stony banks
1230	Vegetated sea cliffs of the Atlantic and Baltic coasts
1833	Slender Naiad *Naias flexilis*
3130	Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea
3140	Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.

Please note that this SAC overlaps with Fanad Head SPA (004148) SPA and Horn Head to Fanad Head SPA (004194) and is adjacent to Mulroy Bay SAC (002159). 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, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	1999
Title :	National Shingle Beach Survey of Ireland 1999
Author :	Moore, D.; Wilson, F.
Series :	Unpublished Report to NPWS
Year :	2007
Title :	Management prescriptions for *Vertigo angustior* at cSAC sites for the species in the Republic of Ireland
Author :	Moorkens, E.
Series :	Unpublished report to NPWS
Year :	2009
Title :	Coastal Monitoring Project 2004-2006
Author :	Ryle, T.; Murray, A.; Connolly, K.; Swann, M.
Series :	Unpublished report to NPWS
Year :	2011
Title :	National survey and assessment of the conservation status of Irish sea cliffs
Author :	Barron, S.J.; Delaney, A.; Perrin, P.M.; Martin, J.; O'Neill, F.
Series :	Irish Wildlife Manual No. 53
Year :	2011
Title :	Monitoring and condition assessment of populations of *Vertigo geyeri*, *Vertigo angustior* and *Vertigo moulinsiana* in Ireland
Author :	Moorkens, E.; Killeen, I.
Series :	Irish Wildlife Manual No. 55
Year :	2013
Title :	A survey of the benthic macrophytes of three hard-water lakes: Lough Bunny, Lough Carra and Lough Owel
Author :	Roden, C.; Murphy, P.
Series :	Irish Wildlife Manual No. 70
Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 2. Habitats assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2015
Title :	Habitats Directive Annex I lake habitats: a working interpretation for the purposes of site-specific conservation objectives and Article 17 reporting
Author :	O Connor, Á.
Series :	Unpublished document by NPWS
Year :	2016
Title :	Ireland Red List No. 10: Vascular Plants
Author :	Wyse Jackson, M.; FitzPatrick, Ú.; Cole, E.; Jebb, M.; McFerran, D.; Sheehy Skeffington, M.; Wright, M.
Series :	Ireland Red Lists series, NPWS
Year :	2017
Title :	Ballyhoorisky Point to Fanad Head SAC (site code: 1975) Conservation objectives supporting document- coastal habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document

Year :	2017
Title :	Ballyhoorisky Point to Fanad Head SAC (site code: 1975) Conservation objectives supporting document- *Najas flexilis* V1
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	1982
Title :	Eutrophication of waters. Monitoring assessment and control
Author :	OECD
Series :	OECD, Paris
Year :	1999
Title :	A survey of the sublittoral vegetation of 15 machair loughs in north west Ireland/ A survey of coastal lakes in Counties Galway, Mayo, Sligo and Donegal/ A survey of Irish machair loughs
Author :	Roden, C.
Series :	Report to the National Heritage Council, Kilkenny
Year :	2000
Title :	Colour in Irish lakes
Author :	Free, G.; Allott, N.; Mills, P.; Kennelly, C.; Day, S.
Series :	Verhandlungen Internationale Vereinigung für theoretische und angewandte Limnologie, 27: 2620-2623
Year :	2001
Title :	Aquatic plants in Britain and Ireland
Author :	Preston, C.D.; Croft, J.M.
Series :	Harley Books, Colchester
Year :	2004
Title :	The ecology of *Najas flexilis*
Author :	Wingfield, R.A.; Murphy, K.J.; Hollingsworth, P.; Gaywood, M.J.
Series :	Scottish Natural Heritage Commissioned Report No. 017 (ROAME No. F98PA02)
Year :	2005
Title :	National inventory of sea cliffs and coastal heaths
Author :	Browne, A.
Series :	Unpublished Report to NPWS
Year :	2006
Title :	A reference-based typology and ecological assessment system for Irish lakes. Preliminary investigations. Final report. Project 2000-FS-1-M1 Ecological assessment of lakes pilot study to establish monitoring methodologies EU (WFD)
Author :	Free, G.; Little, R.; Tierney, D.; Donnelly, K.; Coroni, R.
Series :	EPA, Wexford
Year :	2008
Title :	Water Quality in Ireland 2004-2006
Author :	Clabby, K.J.; Bradley, C.; Craig, M.; Daly, D.; Lucey, J.; McGarrigle, M.; O'Boyle, S.; Tierney, D.; Bowman, J.
Series :	EPA, Wexford
Year :	2010
Title :	Water quality in Ireland 2007-2009
Author :	McGarrigle, M.; Lucey, J.; Ó Cinnéide, M.
Series :	EPA, Wexford

Year :	2015
Title :	Water quality in Ireland 2010-2012
Author :	Bradley, C., Byrne, C., Craig, M., Free, G., Gallagher, T., Kennedy, B., Little, R., Lucey, J., Mannix, A., McCreesh, P., McDermott, G., McGarrigle, M., Ní Longphuirt, S., O'Boyle, S., Plant, C., Tierney, D., Trodd, W., Webster, P., Wilkes, R. & Wynne, C.
Series :	EPA, Wexford
Year :	in prep.
Title :	Monitoring of hard-water lakes in Ireland using charophytes and other macrophytes
Author :	Roden, C.; Murphy, P.
Series :	Unpublished report to NPWS

Spatial data sources

Year :	Revision 2012
Title :	National Shingle Beach Survey
GIS Operations :	Clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1220 (map 3)
Year :	2009
Title :	Coastal Monitoring Project 2004-2006. Version 1
GIS Operations :	QI selected; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1220 (map 3)
Year :	2011
Title :	National survey and assessment of the conservation status of Irish sea cliffs
GIS Operations :	Clipped to SAC boundary
Used For :	1230 (map 4)
Year :	2008
Title :	OSi 1:5000 IG vector dataset
GIS Operations :	WaterPolygons feature class clipped to the SAC boundary. Expert opinion used to identify Annex I habitat and to resolve any issues arising
Used For :	3130, 3140 (map 5)
Year :	2016
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 :	1014 (map 6)
Year :	2013
Title :	*Najas flexilis* data
GIS Operations :	Lake habitat for species clipped to SAC boundary
Used For :	1833 (map 7)

1220 Perennial vegetation of stony banks

To restore the favourable conservation condition of Perennial vegetation of stony banks in Ballyhoorisky Point to Fanad Head 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	The current total area of perennial vegetation of stony banks in Ballyhoorisky Point to Fanad Head SAC is unknown. The habitat was recorded as being present, but its extent was not mapped, from three sub-sites during the National Shingle Beach Survey (NSBS) (Moore and Wilson, 1999): Fanad Head (NSBS site ID: 0020), Ballyhiernan Bay (NSBS site ID: 0021) and Rinboy Point to Ballyhoorisky Island (NSBS site ID: 0022). During the Coastal Monitoring Project (CMP), an area of 0.26ha of vegetated shingle was recorded within the sub-site Maheradrumman (CMP site ID: 172) (Ryle et al., 2009). It is important to note that further unsurveyed areas may be present within the SAC and the total area of the habitat is likely to be much greater. See the Ballyhoorisky Point to Fanad Head SAC conservation objectives supporting document for coastal habitats for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 3 for recorded locations	The full distribution of vegetated shingle within the SAC is unknown at present, although the habitat has been recorded within the sub-sites Fanad Head, Ballyhiernan Bay and Rinboy Point to Ballyhoorisky Island by Moore and Wilson (1999) and within the Maheradrumman sub-site by Ryle et al. (2009). The habitat is likely to be more widespread. See the 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 Moore and Wilson (1999) and Ryle et al. (2009). At Ballyhoorisky Point to Fanad Head SAC, shingle extraction has damaged the habitat. See the 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 Moore and Wilson (1999). At Ballyhoorisky Point to Fanad Head SAC, vegetated shingle is associated with intertidal shingle, rocky shore, shingle-based grassland, cliffs, machair and sand dunes. See the 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 typical vegetated shingle flora including the range of sub-communities within the different zones	Within the habitat in the SAC, the CMP recorded curled dock (*Rumex crispus*), scentless mayweed (*Tripleurospermum maritimum*), silverweed (*Potentilla anserina*), sand couch (*Elytrigia juncea*), sea holly (*Erygnium maritimum*), sea sandwort (*Honkenya peploides*), sea mayweed (*Matricaria maritima*), cleavers (*Galium aparine*) and Yorkshire fog (*Holcus lanatus*) (Ryle et al., 2009). The NSBS also noted creeping bent (*Agrostis stolonifera*), spear-leaved orache (*Atriplex prostrata*), daisy (*Bellis perennis*), thistles (*Cirsium* spp.), common scurvygrass (*Cochlearia officinalis*), ribwort plantain (*Plantago lanceolata*), broadleaved plantain (*P. major*), creeping buttercup (*Ranunculus repens*), dandelion (*Taraxacum* agg.) and clovers (*Trifolium* spp.) (Moore and Wilson, 1999). See the coastal habitats supporting document for further details

Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-native species) to represent less than 5% cover	Based on data from Moore and Wilson (1999). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. The NSBS noted the presence of common nettle (*Urtica dioica*) on the exposed shingle beach at Fanad Head. See the coastal habitats supporting document for further details

1230 Vegetated sea cliffs of the Atlantic and Baltic coasts

To maintain the favourable conservation condition of Vegetated sea cliffs of the Atlantic and Baltic coasts in Ballyhoorisky Point to Fanad Head SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat length	Kilometres	Area stable, subject to natural processes, including erosion. For the four sub-sites mapped, total length of cliff sections: Croaghross - 4.25km; Doagh Beg - 0.95km; Pollet - 4.5km; Rinboy - 0.73km. See map 4	Based on data from the Irish Sea Cliff Survey (ISCS) (Barron et al., 2011). Cliffs are linear features and are therefore measured in kilometres. Four sub-sites were identified using a combination of aerial photos and the DCENR helicopter viewer: Croaghross (ISCS site ID: 03013), Doagh Beg (ISCS site ID: 03014), Pollet (ISCS site ID: 03043) and Rinboy (ISCS site ID: 03044). The length of each cliff was measured (in some cases the cliff was measured in sections) to give a total estimated area of 10.43km within the SAC. The length of cliff is likely to be underestimated. See the Ballyhoorisky Point to Fanad Head SAC conservation objectives supporting document for coastal habitats for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 4	Only hard cliffs have been noted in this SAC (Browne, 2005; Barron et al., 2011). See the coastal habitats supporting document for further details
Physical structure: functionality and hydrological regime	Occurrence of artificial barriers	No alteration to natural functioning of geomorphological and hydrological processes, including groundwater quality, due to artificial structures	Based on data from Barron et al. (2011). Maintaining natural geomorphological processes, including natural erosion, is important for the health of vegetated sea cliffs. Hydrological processes maintain flushes, and in some cases tufa formations, that can be associated with sea cliffs. See the coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of sea cliff habitat zonations, including transitional zones, subject to natural processes including erosion and succession	Based on data from Barron et al. (2011). The base of the cliffs consists of bedrock, gravel and shingle. The cliff-top soils are shallow, lithosolic-podzolic type soils with peaty topsoil. See the coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from Barron et al. (2011). See the 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 the Irish Sea Cliff Survey (Barron et al., 2011)	At Ballyhoorisky Point to Fanad Head SAC, species such as thrift (*Armeria maritima*), sea campion (*Silene vulgaris* subsp. *maritima*), common scurvygrass (*Cochlearia officinalis*), buck's-horn plantain (*Plantago coronopus*), sea plantain (*P. maritima*), angelica (*Angelica sylvestris*) and the scarce roseroot (*Rhodiola rosea*) occur on the cliffs. The Near Threatened species (Wyse Jackson et al., 2016) Scots lovage (*Ligusticum scoticum*) has been reported from sea cliffs in this SAC. See the coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage	Negative indicator species (including non-native species) to represent less than 5% cover	Based on data from Barron et al. (2011). See the coastal habitats supporting document for further details
Vegetation composition: bracken and woody species	Percentage	Cover of bracken (*Pteridium aquilinum*) on grassland and/or heath less than 10%. Cover of woody species on grassland and/or heath less than 20%	Based on data from Barron et al. (2011). See the coastal habitats supporting document for further details

3130 Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea

To maintain the favourable conservation condition of Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea in the Ballyhoorisky Point to Fanad Head 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. See map 5	The SAC is located at the interface between outcropping granite and quartzite bedrock and calcareous, wind-blown sand, hence a mixture of habitats 3130 and 3140 occurs in the lakes. Habitat 3130 is believed to occur in Shannagh Lough and probably also in Kinny Lough and smaller lakes in the SAC (e.g. Rinboy and Eelburn Loughs). The 3130 characteristic species *Najas flexilis* occurs in Shannagh (see the *Najas flexilis* conservation objective). Kinny has a variety of plant communities indicative of soft and hard waters (Roden, 1999). Two measures of extent should be used: 1. the area of the lake itself and; 2. the extent of the vegetation communities/zones that typify the habitat. Further information relating to all attributes is provided in the lake habitats supporting document for the purposes of site-specific conservation objectives and Article 17 reporting (O Connor, 2015) and the *Najas flexilis* conservation objective supporting document for the SAC
Habitat distribution	Occurrence	No decline, subject to natural processes	As noted above, habitat 3130 is likely to occur in Shannagh and Kinny Loughs, and possibly other smaller lakes in the SAC (see map 5). The characteristics and distribution of lake habitat 3130 in Ireland are not yet fully understood, and the distinction between lake habitats 3130 and 3140 is particularly challenging in coastal areas
Typical species	Occurrence	Typical species present, in good condition, and demonstrating typical abundances and distribution	For lists of typical plant species, see Article 17 habitat assessment for lake habitat 3130 (NPWS, 2013) and O Connor (2015). The *Najas flexilis* conservation objective supporting document provides specific information on Shannagh Lough. Kinny Lough has *Isoetes lacustris*, good pondweed diversity with *Potamogeton berchtoldii*, *P. crispus*, *P. filiformis*, *P. gramineus*, *P. pectinatus*, *P. perfoliatus*, *P. praelongus*, *P. pusilus* and *P.* x *nitens*, and dense stands of *Callitriche hermaphroditica* (C.D. Preston records; Roden, 1999)
Vegetation composition: characteristic zonation	Occurrence	All characteristic zones should be present, correctly distributed and in good condition	Further work is necessary to describe the characteristic zonation and other spatial patterns in lake habitat 3130 (see O Connor, 2015). Lake-specific information on vegetation zonation may be available from Roden (1999) or other sources
Vegetation distribution: maximum depth	Metres	Maintain maximum depth of vegetation, subject to natural processes	The maximum depth of vegetation is likely to be specific to the lake shoreline in question. An indicative target has not yet been set for this lake habitat type
Hydrological regime: water level fluctuations	Metres	Maintain appropriate natural hydrological regime necessary to support the habitat	Fluctuations in lake water level are typical in Ireland, but can be amplified by activities such as abstraction and drainage. Increased water level fluctuations can increase wave action, up-root vegetation, increase turbidity, alter the substratum and lead to release of nutrients from the sediment. The hydrological regime of the lakes must be maintained so that the area, distribution and depth of the lake habitat and its constituent/characteristic vegetation zones and communities are not reduced

