



IRISH WATER

LEAD IN DRINKING WATER MITIGATION PLAN
– GORTAHORK-FALCARRAGH WTP

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 Gortahork Water Treatment Plant (WTP) to the Gortahork Falcarragh Water Supply Scheme (WSS).

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 (Zol) 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 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). 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 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 ($\mu\text{g}/\text{l}$) 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 Gortahork WTP will be 1.2 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 any significant effect to the receiving environment an Environmental Assessment Methodology (EAM) has been developed based on a conceptual model of P transfer (from the water distribution and wastewater collection systems), using the source-pathway-receptor framework.

The first step of Screening for AA is to identify the European sites that are in close proximity to or have a hydrological or hydrogeological connectivity to the WSZs affected by the proposed OP dosing. The Screening recognises that for those European Sites with nutrient sensitive Qualifying Interests (habitats and species) which have connectivity to the WSZ, there are pathways for effects which require further evaluation. The Screening Report applies objective scientific information from the EAM as outlined in this document and evaluates whether the proposed dosing will give rise to significant effects 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. 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 or 4 – the assessment of alternative solutions or the determination of Imperative Reasons of Overriding Public Interest (IROPI).

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

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

Article 6(4) states:

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

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

2.2 GUIDANCE FOR THE APPROPRIATE ASSESSMENT PROCESS

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

European and National Legislation:

- Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (also known as the ‘Habitats Directive’);

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

Guidance