Lake substratum quality	Various	Maintain appropriate substratum type, extent and chemistry to support the vegetation	Research is required to further characterise the substratum types (particle size and origin) and substratum quality (notably pH, calcium, iron and nutrient concentrations) favoured by each of the five Annex I lake habitats in Ireland. It is likely that lake habitat 3130 is associated with a range of substrate types that are more productive/base-rich relative to the substratum of lake habitat 3110. Substratum particle size is likely to vary with depth and along the shoreline within a single lake. Roden (1999) noted both Shannagh and Kinny Loughs have a sand shelf at the northern end, with rocky shores elsewhere
Water quality: transparency	Metres	Maintain appropriate Secchi transparency. There should be no decline in Secchi depth/transparency	Transparency relates to light penetration and, hence, to the depth of colonisation of vegetation. It can be affected by phytoplankton blooms, water colour and turbidity. A specific target has yet to be established for this Annex I lake habitat. Habitat 3130 is associated with clear water, as evidenced by the growth of the character species *Najas flexilis* at depths of up to 10m. The OECD fixed boundary system set transparency targets for oligotrophic lakes of ≥6m annual mean Secchi disk depth, and ≥3m annual minimum Secchi disk depth. There is likely to be some variation across lakes with habitat 3130 in Secchi depth and site-specific conditions should also be considered
Water quality: nutrients	µg/l P; mg/l N	Maintain the concentration of nutrients in the water column at sufficiently low levels to support the habitat and its typical species	Lake habitat 3130 is associated with high water quality, with naturally low dissolved nutrients. It is naturally more productive than lake habitat 3110, probably reflecting higher concentrations of nutrients such as calcium, rather than P alone. Lake habitat 3130 may reach favourable condition slightly above the oligotrophic boundary for nutrients, but in the absence of habitat-specific targets, the targets are Water Framework Directive (WFD) 'High Status' or oligotrophic (OECD, 1982). The "good-moderate" boundary is too enriched to support the habitat. Annual average TP concentration should be ≤10µg/l TP, average annual total ammonia should be ≤0.040mg/l N and annual 95th percentile for total ammonia should be ≤0.090mg/l N. Where nutrient concentrations are lower, there should be no upward trend in nutrient concentrations. See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009
Water quality: phytoplankton biomass	µg/l Chlorophyll *a*	Maintain appropriate water quality to support the habitat, including high chlorophyll *a* status	Lake habitat 3130 is associated with high water quality, and naturally low algal growth. As for nutrients, the targets are WFD 'High Status' or oligotrophic (OECD, 1982). The "good-moderate" boundary is too enriched to support the habitat. The average growing season (March-October) chlorophyll *a* concentration must be <5.8µg/l. The annual average chlorophyll *a* should be <2.5µg/l and the annual peak chlorophyll *a* should be <8.0µg/l. Where a lake has a chlorophyll *a* concentration that is lower than this target, there should be no decline within class, i.e. no upward trend in phytoplankton biomass. See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009
Water quality: phytoplankton composition	EPA phytoplankton composition metric	Maintain appropriate water quality to support the habitat, including high phytoplankton composition status	The EPA has developed a phytoplankton composition metric for nutrient enrichment of Irish lakes. As for other water quality indicators, habitat 3130 is considered to require WFD high status

Water quality: attached algal biomass	Algal cover and EPA phytobenthos metric	Maintain trace/absent attached algal biomass (<5% cover) and high phytobenthos status	Nutrient enrichment can favour epiphytic and epipelic algae that can out-compete the submerged vegetation. The cover abundance of attached algae in lake habitat 3130 should, therefore, be trace/absent (<5% cover). EPA phytobenthos can be used as an indicator of changes in attached algal biomass. As for other water quality indicators, habitat 3130 requires high phytobenthos status
Water quality: macrophyte status	EPA macrophyte metric (The Free Index)	Maintain high macrophyte status	Nutrient enrichment can favour more competitive submerged macrophyte species that out-compete the typical and characteristic species for lake habitat 3130. The EPA monitors macrophyte status for WFD purposes using the 'Free Index'. The target for habitat 3130 is high status or an Ecological Quality Ratio (EQR) for lake macrophytes of ≥0.90, as defined in Schedule Five of the European Communities Environmental Objectives (Surface Waters) Regulations 2009
Acidification status	pH units; mg/l	Maintain appropriate water and sediment pH, alkalinity and cation concentrations to support the habitat, subject to natural processes	Acidification can impact on species abundance and composition in habitat 3130. Acidification reduces the abundance and reproductive capacity of *Najas flexilis* (Wingfield et al., 2004). The specific requirements of habitat 3130, in terms of water and sediment pH, alkalinity and cation concentration, have not been determined. In line with targets for *Najas flexilis*, median pH values should be greater than 7 pH units. Water and sediment alkalinity and concentrations of cations (notably calcium) should be appropriate to the habitat. The target for WFD Acidification/Alkalisation status is high. Maximum pH should be <9.0 pH units, in line with the surface water standards. See The European Communities Environmental Objectives (Surface Waters) Regulations 2009
Water colour	mg/l PtCo	Maintain appropriate water colour to support the habitat	Increased water colour and turbidity decrease light penetration and can reduce the area of available habitat for lake macrophytes, particularly at the lower euphotic depths. The primary source of increased water colour in Ireland is disturbance to peatland. No habitat-specific or national standards for water colour currently exist. Studies have shown median colour concentrations in Irish lakes of 38mg/l PtCo (Free et al., 2000) and 33mg/l PtCo (Free et al., 2006). It is likely that the water colour in all Irish lake habitats would naturally be <50mg/l PtCo. Water colour is generally <30mg/l PtCo or, more naturally, <20mg/l PtCo in lakes with habitat 3130, where the peatland in the lake's catchment is intact
Dissolved organic carbon (DOC)	mg/l	Maintain appropriate organic carbon levels to support the habitat	Dissolved (and particulate) organic carbon (OC) in the water column is linked to water colour and acidification (organic acids). Increasing DOC in water has been documented across the Northern Hemisphere, including afforested peatland catchments in Ireland. Damage and degradation of peatland, leading to decomposition of peat is likely to be the predominant source of OC in Ireland. OC in water promotes decomposition by fungi and bacteria that, in turn, releases dissolved nutrients. The increased biomass of decomposers can also impact directly on the characteristic lake communities through shading, competition, etc.

Turbidity	Nephelometric turbidity units/ mg/l SS/ other appropriate unit	Maintain appropriate turbidity to support the habitat	Turbidity can significantly affect the quantity and quality of light reaching rooted and attached vegetation and can, therefore, impact on lake habitats. The settlement of higher loads of inorganic or organic material on lake vegetation communities may also have impacts on sensitive, delicate species. Turbidity can increase as a result of re-suspension of material within the lake, higher loads entering the lake, or eutrophication. Turbidity measurement and interpretation is challenging. As a result, it is likely to be difficult to set habitat-specific targets for turbidity in lakes
Fringing habitat: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the natural structure and functioning of habitat 3130	Most lake shorelines have fringing habitats of reedswamp, other swamp, fen, marsh or wet-woodland that intergrade with and support the structure and functions of the lake habitat. Equally, fringing habitats are dependent on the lake, particularly its water levels, and support wetland communities and species of conservation concern. Many of the fringing wetland habitats support higher invertebrate and plant species richness than the lake habitats themselves. In this SAC, lake shorelines may have marsh/swamp communities and are fringed by dune habitats and heath

3140 Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.

To maintain the favourable conservation condition of Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. in Ballyhoorisky Point to Fanad Head 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 SAC is located at the interface between outcropping granite and quartzite bedrock and calcareous, wind-blown sand, hence a mixture of habitats 3130 and 3140 occurs in the lakes. The hard water lake habitat (3140) is found in Magheradrumman Lough (Roden, 1999). Elements of the habitat may also occur in other lakes (see map 5). Two measures of extent should be used: 1. the area of the lake itself and; 2. the extent of the vegetation communities/zones that typify the habitat. Further information relating to all attributes is provided in the lake habitats supporting document for the purposes of site-specific conservation objectives and Article 17 reporting (O Connor, 2015)
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 5	As noted above, habitat 3140 occurs in Magheradrumman Lough and possibly also in other lakes in the SAC. Magheradrumman Lough is a small lake with the coastal, machair form of lake habitat 3140, a well-developed sandy shelf and a range of plant communities typical of calcareous water (Roden, 1999). The machair form is generally shallower, has cloudier water and is probably naturally more productive than typical hard water forms. It is likely that the machair form of habitat 3140 intergrades with or is related to lake habitats 3150 and 3130. More research is needed to characterise coastal lakes and the inter-relationships of lake habitats 3130, 3140 and 3150
Vegetation composition: typical species	Occurrence	Typical species present, in good condition, and demonstrating typical abundances and distribution	For lists of typical species (cyanobacteria, algae, higher plants and water beetles), see Article 17 habitat assessment for lake habitat 3140 (NPWS, 2013) and the lake habitats supporting document (O Connor, 2015). The machair form of the hard water lake habitat (3140) differs from more typical forms by having characteristic plants such as *Ranunculus baudotii* and *Potamogeton pectinatus*. N.F. Stewart visited Magheradrumman Lough in August 1989 and again, with C.D. Preston, in June 1990 and recorded *Chara* ?*aspera*, *C. contraria*, *C. curta*, *C. rudis* and *Tolypella glomerata*, *Potamogeton crispus*, *P. filiformis*, *P. pectinatus* and *P. pusilus* (charophytes and pondweeds only listed). Roden (1999) also found a diverse charophyte flora in Magheradrumman Lough, including *Chara aspera*, *C. curta*, *C. globularis* and *Nitella flexilis*
Vegetation composition: characteristic zonation	Occurrence	All characteristic zones should be present, correctly distributed and in good condition	The characteristic zonation of lake habitat 3140 has been described (Roden and Murphy, 2013; in prep.). The zonation in machair forms of habitat 3140 differs from that of the clearer water forms (Roden and Murphy, in prep.)

Vegetation distribution: maximum depth	Metres	Maintain maximum depth of vegetation, subject to natural processes	The maximum depth of vegetation is likely to be specific to the lake shoreline in question, but is typically expected to be deep in clear, hard water lakes. An indicative target of >6 m has been developed for hard water lakes (3140), but this may need to be modified based on the habitat sub-type/form and/or the specific lake in question (see Roden and Murphy, 2013; in prep.). Colonisation tends to be shallower in the machair form of hard water lakes, owing to cloudier water and shallower lake depth (Roden and Murphy, in prep.). Extremely clear marl lakes can have charophyte vegetation to far greater depths, such as Lough Rea (charophytes to 10-11m), or Coolorta (>9m) (Roden and Murphy, in prep.). In this SAC, vegetation was found to depths of at least 6m in Magheradrumman Lough (Roden, 1999)
Hydrological regime: water level fluctuations	Metres	Maintain appropriate natural hydrological regime necessary to support the habitat	The hydrological regime of lakes with habitat 3140 is driven by groundwater flows. Groundwater can discharge directly to the lake, via springs or seepages, or to in-flowing rivers. For machair forms, the hydrological regime is that of the surrounding sand plain. Fluctuations in lake water level are typical in Ireland, but can be amplified by activities such as abstraction and drainage. Increased water level fluctuations can increase wave action, up-root vegetation, increase turbidity, alter the substratum and lead to release of nutrients from the sediment. The hydrological regime, particularly the groundwater contribution, must be maintained so that the area, distribution and depth of the lake habitat and its constituent/characteristic vegetation zones and communities are not reduced
Lake substratum quality	Various	Maintain appropriate substratum type, extent and chemistry to support the vegetation	The hard water lake habitat is associated with a range of base-rich substratum types, from marl and limestone bedrock, through rocks, cobbles, gravel, muds and even peat. Further research into substratum quality (notably calcium, iron and nutrient concentrations) in the hard water lake habitat would be beneficial. Magheradrumman Lough has a sand shelf along the northern shoreline, elsewhere sand with some stones, no rock outcrops and a sandy lake bed embedded with shells (Roden, 1999)
Water quality: transparency	Metres	Maintain appropriate Secchi transparency. There should be no decline in Secchi depth/transparency	Transparency relates to light penetration and, hence, to the depth of colonisation of vegetation. It can be affected by phytoplankton blooms, water colour and turbidity. A target has been set for hard water lakes (3140) of >6m (Roden and Murphy, in prep.). The OECD fixed boundary system set transparency targets for oligotrophic lakes of ≥6 m annual mean Secchi disk depth and ≥3m annual minimum Secchi disk depth. Hard water lakes typically have high transparency, particularly in the very clear and typical marl forms; however, transparency may be relatively lower in the machair form (Roden and Murphy, in prep.)

Water quality: nutrients	µg/l P; mg/l N	Maintain the concentration of nutrients in the water column at sufficiently low levels to support the habitat and its typical species	Habitat 3140 is typically associated with high water quality, as demonstrated by naturally low dissolved nutrients. Some forms appear to be naturally more productive than others however. In particular, the machair form may be naturally more nutrient-rich. The default target is Water Framework Directive (WFD) High Status or oligotrophic (OECD, 1982). Annual average TP concentration should be ≤10µg/l TP, average annual total ammonia concentration should be ≤0.04mg/l N and annual 95th percentile for total ammonia should be ≤0.09mg/l N. For machair sites, where study demonstrates it can maintain favourable condition for the long-term, a target of 'good' status or mesotrophic can be applied: annual average TP≤ 20µg/l TP and total ammonia ≤0.065mg/l N, total ammonia 95th percentile ≤0.14mg/l N. Where nutrient concentrations are lower than the targets, there should be no upward trend in concentrations. See The European Communities Environmental Objectives (Surface Waters) Regulations 2009
Water quality: phytoplankton biomass	µg/l Chlorophyll *a*	Maintain appropriate water quality to support the habitat, including high chlorophyll *a* status	Habitat 3140 is associated with high water quality, as demonstrated by naturally low algal growth. As for nutrients, the default target is WFD High Status or oligotrophic (OECD, 1982). Average growing season (March-October) chlorophyll *a* concentration must be <5.8µg/l. Annual average chlorophyll *a* concentration should be <2.5µg/l and the annual peak should be <8.0µg/l. For machair sites, where study demonstrates it can maintain favourable condition for the long-term, a target of 'good' status or mesotrophic can be applied: average growing season chlorophyll *a* <10µg/l; annual average <8.0µg/l; annual peak <25µg/l. Where chlorophyll *a* concentrations are lower than the targets, there should be no upward trend in phytoplankton biomass. See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009
Water quality: phytoplankton composition	EPA phytoplankton composition metric	Maintain appropriate water quality to support the habitat, including high phytoplankton composition status	The EPA has developed a phytoplankton composition metric for nutrient enrichment of Irish lakes. As for other water quality indicators, the default target for habitat 3140 is WFD high status
Water quality: attached algal biomass	Algal cover and EPA phytobenthos metric	Maintain trace/absent attached algal biomass (<5% cover) and high phytobenthos status	Nutrient enrichment can favour epiphytic and epipelic algae that can out-compete the submerged vegetation. The cover abundance of attached algae in hard water lakes (3140) should, therefore, be trace/absent (<5% cover). EPA phytobenthos can be used as an indicator of changes in attached algal biomass. As for other water quality indicators, the default target for habitat 3140 is high phytobenthos status
Water quality: macrophyte status	EPA macrophyte metric (The Free Index)	Maintain high macrophyte status	Nutrient enrichment can favour more competitive submerged macrophyte species that out-compete the typical and characteristic species for hard water lakes (3140). The EPA monitors macrophyte status for WFD purposes using the 'Free Index'. The target for lake habitat 3140 is high status or an Ecological Quality Ratio (EQR) for lake macrophytes of ≥0.90, as defined in Schedule Five of the European Communities Environmental Objectives (Surface Waters) Regulations 2009
Acidification status	pH units; mg/l	Maintain appropriate water and sediment pH, alkalinity and cation concentrations to support the habitat, subject to natural processes	The specific requirements of habitat 3140, in terms of water and sediment pH, alkalinity and cation concentration, have not been fully determined. Acidification is not considered a threat to habitat 3140, however eutrophication can lead to at least temporary increases in pH to toxic levels (>9/9.5 pH units). Maximum pH should be <9.0 pH units, in line with the surface water standards. See Schedule Five of the European Communities Environmental Objectives (Surface Waters) Regulations 2009

Water colour	mg/l PtCo	Maintain appropriate water colour to support the habitat	Increased colour decreases light penetration and reduces the area of macrophyte habitat, particularly at the lower euphotic depths. Higher colour also appears to favour angiosperms over charophytes in hard water lakes (Roden and Murphy, in prep.). The primary source of increased colour in Ireland is peatland disturbance. No habitat-specific or national standards for water colour exist. Studies have shown median colour concentrations in Irish lakes of 38mg/l PtCo (Free et al., 2000) and 33mg/l PtCo (Free et al., 2006). Habitat 3140 is typically associated with very clear waters and expected colour would be <10 or, more likely, <5 mg/l PtCo. Higher colour is found in some hard water lakes with significant areas of peatland in their catchment, but it is not clear whether this is natural or the result of peatland degradation
Dissolved organic carbon (DOC)	mg/l	Maintain appropriate organic carbon levels to support the habitat	Dissolved (and particulate) organic carbon (OC) in the water column is linked to water colour and acidification (organic acids). Increasing DOC in water has been documented across the Northern Hemisphere, including afforested peatland catchments in Ireland. Damage and degradation of peatland, leading to decomposition of peat is likely to be the predominant source of OC in Ireland. OC in water promotes decomposition by fungi and bacteria that, in turn, releases dissolved nutrients. The increased biomass of decomposers can also impact directly on the characteristic lake communities through shading, competition, etc.
Turbidity	Nephelometric turbidity units/ mg/l SS/ other appropriate unit	Maintain appropriate turbidity to support the habitat	Turbidity can significantly affect the quantity and quality of light reaching rooted and attached vegetation and can, therefore, impact on lake habitats. The settlement of higher loads of inorganic or organic material on lake vegetation communities may also have impacts on sensitive, delicate species. Turbidity can increase as a result of re-suspension of material within the lake, higher loads entering the lake, or eutrophication. Turbidity measurement and interpretation is challenging. As a result, it is likely to be difficult to set habitat-specific targets for turbidity in lakes
Fringing habitat: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the natural structure and functioning of habitat 3140	Most lake shorelines have fringing habitats of reedswamp, other swamp, fen, marsh or wet-woodland that intergrade with and support the structure and functions of the lake habitat. Equally, fringing habitats are dependent on the lake, particularly its water levels, and support wetland communities and species of conservation concern. Many of the fringing wetland habitats support higher invertebrate and plant species richness than the lake habitats themselves. Fringing fen habitats can be particularly important around hard water lakes, notably the Annex I habitats alkaline and *Cladium* fen, and petrifying springs (habitat codes 7230, 7210 and 7220). In this SAC, lake shorelines may have marsh/swamp communities and are fringed by dune habitats and heath

1014 Narrow-mouthed Whorl Snail *Vertigo angustior*

To maintain the favourable conservation condition of Narrow-mouthed Whorl Snail in Ballyhoorisky Point to Fanad Head SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: occupied sites	Number	No decline. There is one known site for this species in the SAC, within three 1km squares - C1744, C1844 and C1944. See map 6	The *Vertigo angustior* population in Ballyhoorisky Point to Fanad Head SAC is found on the dunes in Kinlackagh Bay (Moorkens, 2007; Moorkens and Killeen, 2011) which should be considered as a single site (site number VaCAM6 in Moorkens and Killeen, 2011). There have been records from three 1km grid squares (C1744, C1844, C1944)
Occurrence in suitable habitat	Percentage positive records in a representative number of samples	A minimum of 67% positive samples in optimal habitat areas; 20% in areas defined as sub-optimal	Target is based on Moorkens and Killeen (2011). Positive samples mean the confirmed presence of snails (either living or recently dead adults and/or juveniles). See the habitat extent attribute below for the definitions of optimal and sub-optimal habitat
Habitat quality: optimal soil wetness	Metres along monitoring transect	Soils, at time of sampling, are at optimal wetness for at least 35m along the established monitoring transect	Transect established as part of condition assessment monitoring by Moorkens and Killeen (2011). At least 35m of the established monitoring transect should be assessed as optimal wetness as defined in Moorkens and Killeen (2011)
Habitat extent	Hectares	Stable or increasing, subject to natural processes. No less than 16ha of at least sub-optimal habitat	The majority of suitable habitat is in dune grassland in C1844 and C1944. A minimum of 16ha should be at least sub-optimal (Moorkens and Killeen, 2011). Optimal habitat is defined as fixed dune species-rich grassland dominated by red fescue (*Festuca rubra*), with sparse marram (*Ammophila arenaria*), lady's bedstraw (*Galium verum*), mouse-ear-hawkweed (*Pilosella officinarum*), pyramidal orchid (*Anacamptis pyramidalis*), ribwort plantain (*Plantago lanceolata*) and other low growing herbs, and grassland with silverweed (*Potentilla anserina*) on flatter zones. Vegetation height is 10-30cm. The habitat is on damp, friable soil covered with a layer of humid, open structured thatch. Sub-optimal habitat is defined as fixed dunes with vegetation composition as per optimal habitat but either the vegetation height is less than 10cm or between 30cm and 50cm, or the soil is dry and sandy, or the thatch is wetter with a denser structure

1833 Slender Naiad *Najas flexilis*

To maintain the favourable conservation condition of Slender Naiad in Ballyhoorisky Point to Fanad Head SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population extent	Hectares; distribution	No change to the spatial extent of *Najas flexilis* within Shannagh Lough, subject to natural processes. See map 7 for known locations	See the *Najas flexilis* supporting document for further details
Population depth	Metres	No change to the depth range of *Najas flexilis* within Shannagh Lough, subject to natural processes	See the *Najas flexilis* supporting document for further details
Population viability	Plant traits	No decline in plant fitness, subject to natural processes	See the *Najas flexilis* supporting document for further details
Population abundance	Square metres	No change to the cover abundance of *Najas flexilis*, subject to natural processes	See the *Najas flexilis* supporting document for further details
Species distribution	Occurrence	No decline, subject to natural processes	See the *Najas flexilis* supporting document for further details
Habitat extent	Hectares	No decline, subject to natural processes	See the *Najas flexilis* supporting document for further details
Hydrological regime: water level fluctuations	Metres	Maintain appropriate natural hydrological regime necessary to support the habitat for the species	See the *Najas flexilis* supporting document for further details
Lake substratum quality	Various	Maintain appropriate substratum type, extent and chemistry to support the population of the species	See the *Najas flexilis* supporting document for further details
Water quality	Various	Maintain appropriate water quality to support the population of the species	See the *Najas flexilis* supporting document for further details
Acidification status	pH units; mg/l	Maintain appropriate water and sediment pH, alkalinity and cation concentrations to support the population of *Najas flexilis*, subject to natural processes	See the *Najas flexilis* supporting document for further details
Water colour	mg/l PtCo	Maintain appropriate water colour to support the population of *Najas flexilis*	See the *Najas flexilis* supporting document for further details
Associated species	Species composition and abundance	Maintain appropriate associated species and vegetation communities to support the population of *Najas flexilis*	See the *Najas flexilis* supporting document for further details
Fringing habitat: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the population of *Najas flexilis*	See the *Najas flexilis* supporting document for further details

Legend

Ballyhoorisky Point to Fanad Head SAC 001975

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

MAP 1:
BALLYHOORISKY POINT TO FANAD HEAD SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

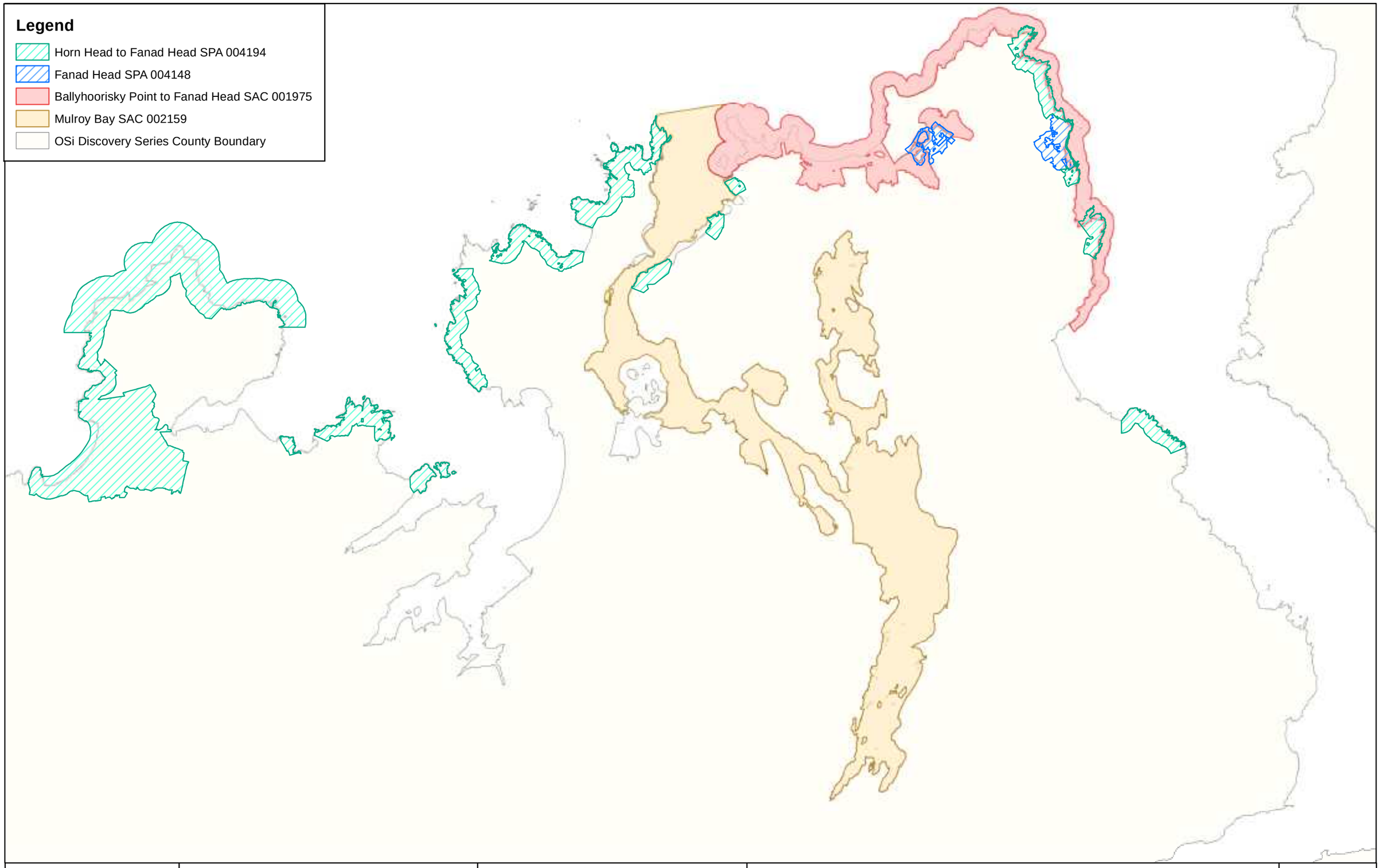
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 001975; version 3.
CO. DONEGAL

0 0.4 0.8 1.2 1.6 2 km

N

Map Version 1
Date: Nov 2016



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

MAP 2:
BALLYHOORISKY POINT TO FANAD HEAD SAC
CONSERVATION OBJECTIVES
ADJACENT / ADJOINING AND OVERLAPPING DESIGNATIONS

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

SITE CODE:
SAC 001975; version 3. SAC 002195; version 3.
SPA 004148; version 3. SPA 004194; version 3.
CO. DONEGAL

0 1 2 3 4 5 km

N

Map Version 1
Date: Nov 2016

Legend

- Ballyhoorisky Point to Fanad Head SAC 001975
- Coastal Monitoring Project Survey Area

Qualifying Interest

- 1220 Perennial vegetation of stony banks
- 1220 Perennial vegetation of stony banks
- OSi Discovery Series County Boundary

NSBS Site ID: 0020

NSBS Site ID: 0022

NSBS Site ID: 0021

CMP Site Code: 172

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

MAP 3:
BALLYHOORISKY POINT TO FANAD HEAD SAC
CONSERVATION OBJECTIVES
PERENNIAL VEGETATION OF STONY BANKS

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

SITE CODE:
SAC 001975; version 3.
CO. DONEGAL

0 0.4 0.8 1.2 1.6 2 km

N

Map Version 1
Date: Nov 2016

Legend

- Ballyhoorisky Point to Fanad Head SAC 001975
- 1230 Vegetated sea cliffs of the Atlantic and Baltic coasts
- OSi Discovery Series County Boundary

Irish Sea Cliff Survey Site ID: 03043

Irish Sea Cliff Survey Site ID: 03044

Irish Sea Cliff Survey Site ID: 03014

Irish Sea Cliff Survey Site ID: 03013

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

MAP 4:
BALLYHOORISKY POINT TO FANAD HEAD SAC
CONSERVATION OBJECTIVES
VEGETATED SEA CLIFFS

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

SITE CODE:
SAC 001975; version 3.
CO. DONEGAL

0 0.35 0.7 1.05 1.4 1.75 km

N

Map Version 1
Date: Nov 2016

Legend

Ballyhoorisky Point to Fanad Head SAC 001975

OSi Discovery Series County Boundary

Indicative Lake Habitats

Potential 3130 Potential oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea*

Potential 3130 / Potential 3140 Potential oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea* / Potential hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp

3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.

Shannagh Lough

Magheradrumman Lough

Kinny Lough

Rinboy Lough

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

MAP 5:
BALLYHOORISKY POINT TO FANAD HEAD SAC
CONSERVATION OBJECTIVES
INDICATIVE LAKE HABITATS

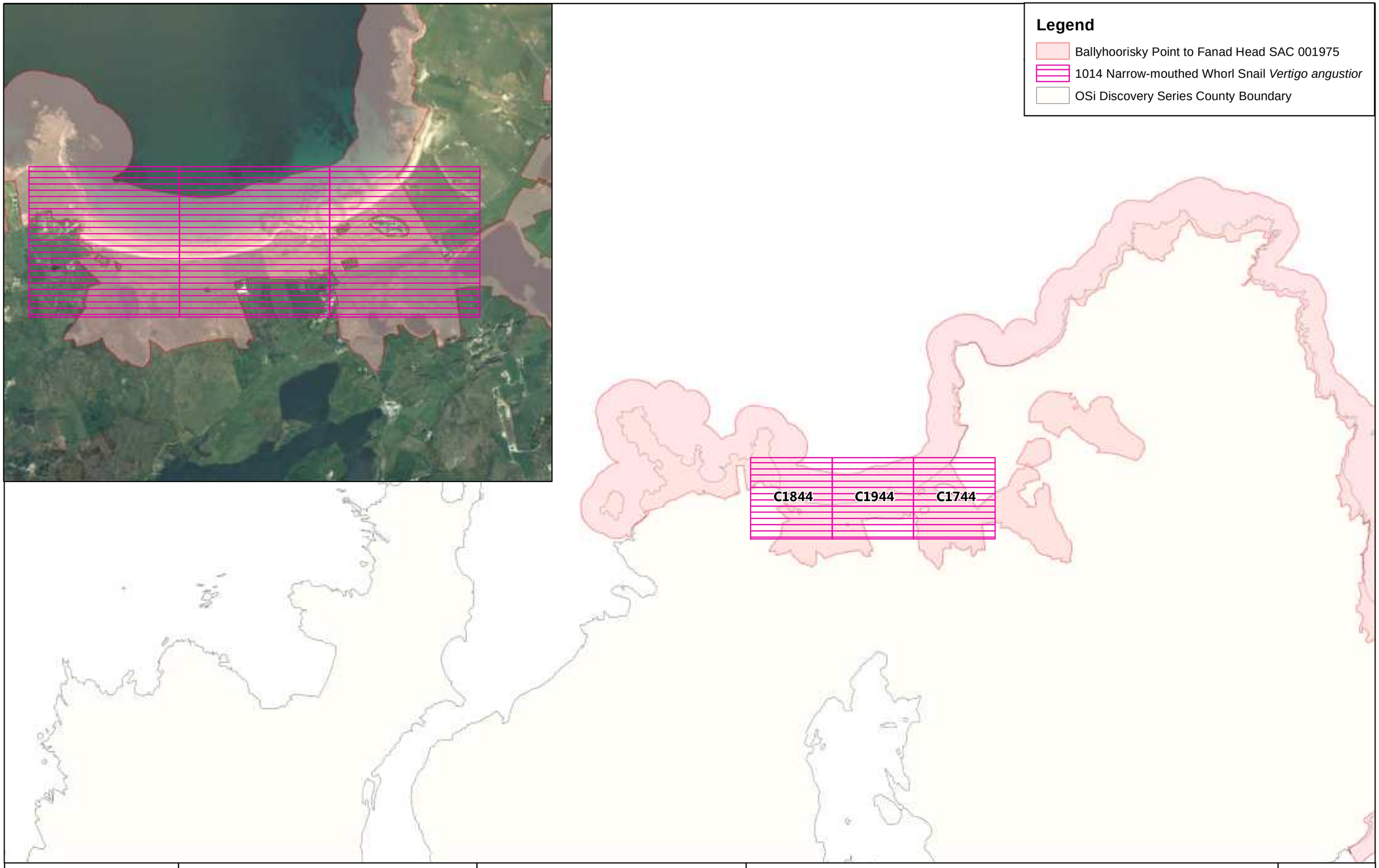
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 001975; version 3.
CO. DONEGAL

0 0.15 0.3 0.45 0.6 0.75 km

N

Map Version 1
Date: Nov 2016



Legend

- Ballyhoorisky Point to Fanad Head SAC 001975
- 1014 Narrow-mouthed Whorl Snail *Vertigo angustior*
- OSi Discovery Series County Boundary

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

MAP 6:
BALLYHOORISKY POINT TO FANAD HEAD SAC
CONSERVATION OBJECTIVES
NARROW-MOUTHED WHORL SNAIL

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

SITE CODE:
SAC 001975; version 3.
CO. DONEGAL

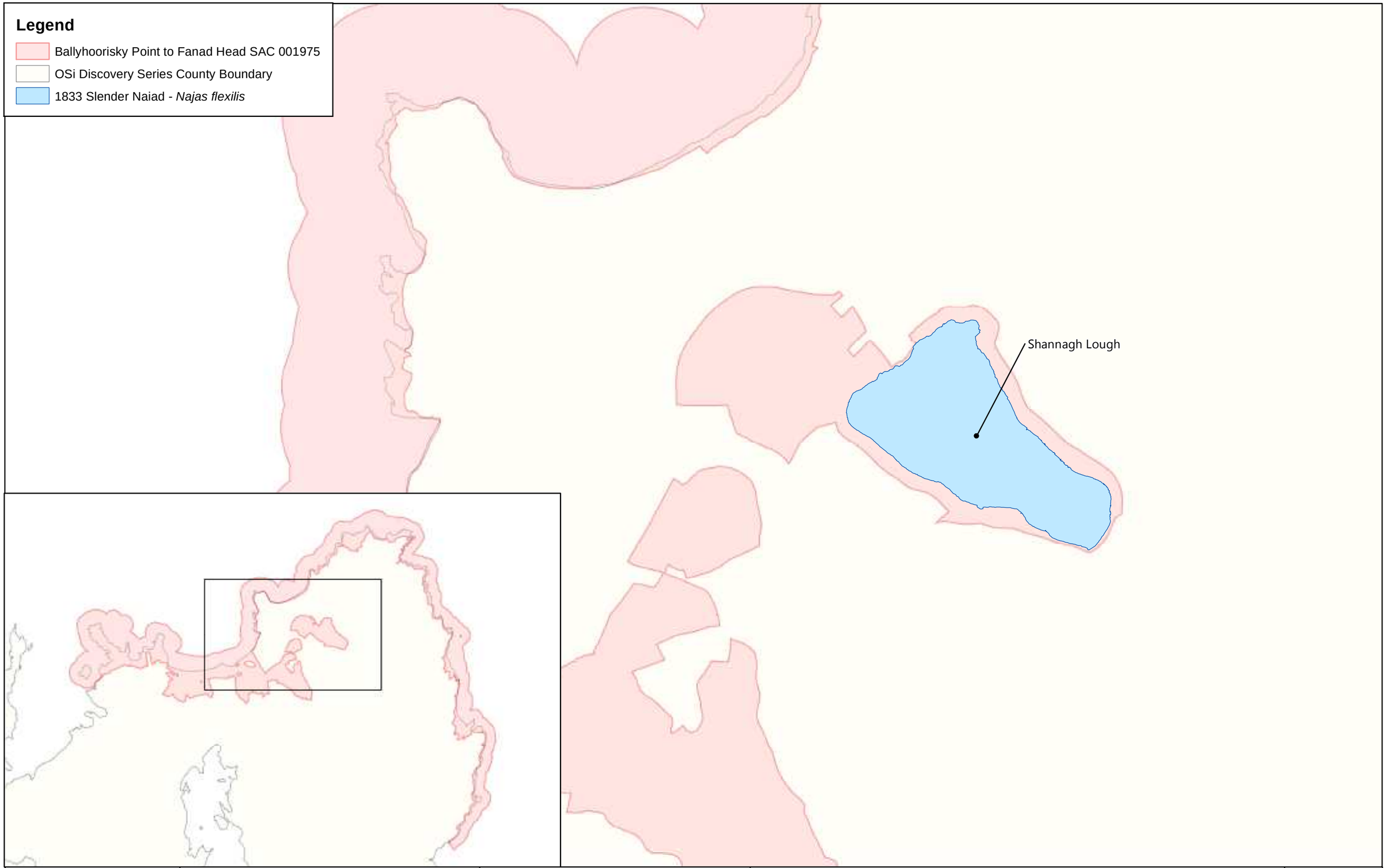
0 0.45 0.9 1.35 1.8 2.25 km

N

Map Version 1
Date: Nov 2016

Legend

- Ballyhoorisky Point to Fanad Head SAC 001975
- OSi Discovery Series County Boundary
- 1833 Slender Naiad - *Najas flexilis*



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

MAP 7:
BALLYHOORISKY POINT TO FANAD HEAD SAC
CONSERVATION OBJECTIVES
SLENDER NAIAD

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

SITE CODE:
SAC 001975; version 3.
CO. DONEGAL

0 0.1 0.2 0.3 0.4 0.5 km

N

Map Version 1
Date: Nov 2016

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Sheephaven SAC 001190

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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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***

001190	Sheephaven SAC
1140	Mudflats and sandflats not covered by seawater at low tide
1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
1395	Petalwort *Petalophyllum ralfsii*
1410	Mediterranean salt meadows (Juncetalia maritimi)
2120	Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)
2130	Fixed coastal dunes with herbaceous vegetation (grey dunes)*
21A0	Machairs (* in Ireland)
91A0	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

Please note that this SAC overlaps with Horn Head to Fanad Head SPA (004194). It is adjacent to Tranarossan and Melmore Lough SAC (000194), Cloghernagore Bog and Glenveagh National Park SAC (002047) and Mulroy Bay SAC (002159). See map 2. The conservation objectives for this site should be used in conjunction with those for overlapping and adjacent 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 :	1996
Title :	Biomar survey of Irish machair sites
Author :	Crawford, I.; Bleasdale, A.; Conaghan, J.
Series :	Irish Wildlife Manual No. 3
Year :	2008
Title :	National Survey of Native Woodlands 2003-2008
Author :	Perrin, P.M.; Martin, J.; Barron, S.; O'Neill, F.H.; McNutt, K.E.; Delaney, A.
Series :	Unpublished Report to NPWS
Year :	2009
Title :	Coastal Monitoring Project 2004-2006
Author :	Ryle, T.; Murray, A.; Connolly, K.; Swann, M.
Series :	Unpublished report to NPWS
Year :	2009
Title :	Saltmarsh monitoring project 2007-2008
Author :	McCorry, M.; Ryle, T.
Series :	Unpublished report to NPWS
Year :	2010
Title :	A provisional inventory of ancient and long-established woodland in Ireland
Author :	Perrin, P.M.; Daly, O.H.
Series :	Irish Wildlife Manual No. 46
Year :	2014
Title :	Sheephaven SAC (site code: 1190) Conservation objectives supporting document- coastal habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document
Year :	2014
Title :	Sheephaven SAC (site code: 1190) Conservation objectives supporting document- marine habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	2002
Title :	Reversing the habitat fragmentation of British woodlands
Author :	Peterken, G.
Series :	WWF-UK, London
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 :	Intertidal benthic survey of Sheephaven 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 :	Intertidal survey 2011
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, 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 :	Revision 2010
Title :	Saltmarsh Monitoring Project 2007-2008. Version 1
GIS Operations :	QIs selected; clipped to SAC boundary; overlapping regions with Coastal CO data investigated and resolved with expert opinion used
Used For :	1330, 1410 (map 5)
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 6)
Year :	Revision 2010
Title :	National Survey of Native Woodlands 2003-2008. Version 1
GIS Operations :	QIs selected; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	91A0 (map 7)
Year :	2014
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 7)

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 Sheephaven 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 using OSi data as 766ha
Community distribution	Hectares	Conserve the following community types in a natural condition: Sand to coarse sediment with *Pygospio elegans* community complex; Sand with *Angulus tenuis* community. See map 4	Based on an intertidal survey undertaken in 2011 (MERC, 2012). See marine supporting document for further details

1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)

To restore the favourable conservation condition of Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) in Sheephaven 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: Creeslough - 19.59ha; Rosapenna - 9.13ha. See map 5	Based on data from Saltmarsh monitoring Project (SMP) (McCorry and Ryle, 2009). Two sub-sites that supports Atlantic Salt Meadows were mapped (28.72ha) and additional areas of potential ASM habitat (20.34ha) were identified from an examination of aerial photographs, giving a total estimated area of 49.06ha. NB further unsurveyed areas maybe present within the SAC. 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 McCorry and Ryle (2009). At Rosapenna the saltmarsh has developed on sandflats and is associated with the sand dune system. At Creeslough, the extensive saltmarsh has developed in sheltered positions along an intricate shoreline. See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/ absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions	Based on data from McCorry and Ryle (2009). At Creeslough, a sea wall was built in the 19th century. Overall, there is an accretional trend at Creeslough and a quantifiable increase in both the ASM and MSM. At Rosapenna, there are no indications of any loss of ASM or MSM due to erosion or land use changes. See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession	Based on data from McCorry and Ryle (2009). At Creeslough, the ASM has a well developed topography with salt pans and creeks present. At Rosapenna, the ASM topography is relatively consistent with few creeks or pans present. See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from McCorry and Ryle (2009). At Creeslough, there are examples of zonation on a landward gradient from pioneer to upper marsh. There are also further transitions to both MSM and Salicornia flats at the upper and lower ASM boundaries. At Rosapenna, there is some zonation in the ASM habitat with several vegetation communities present. See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from McCorry and Ryle (2009). At Creeslough, some areas are damaged by excessive grazing pressure. At Rosapenna grazing by sheep and cattle occurs. The intensity of grazing is greatest in the fenced marsh. Poaching was noted by the SMP here. See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative number of monitoring stops	Maintain more than 90% area outside creeks vegetated	See coastal habitats supporting document for further deetails.
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 SMP (McCorry and Ryle, 2009)	See coastal habitats supporting document for further details

Vegetation structure: negative indicator species - *Spartina anglica*	Hectares	There is no record of common cordgrass (*Spartina anglica*) in the SAC and its establishment should be prevented	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details

1410 Mediterranean salt meadows (Juncetalia maritimi)

To maintain the favourable conservation condition of Mediterranean salt meadows (*Juncetalia maritimi*) in Sheephaven 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: Creeslough - 5.75ha; Rosapenna - 3.92ha. See map 5	Based on data from the Saltmarsh Monitoring Project (SMP) (McCorry and Ryle, 2009). Two sub-sites that supports Mediterranean Salt Meadows were mapped (9.67ha) and additional areas of potential habitat (7.58ha) were identified from an examination of aerial photographs, giving a total estimated area of 17.25ha. NB further unsurveyed areas maybe present within the site. 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 McCorry and Ryle (2009). At Rosapenna, the saltmarsh has developed on sandflats and is associated with the sand dune system. At Creeslough, the extensive saltmarsh has developed in sheltered positions along an intricate shoreline. See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions	Based on data from McCorry and Ryle (2009). At Creeslough a sea wall was built in the 19th century. Overall there is an accretional trend at Creeslough and a quantifiable increase in both the ASM and MSM. At Rosapenna, there are no indications of any loss of ASM or MSM due to erosion or land use changes. See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	Mediterranean salt meadows is found high up in the saltmarsh but requires occasional tidal inundation. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from McCorry and Ryle (2009). At Creeslough, there are examples of zonation on a landward gradient from pioneer to upper marsh. There are also further transitions to both MSM and *Salicornia* flats at the upper and lower ASM boundaries. See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation in the sward	Based on data from McCorry and Ryle (2009). At Creeslough, some areas are damaged by excessive grazing pressure. At Rosapenna, grazing by sheep and cattle occurs. The intensity of grazing is greatest in the fenced marsh. Poaching was noted by the SMP here. See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative number of monitoring stops	Maintain more than 90% of area outside creeks vegetated	Based on data from McCorry and Ryle (2009). Poaching and trails from livestock is evident in the MSM at Rosapenna as well as in some areas of Creeslough. 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 characteristic species listed in SMP (McCorry and Ryle, 2009)	See coastal habitats supporting document for further details

Vegetation structure: negative indicator species - *Spartina anglica*	Hectares	There is no record of common cordgrass (*Spartina anglica*) in the SAC and its establishment should be prevented	Based on data from McCorry and Ryle (2009). See coastal habitats 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 Sheephaven 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: Ards - 0.48ha; Marble Hill - 1.01ha; Rosapenna - 3.98ha. See map 6	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al. 2009). Habitat mapped at three sub-sites to give a total estimated area of 5.47ha. 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 6 for known distribution	Based on data from Ryle et al. (2009). 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	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. Rock armour has been installed at the seaward edge of the dunes at Ards. 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 Gaynor (2008) and Ryle et al. (2009). At Rosapenna, the sand dune habitats grade into saltmarsh. At Ards, heath vegetation occurs adjacent to the fixed dunes. 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). 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). 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. At Marble Hill both Sea-buckthorn (*Hippophae rhamnoides*) and bracken (*Pteridium aquilinum*) occur. Bracken was also recorded at Rosapenna. 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 Sheephaven 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: Ards - 11.14ha; Marble Hill - 31.02ha; Rosapenna - 215.74ha. See map 6	Based on data from Coastal Monitoring Project (CMP) (Ryle et al. 2009). Habitat mapped at three sub-sites to give a total estimated area of 257.90ha. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 6 for known distribution	Based on data from Ryle et al. (2009). 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. Rock armour has been installed at the seaward edge of the dunes at Ards. 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 Gaynor (2008) and Ryle et al. (2009). At Rosapenna, the sand dune habitats grade into saltmarsh. At Ards, heath vegetation occurs adjacent to the fixed dunes. 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). Petalwort (*Petalophyllum ralfsii*), a species that requires compacted sandy ground occurs at Rosapenna. See coastal habitats supporting document for further details as well as the conservation objective for petalwort (1395)
Vegetation structure: sward height	Centimetres	Maintain structural variation within sward	Based on data from Gaynor (2008) and Ryle et al. (2009). At Marble Hill, parts of the fixed dunes were undergrazed. At Ards, there is no grazing by livestock. At Rosapenna, grazing by livestock is impacting positively on the dune grassland. 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). At Rosapenna bryophyte cover is high and frog orchid (*Coeloglossum viride*) and fragrant orchid (*Gymnadenia conopsea*) were recorded at the fixed dune/ fen boundary by the CMP. 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. At Marble Hill both Sea-buckthorn (*Hippophae rhamnoides*) and bracken (*Pteridium aquilinum*) occur. Bracken was also recorded at Rosapenna. 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 the Ards site, scrub and trees are encroaching the dunes. See coastal habitats supporting document for further details

21A0 Machairs (* in Ireland)

To maintain the favourable conservation condition of Machairs in Sheephaven 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	Current extent is unknown. Machair was not mapped during the Coastal Monitoring Project (CMP) (Ryle et al., 2009). See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes	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	See coastal habitats supporting document for further details
Physical structure: hydrological and flooding regime	Presence/ absence of water abstraction or drainage works	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). See coastal habitats supporting document for further details
Vegetation structure: sward 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 number of monitoring stops	Maintain range of sub-communities with typical species listed in Ryle et al. (2009)	Based on data from 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
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
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

91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

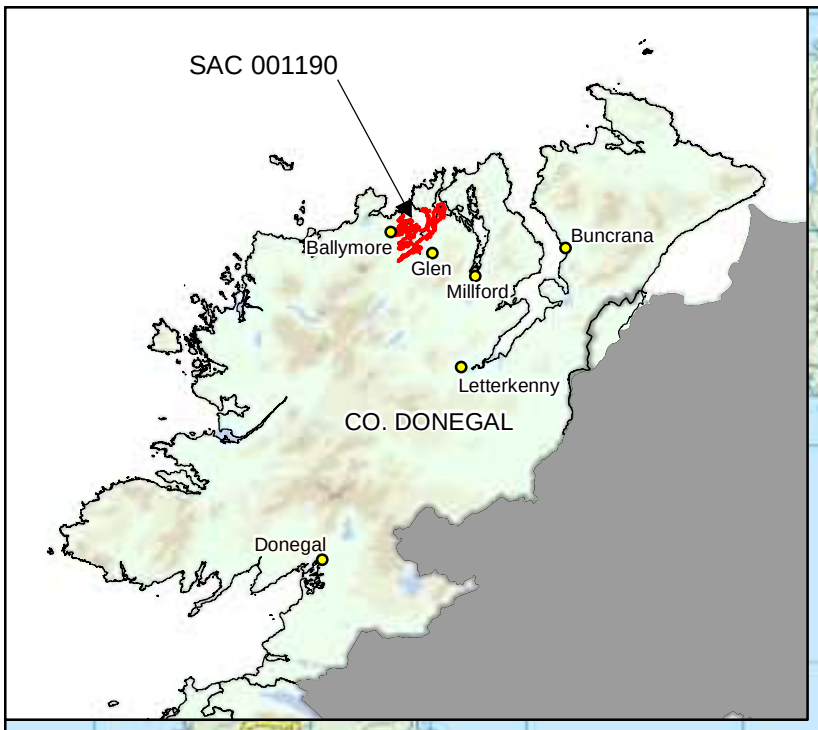
To maintain the favourable conservation condition of Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles in Sheephaven SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, at least 4.1ha for sub-sites surveyed. See map 7	Minimum area, based on two sub-sites surveyed by Perrin et al. (2008)- Ards Forest Park (1439), Duntally Wood (1421). The latter did not contain 91A0. NB further unsurveyed areas maybe present within the SAC
Habitat distribution	Occurrence	No decline. Surveyed location shown on map 7	Distribution based on Perrin et al. (2008). N.B. Further unsurveyed areas may be present within this SAC
Woodland size	Hectares	Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and "small" woods at least 3ha in size	Large woodlands reduce habitat fragmentation and benefit those species requiring 'deep' woodland conditions (Peterken, 2002). Topographical and land ownership constraints may restrict expansion
Woodland structure: cover and height	Percentage and metres	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi-mature trees and shrubs; and well-developed herb layer	Described in Perrin et al (2008)
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	Based on data from Perrin et al. (2008)
Woodland structure: natural regeneration	Seedling: sapling: pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	Oak (*Quercus petraea*) regenerates poorly. In suitable sites ash (*Fraxinus excelsior*) can regenerate in large numbers although few seedlings reach pole size
Woodland structure: dead wood	m^3 per hectare; number per hectare	At least $30m^3$/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem
Woodland structure: veteran trees	Number per hectare	No decline	Mature and veteran trees are important habitats for bryophytes, lichens, saproxylic organisms and some bird species. Their retention is important to ensure continuity of habitats/niches and propagule sources
Woodland structure: indicators of local disctinctiveness	Occurrence	No decline	Includes ancient or long-established woodlands, archaeological and geological features as well as red-data and other rare or localised species. Perrin and Daly (2010) list woodlands in Ards Forest Park as long established
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover not less than 95%	Species reported in Perrin et al. (2008)
Vegetation composition: typical species	Occurrence	A variety of typical native species present, depending on woodland type, including oak (*Quercus petraea*) and birch (*Betula pubescens*)	Species reported in Perrin et al. (2008)
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control	Beech (*Fagus sylvatica*), sycamore (*Acer pseudoplatanus*) and rhododendron (*Rhododendron ponticum*) have been recorded in semi-natural woodland in Ards Forest Park (internal NPWS files)

1395 Petalwort *Petalophyllum ralfsii*

To maintain the favourable conservation condition of Petalwort in Sheephaven 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 7 for recorded location in SAC	The known population occurs at Rosepenna on the edge of the R248 road, in sparse low vegetation on pathway in area grazed by rabbits (*Oryctolagus cuniculus*) where short vegetation is also maintained by mowing. Data from NPWS surveys and Campbell (2013)
Population size	Number of individuals	No decline. The population is estimated to be a maximum of 712 thalli. Actual population is more likely to be 50% of this, or c.356 thalli	Counts of thalli are based on the mean of number of thalli in one 1x1m plot, averaged for three counts from early April 2009 to April 2011: 0.33 thalli per m^2 (Campbell, 2013). Maximum estimated population at Rosepenna is therefore 0.33 x 2159.5m^2 = 712.6 thalli. As not all the habitat within the area of occupancy is suitable habitat, the actual number of thalli is likely to be much less, 50% of this figure, i.e. 356.3 (or c.356 thalli)
Area of suitable habitat	Hectares	No decline. Area of suitable habitat at Rosepenna is estimated at c.0.1080ha	The area of occupancy is 2159.5m^2. Not all of the area is actually suitable habitat for *Petalophyllum ralfsii*. Some sections are too dry and some sections too overgrown with coarse vegetation. Therefore the area of suitable habitat is estimated at 50% of the total, i.e. 1079.8 m^2 (= 0.1080ha)
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*) grazing, trampling (by walkers and horses) and some mowing. Campbell (2013) recorded a mean height of vegetation of 3.0cm, with bryophyte cover c.26-33% and bare ground c. 11-25% (based on one 1x1m plot from 2009 and 2011). See also the conservation objective for fixed coastal dunes with herbaceous vegetation (2130)



MAP 1: SHEEPHAVEN SAC CONSERVATION OBJECTIVES SAC DESIGNATION

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

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Department of Arts, Heritage and the Gaeltacht

SITE CODE:
SAC 001190; version 3. CO. DONEGAL

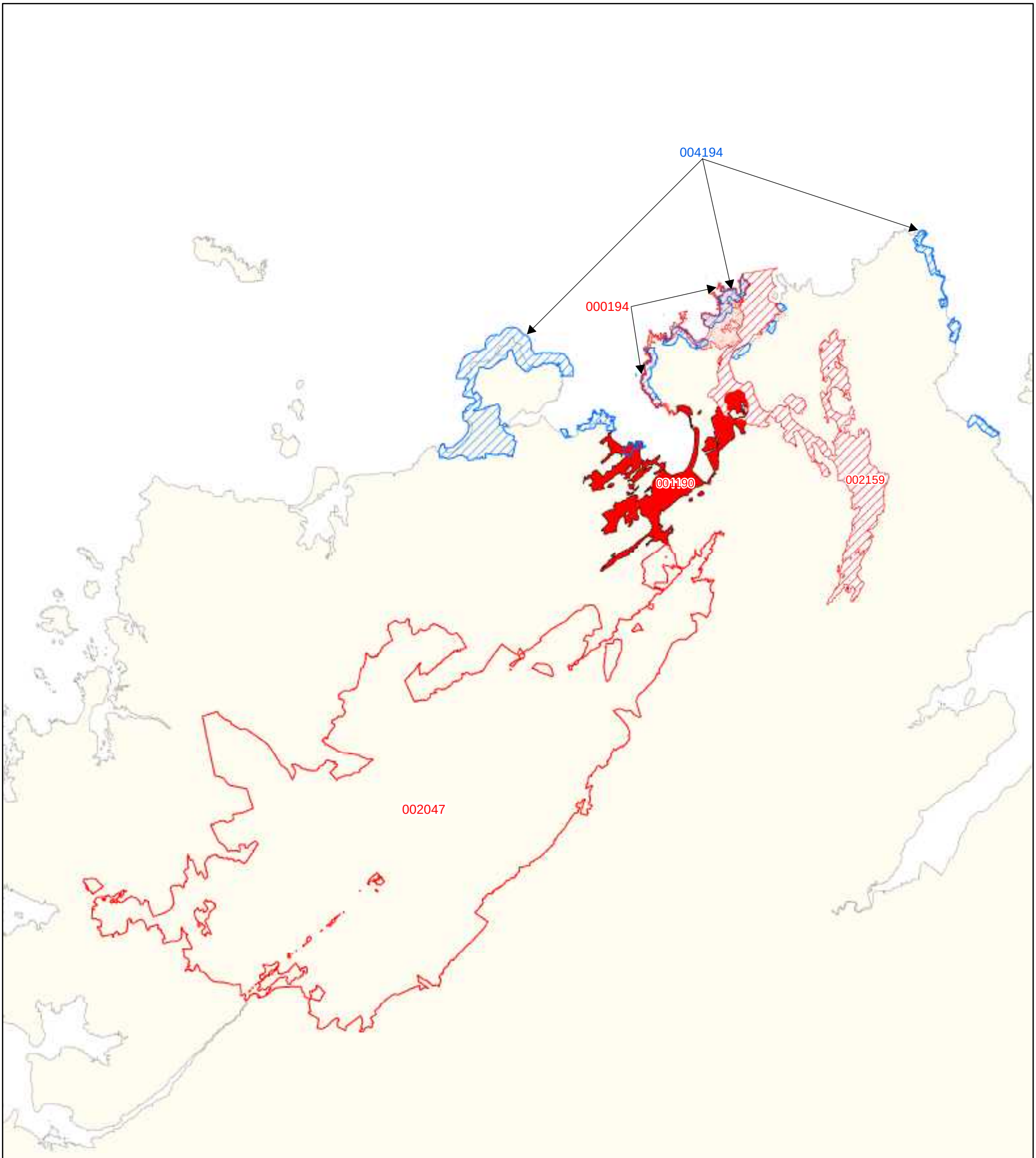
0 0.5 1 km

N

Map Version 1
Date: Sep 2014

Legend

Sheephaven SAC 001190



Legend

- Sheephaven SAC 001190
- Tranarossan and Melmore Lough SAC 000194
- Cloghernagore Bog and Glenveagh National Park SAC 002047
- Mulroy Bay SAC 002159
- Horn Head to Fanad Head SPA 004194
- OSi Discovery Series County Boundary

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MAP 2: SHEEPHAVEN SAC CONSERVATION OBJECTIVES ADJACENT / ADJOINING & OVERLAPPING DESIGNATIONS

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

SITE CODE:
SAC 000194; version 3, SAC 001190; version 3
SAC 002047; version 3, SAC 002159; version 3.
SPA 004194; version 2.02. CO. DONEGAL

0 2.5 5 7.5 10 km

N

Map Version 1
Date: Sep 2014

Legend

- Sheephaven SAC 001190
- 1140 Mudflats and sandflats not covered by sea water at low tide
- OSi Discovery Series County Boundary

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MAP 3:
SHEEPHAVEN SAC
CONSERVATION OBJECTIVES
TIDAL MUDFLATS AND SANDFLATS

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

SITE CODE:
SAC 001190; version 3. CO. DONEGAL

0 0.5 1 km

N

Map Version 1
Date: Sep 2014

Legend

Sheephaven SAC 001190

OSi Discovery Series County Boundary

Marine Community Types

Reef community complex

Sand to coarse sediment with *Pygospio elegans* community complex

Sand with *Angulus tenuis* community

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MAP 4:
SHEEPHAVEN SAC
CONSERVATION OBJECTIVES
MARINE COMMUNITY TYPES

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

SITE CODE:
SAC 001190; version 3. CO. DONEGAL

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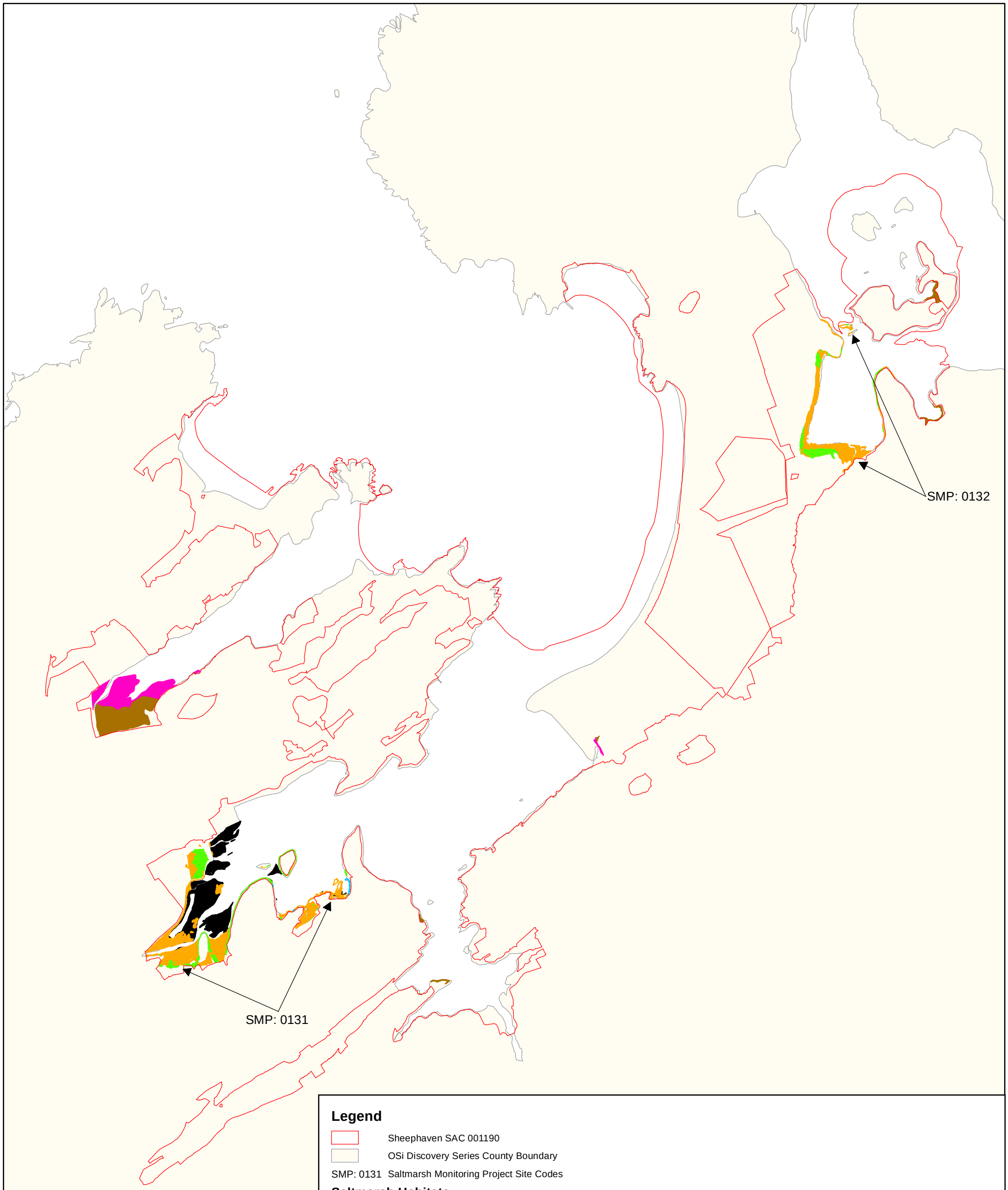
N

Map Version 1
Date: Sep 2014



Legend

- Sheephaven SAC 001190
- OSi Discovery Series County Boundary
- SMP: 0131 Saltmarsh Monitoring Project Site Codes

Saltmarsh Habitats

Qualifying Interests

- 1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
- 1330 / 1410 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) / Mediterranean salt meadows (Juncetalia maritimi)
- 1410 Mediterranean salt meadows (Juncetalia maritimi)
- Potential 1330 Potential Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
- Potential 1330 / 1410 Potential Atlantic salt meadows (Glauco-Puccinellietalia maritimae) / Mediterranean salt meadows (Juncetalia maritimi)

Non Qualifying Interests

- 1310 *Salicornia* and other annuals colonising mud and sand

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MAP 5: SHEEPHAVEN SAC CONSERVATION OBJECTIVES SALTMARSH HABITATS

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

SITE CODE:
SAC 001190; version 3. CO. DONEGAL

0 0.5 1 km

N

Map Version 1
Date: Sep 2014

CMP: 164

CMP: 165

CMP: 166

Legend

Sheephaven SAC 001190

OSi Discovery Series County Boundary

CMP: 164 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')

Non Qualifying Interests

1210 Annual vegetation of drift lines

2110 Embryonic shifting dunes

2190 Humid dune slacks

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MAP 6: SHEEPHAVEN SAC CONSERVATION OBJECTIVES SAND DUNE HABITATS

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

SITE CODE:
SAC 001190; version 3. CO. DONEGAL

0 0.45 0.9 km

N

Map Version 1
Date: Sep 2014

Map Extent

Sheephaven (Rosepenna)

NSNW: 1439

Legend

- Sheephaven SAC 001190
- OSi Discovery Series County Boundary
- 1395 Petalwort - *Petalophyllum ralfsii*

NSNW: 1439 National Survey of Native Woodland Site Codes

Woodland Habitats

Qualifying Interests

- 91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

Non Qualifying Interests

- 91E0 *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-padion, Alnion incanae, Salicion albae)
- WN1 / WN2 Oak-birch-holly woodland / Oak-ash-hazel woodland
- WN2 / WD1 Oak-ash-hazel woodland / (Mixed) broadleaved woodland
- WN2 Oak-ash-hazel woodland

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MAP 7:
SHEEPHAVEN SAC
CONSERVATION OBJECTIVES
WOODLANDS HABITATS
& PETALWORT

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

SITE CODE:
SAC 001190; version 3. CO. DONEGAL

0 0.5 1 km

N

Map Version 1
Date: Sep 2014

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 Letterkenny WSZs

Irish Water

Lead in Drinking Water Mitigation Plan - EAM

Letterkenny EAM

Issue 8 | 19 January 2022

Job number 257367

Ove Arup & Partners Ireland Ltd

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Document verification

ARUP

Job title		Lead in Drinking Water Mitigation Plan - EAM			**Job number** Job number
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			Prepared by	Checked by	Approved by
		Name	Alison Orr	Orla Murphy	Gerry Baker
		Signature			
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		Description	Second Draft		
			Prepared by	Checked by	Approved by
		Name	Alison Orr	Orla Murphy	Gerry Baker
		Signature			
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			Prepared by	Checked by	Approved by
		Name	Alison Orr	Orla Murphy	Gerry Baker
		Signature			
Draft 4	19 Jan 2022	Filename	022. Letterkenny & 103. Milford EAM D04.docx		
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		Name	Alison Orr	Orla Murphy	Gerry Baker
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			Issue Document verification with document		✓

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		Name	Alison Orr	Orla Murphy	Gerry Baker
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		Name	Alison Orr	Orla Murphy	Gerry Baker
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		Name	Alison Orr	Orla Murphy	Gerry Baker
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			Prepared by	Checked by	Approved by
		Name	Lindsay Connolly	Gerry Baker	Gerry Baker
		Signature			
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		Description			
			Prepared by	Checked by	Approved by
		Name	Sam Marchant	Gerry Baker	Gerry Baker
		Signature			
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		Description	Revised Water Supply Rate		
			Prepared by	Checked by	Approved by
		Name	Sam Marchant	Gerry Baker	Gerry Baker
		Signature			
				Issue Document Verification with Document	✓

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			Prepared by	Checked by	Approved by
		Name	Sam Marchant	Alison Orr	Gerry Baker
		Signature			
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		Description	WFD Data Update		
			Prepared by	Checked by	Approved by
		Name	Sam Marchant	Gerry Baker	Gerry Baker
		Signature			
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		Description	Format Update		
			Prepared by	Checked by	Approved by
		Name	Sam Marchant	Gerry Baker	Gerry Baker
		Signature			
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		Description	Unverified Eden Data Assessment		
			Prepared by	Checked by	Approved by
		Name	Sam Marchant	Alison Orr	Gerry Baker
		Signature			
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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 Letterkenny Water Supply Zone 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 10th December 2021.
- 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 Letterkenny and Letterkenny Mixed Water Supply Zones

Letterkenny Water Supply Zone (WSZ) (0600PUB1110) and Letterkenny Milford Mixed WSZ (0600PUB1128) are located in County Donegal. The Letterkenny WSZ supplies include Letterkenny town, Kilmacrenan town to the north and a large rural surrounding area. The WSZ is supplied by the Letterkenny (Goldrum) Water Treatment Plant (WTP) and the Ballymacool WTP with output blended at Ard O'Donnell Reservoir. Goldrum WTP also supplies water to Milford Letterkenny Mixed WSZ. The proportion of supply to the WSZ from each WTP is undetermined. For the purpose of this assessment and as a conservative approach it is assumed that there is no dilution of the dosed water from Goldrum WTP by the Milford WTP in the Milford Letterkenny Mixed WSZ.

The Draft Plumbosolvency Control Plan proposes dosing of orthophosphate (with an average orthophosphate dose of 1.0 mg/l P) at the outlet of the Goldrum and Ballymacool WTPs. Figure 1, at the end of this report, shows the location of the areas proposed to receive orthophosphate dosed water.

The average discharge to the dosed area from Letterkenny (Goldrum) WTP, Ballymacool WTP and Illies WTP is 11,540m^3/day. Approximately 54% of the flow is accounted for, and this fixed rate for water mains leakage is assumed in all the Water Supply Zones (WSZs).

The WSZ boundaries cover a large rural area and five urban areas which are served by WWTP agglomerations. A planning application is being lodged to build a new secondary WWTP near Ramelton which will accomodate the load from Ramelton, Milford and Rathmullan agglomerations and discharge into Lough Swilly.

The density of water mains is relatively low across the rural areas. There are an estimated 4,290 properties across the WSZs that are serviced by DWWTS.

Note the results detailed in the table below are from "Scenario A"

Water Supply Zone	**Letterkenny (0600PUB1110)** **Milford (0600PUB1050 and 0600PUB1130)** **Letterkenny Milford Mixed (0600PUB1128)**
Step 1 – Appropriate Assessment Screening	*To be completed by Ryan Hanley*
Model Assumptions	Concentration and loading units for orthophosphate (as PO_4-P) are mg/l and kg/yr Adopted orthophosphate optimum dosing concentration is 1.0 mg/l P. Unaccounted for water from the mains is 46%. 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 to orthophosphate 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 TP 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: • 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; - Ramelton – Preliminary treatment PE 1,433. - Churchill Housing Scheme – Primary treatment PE 30 - Kilmacreannan – Secondary treatment PE 892 - Letterkenny – Tertiary treatment PE 26,095 - Termon Housing Scheme – Primary 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 total loading from mains leakage from both WSZs is 5,285m^3/d (1,929 kg/yr P). Approximately 1,493 kg/yr P of the load is attenuated along the flowpaths. The hydraulic loading from the DWWTS is 1,216 m^3/d (444 kg/yr P). Approximately 441 kg/yr P of the load is attenuated along the flowpaths. Flow gauge data is available for one river water body, Deele (Donegal)_030. Where flow gauge data was not available the river flows for receiving water bodies are established from Hydrotool data or, if that is not available, using the Area-SAAR method.

	Baseline orthophosphate monitoring data and associated thresholds are available for 16 of the 24 RWBs. Monitoring data is not available for Bunlin_010, Dooballagh Burn_010, Glashagh (Lower)_010, Glashagh (Upper)_010, , Knockybrin_010, Leannan_030, Newmill_010 and Swilly (Donegal)_010. The increase in concentration as a result of the orthophosphate dosing of drinking water does not cause a deterioration in the status of any RWB.
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 dosing areas. Figure 2 illustrates the scale of orthophosphate loading to the receiving water bodies 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 pathway. In Leannan_050, Leannan_060 and Carn Low_010 primary discharges from WWTPs are a significant proportion of the load. In the Leslie Hill Stream_020 upstream EAMs contribute a significant proportion of the load. Figure 3 presents the total loading to the 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 that a large proportion of the mains leakage is attenuated. Direct discharges from WWTPs are combined with diffuse discharges at the following receiving waterbodies and tracked downstream from that point: Ramelton WWTP - Swilly Estuary Churchill Housing Scheme WWTP - Leannan_020 Kilmacreannan WWTP - Leannan_050 Letterkenny WWTP - Swilly (Donegal)_010 (SWOs only) Termon Housing Scheme WWTP - Leannan_050 The orthophosphate concentrations in the RWBs following dosing are presented in Table 2. The increase in concentration as a result of the orthophosphate dosing of drinking water does not cause a deterioration in the status of any RWB.
Step 5 and 6 - Combined Impact through subsurface and surface pathways on Groundwater Waterbodies (GWB)	The increase in orthophosphate concentrations in the GWBs as a result of the P dosing is shown in Table 3. This assessment includes the cumulative load from other EAM dosing areas which also contribute loads to these groundwater bodies. Monitoring data is not available for any of the groundwater bodies. Surrogate indicative quality values are applied based on the adjacent GWB status. The assessment indicates that the loading contribution to the groundwater bodies is insignificant and does not cause a deterioration in status.

Step 5 and 6 - Combined Impact from direct and diffuse sources on Lakes within the Water Supply Zone	The increase in orthophosphate concentrations in the lake WBs as a result of the dosing is shown in Table 4. Monitoring data is available for four of the five LWBs. There is no monitoring data available for Necally LWB. The assessment indicates that the loading to lakes as a result of the drinking water orthophosphate dosing 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 Waterbodies (TraC) as a result of drinking water dosing is shown in Table 5. Baseline orthophosphate monitoring data and associated thresholds are available for Swilly Estuary, Mulroy Bay Broadwater and Lough Swilly but not for Foyle and Faughan Estuaries or Lough Foyle. Direct discharges from WWTPs are combined with diffuse discharges at the following receiving TraC: Letterkenny WWTP - Swilly Estuary The increase in dosing concentration does not deteriorate the status of the transitional water bodies 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 dosing areas. The assessment is carried out on a regional catchment scale. The following EAM dosing areas are within the Lough Swilly Catchment and discharge to the same TraC WBs as Letterkenny EAM, see Figure 4: 029 Illies The following EAM dosing areas are within the Foyle Catchment and discharge to the same TraC WBs as Letterkenny EAM, see Figure 4: 029 Illies 136 Glenties Ardara and Fintown The increase in orthophosphate concentrations in the TraC WBs as a result of the drinking water dosing of all 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 RWBs 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. The table includes an assessment of the Lurgy River, which is a tributary of the Leannan_050 which is classified as an SAC. The catchment for this river section has been delineated and the flow estimate such that the loading and resulting concentration increase can be estimated. The results show there is no deterioration in WB status downstream of the EAM. The results show that there will be no 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**. The results of the assessment show there is no deterioration in water bodies as a result of orthophosphate dosing. A map of the RAG status of waterbodies is presented in Figure 5.
Recommendation	None Required

Table 1: Increased loading/concentration due to orthophosphate Dosing of drinking water – Dosing rate = 1.0 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 TP – OP Conversion factor varied for sensitivity analysis (40%, 50%, 68%)		
						0.5	0.4	0.68
Ramelton Primary Discharge	Preliminary	Orthophosphate 2mg/l – Non-Compliant	Swilly Estuary	Pre-dosing	439	1.64	1.31	2.23
				Post Dosing	510	1.90	1.52	2.59
Ramelton SWOs (1 No.)				Pre-dosing	7	0.12	0.10	0.17
				Post Dosing	9	0.16	0.13	0.22
Churchill Housing Scheme Primary Discharge	Primary	No ELVs	Leannan_020	Pre-dosing	15	5.34	4.27	7.26
				Post Dosing	16	5.88	4.70	8.00
Kilmacreannan Primary Discharge	Secondary	Orthophosphate 0.5mg/l – Non-Compliant	Leannan_050	Pre-dosing	310	1.25	1.00	1.70
				Post Dosing	354	1.43	1.14	1.94
Kilmacreannan SWOs (1 No.)				Pre-dosing	19	0.37	0.30	0.51
				Post Dosing	20	0.40	0.32	0.54
Letterkenny Primary Discharge	Tertiary	Orthophosphate 1mg/l - Compliant	Swilly Estuary	Pre-dosing	573	0.08	0.07	0.11
				Post Dosing	573	0.08	0.07	0.11
Letterkenny SWOs (10 No.)				Pre-dosing	475	0.33	0.26	0.45
				Post Dosing	513	0.36	0.29	0.49
Termon Housing Scheme Primary Discharge	Primary	No ELVs	Leannan_050	Pre-dosing	20	5.34	4.27	7.26
				Post Dosing	23	5.88	4.70	8.00

Table 2: Orthophosphate concentrations in river water bodies 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)
Bunlin_010	IE_NW_38B040100	*High*	0.0125	0.0188	6.6	0.0006	0.0131
Carn Low_010	IE_NW_39L012000	High	0.0125	0.0188	143.8	0.0005	0.0130
Corravaddy Burn_010	IE_NW_39C030250	High	0.0078	0.0188	5.2	0.0005	0.0083
Deele (Donegal)_030	IE_NW_01D010500	Good	0.0263	0.0325	1.4	0.00001	0.0263
Dooballagh Burn_010	IE_NW_39D020200	*Good*	0.0300	0.0325	3.3	0.0003	0.0303
Glashagh (Lower)_010	IE_NW_39G020200	*High*	0.0125	0.0188	39.8	0.0016	0.0141
Glashagh (Upper)_010	IE_NW_39G010200	*High*	0.0125	0.0188	4.6	0.0002	0.0127
Glashagh (Upper)_020	IE_NW_39G010400	High	0.0076	0.0188	9.8	0.0003	0.0079
Knockybrin_010	IE_NW_39K240610	*High*	0.0125	0.0188	25.8	0.0013	0.0138
Leannan_010	IE_NW_39L010100	High	0.0122	0.0188	4.4	0.00003	0.0122
Leannan_020	IE_NW_39L010200	High	0.0106	0.0188	7.8	0.00004	0.0107
Leannan_030	IE_NW_39L010250	*High*	0.0125	0.0188	18.9	0.0001	0.0126
Leannan_040	IE_NW_39L010300	High	0.0056	0.0188	21.3	0.0001	0.0057
Leannan_050	IE_NW_39L010500	High	0.0071	0.0188	90.5	0.0003	0.0074
Leannan_060	IE_NW_39L010600	High	0.0097	0.0188	92.3	0.0003	0.0100
Leslie Hill Stream_010	IE_NW_39L050600	Good	0.0275	0.0325	24.9	0.0014	0.0288
Leslie Hill Stream_020	IE_NW_39L050660	Bad	0.1184	NA	35.0	0.0006	0.1191
Loughkeel Burn_010	IE_NW_38L030400	High	0.0109	0.0188	1.1	0.0002	0.0111
Lurgy_010	IE_NW_39L020100	High	0.0167	0.0188	15.8	0.0009	0.0175
Newmill_010	IE_NW_39N050990	*High*	0.0125	0.0188	17.0	0.0011	0.0136
Swilly (Donegal)_010	IE_NW_39S020300	*High*	0.0125	0.0188	170.3	0.0014	0.0139
Swilly_010	IE_NW_39S020050	Moderate	0.0147	0.0508	4.2	0.0002	0.0148
Swilly_020	IE_NW_39S020100	Moderate	0.0058	0.0508	16.2	0.0002	0.0061
Swilly_030	IE_NW_39S020200	High	0.0121	0.0188	21.1	0.0003	0.0124

Table 3: Orthophosphate concentrations in groundwater bodies 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 Baseline conc. Following dosing (mg/l P)**
Lough Swilly	IEGBNI_NW_G_059	*Good*	0.0175	0.0263	7.6	0.0001	0.0176
Manor Cunningham	IE_NW_G_052	*Good*	0.0175	0.0263	0.4	0.0001	0.0176
Northwest Donegal	IE_NW_G_049	*Good*	0.0175	0.0263	0.05	0.0000004	0.0175
Raphoe	IE_NW_G_054	*Good*	0.0175	0.0263	0.2	0.00001	0.0175

Table 4: Total Phosphorus concentrations in lake bodies 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 Baseline Total conc. following dosing (mg/l P)**
Akibbon	IE_NW_39_11	Good	0.0146	0.0213	4.4	0.00003	0.0146
Gartan	IE_NW_39_12	High	0.0071	0.0075	4.4	0.00003	0.0071
Keel Kilmacrenan	IE_NW_38_75	High	0.0073	0.0075	1.1	0.0002	0.0075
Fern	IE_NW_39_13	Good	0.0292	0.0213	92.3	0.0003	0.0295*
Nacally	IE_NW_39_68	*High*	0.0050	0.0075	4.4	0.00003	0.0050

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

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)
Swilly Estuary	IE_NW_220_0100	Summer	High	0.0160	0.0188	442.6	0.0007	0.0167
		Winter	High	0.0200	0.0188	442.6	0.0007	0.0207*
Lough Swilly	IE_NW_220_0000	Summer	High	0.0025	0.0188	442.6	0.0005	0.0030
		Winter	High	0.0190	0.0188	442.6	0.0005	0.0195*
Foyle and Faughan Estuaries	UKGBNI5NW250010	Summer	*Good*	0.0325	0.0363	1.4	0.000005	0.0325
		Winter	*Good*	0.0325	0.0363	1.4	0.000005	0.0325
Lough Foyle	GBNIIE6NW250	Summer	*High*	0.0125	0.0188	1.4	0.00002	0.0125
		Winter	*High*	0.0125	0.0188	1.4	0.00002	0.0125
Mulroy Bay Broadwater	IE_NW_200_0000	Summer	High	0.0057	0.0188	1.1	0.00002	0.0057
		Winter	High	0.0065	0.0188	1.1	0.00002	0.0065

** 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)
Swilly Estuary	IE_NW_220_0100	Summer	High	0.0160	0.0188	442.6	572.7	0.0009	0.0169
		Winter	High	0.0200	0.0188	442.6	572.7	0.0009	0.0209*
Lough Swilly	IE_NW_220_0000	Summer	High	0.0025	0.0188	442.6	814.5	0.0009	0.0034
		Winter	High	0.0190	0.0188	442.6	814.5	0.0009	0.0199*
Foyle and Faughan Estuaries	UKGBNI5NW250010	Summer	*Good*	0.0325	0.0363	1.4	134.1	0.0002	0.0327
		Winter	*Good*	0.0325	0.0363	1.4	134.1	0.0002	0.0327
Lough Foyle	GBNIIE6NW250	Summer	*High*	0.0125	0.0188	1.4	189.5	0.0002	0.0127
		Winter	*High*	0.0125	0.0188	1.4	189.5	0.0002	0.0127
Mulroy Bay Broadwater	IE_NW_200_0000	Summer	High	0.0057	0.0188	1.1	24.2	0.0002	0.0059
		Winter	High	0.0065	0.0188	1.1	24.2	0.0002	0.0067

** 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 (kg/yr P)	Modelled dosing conc. (mg/l P)	Potential conc. following dosing (mg/l P)
Deele (Donegal)_040	IE_NW_01D010600	High	0.0163	0.0188	1.4	0.000006	0.0163
Deele (Donegal)_050	IE_NW_01D010650	Poor	0.0577	0.0868	1.4	0.000006	0.0577
Lurgy River subsection of Leannan_050	IE_NW_39L010500	Good	0.0265	0.0325	61.9	0.0014	0.0279

Figure 1: Letterkenny WSZ and Letterkenny Mixed WSZ Dosing Areas

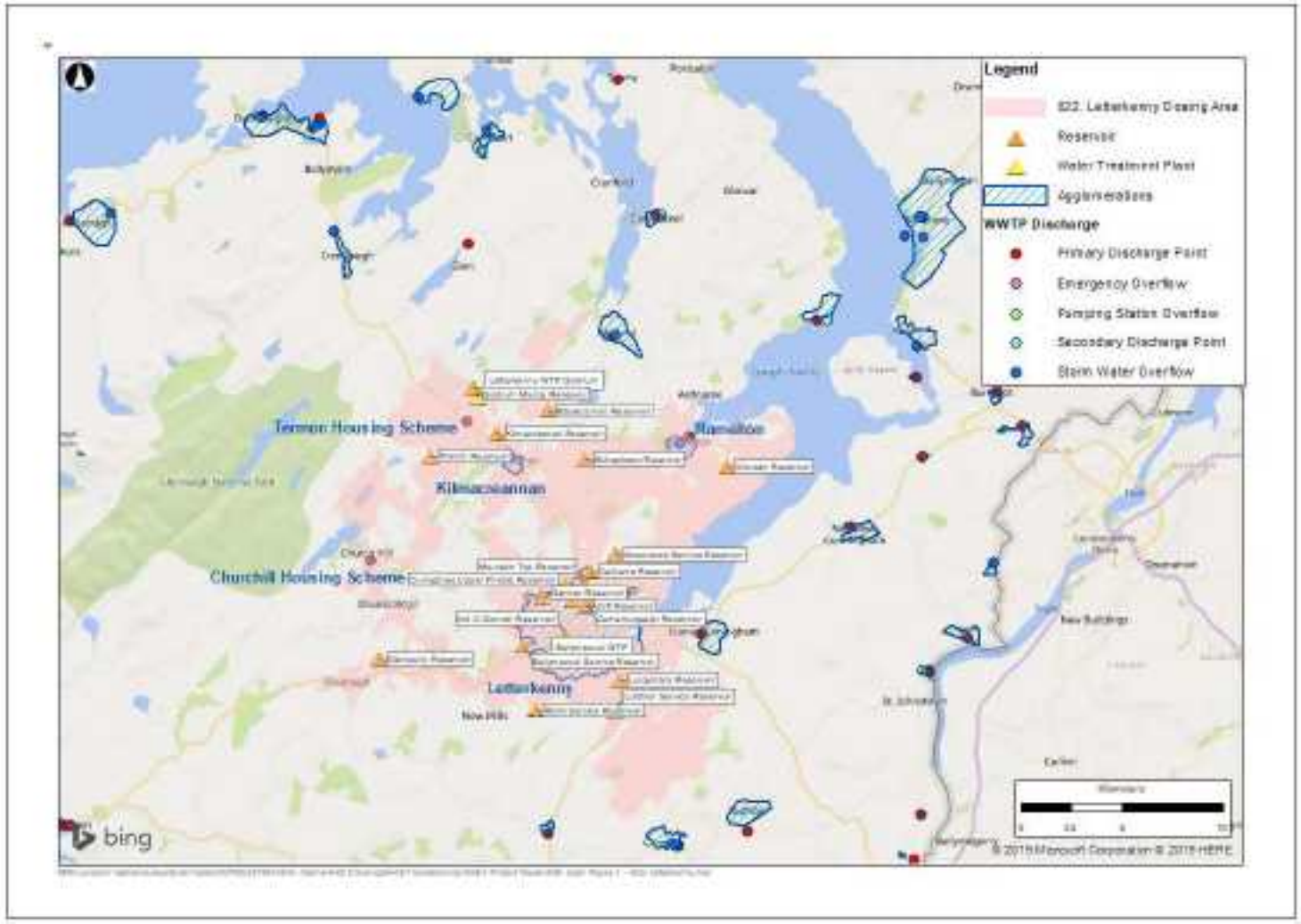

Figure 2: RWB Cumulative Loading Assessment

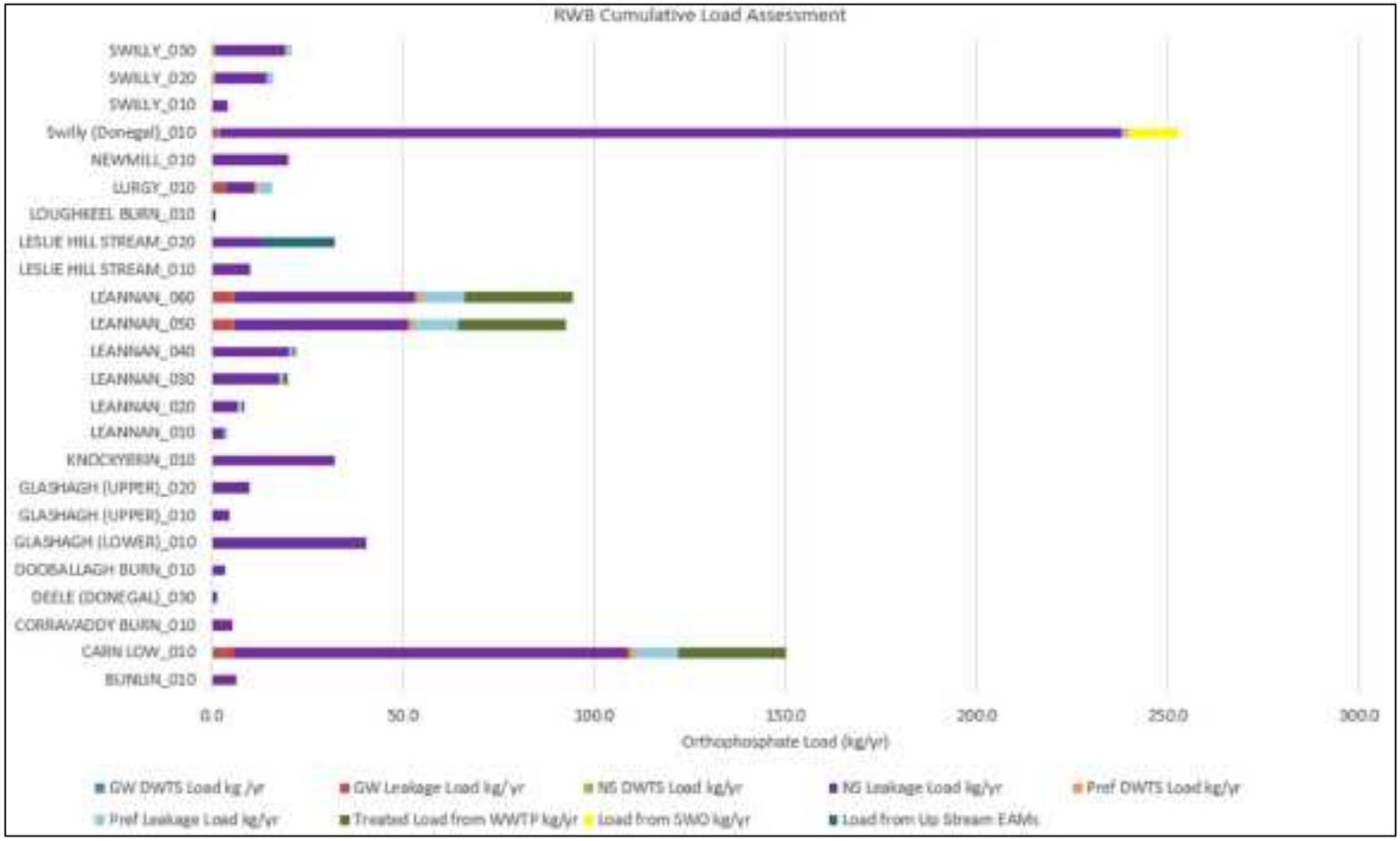

Figure 3: Total dosing area Attenuated, Treated and Transported Loads

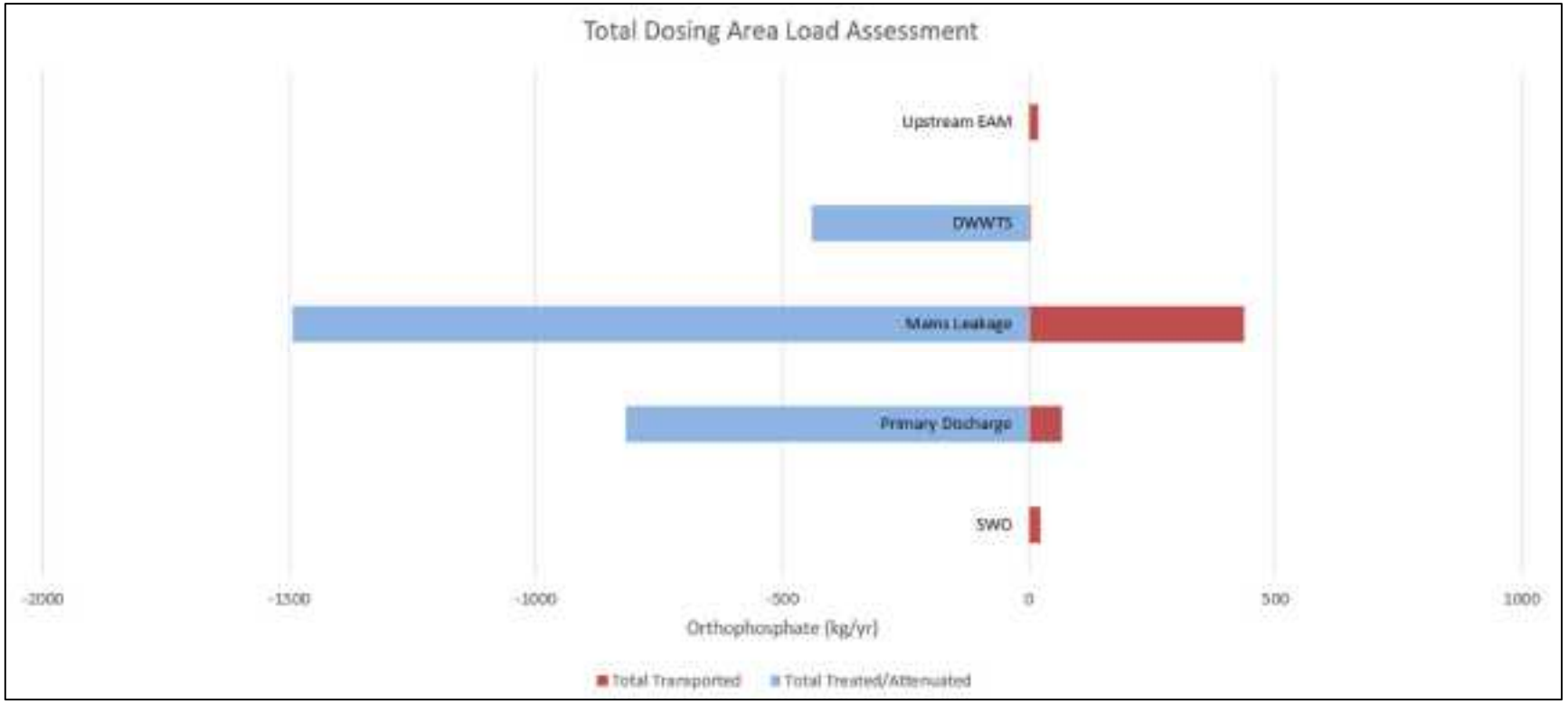

Figure 4: Upstream and downstream EAMs within WFD catchment

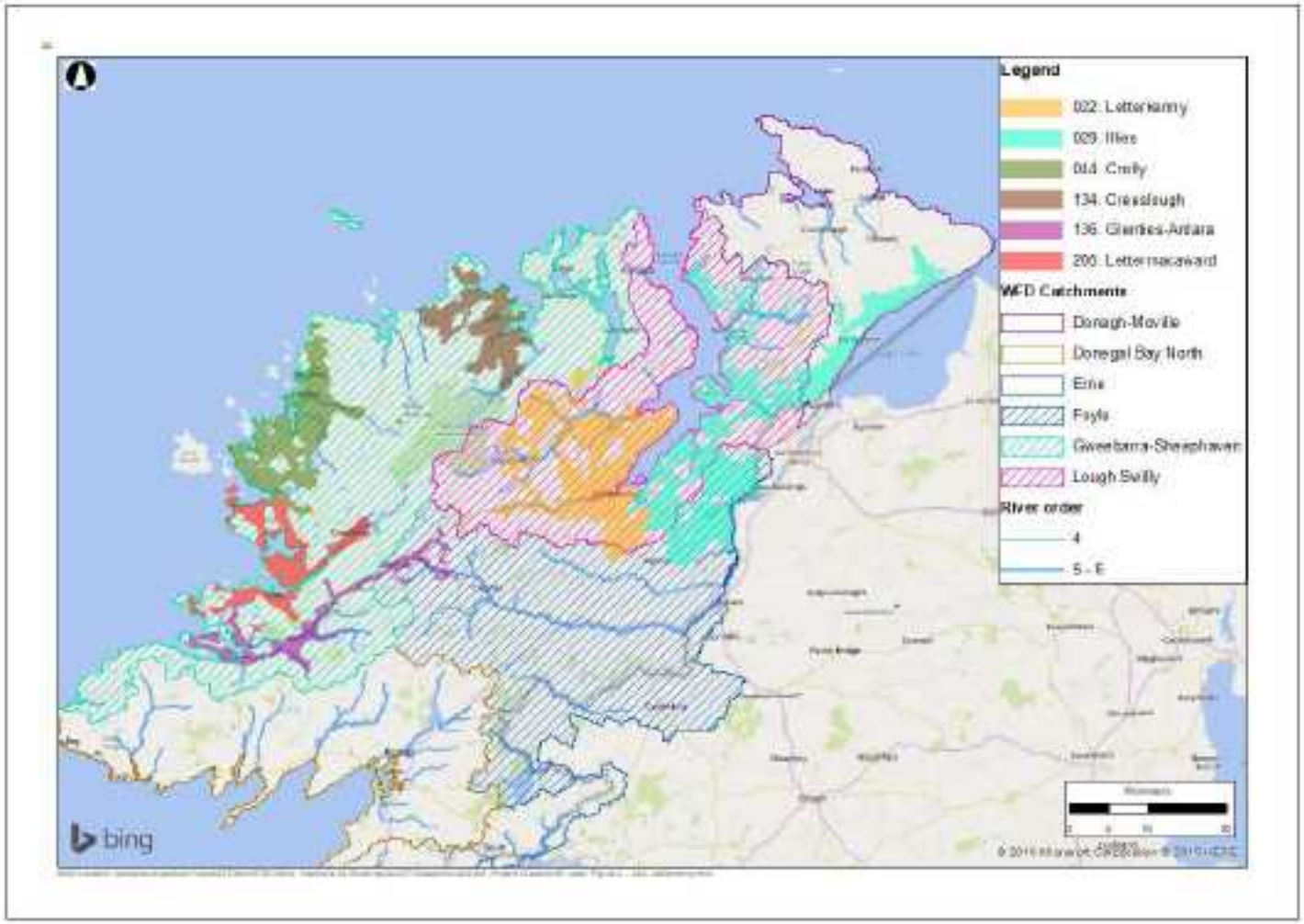

Figure 5: Red, Amber, Green (RAG) Status of waterbodies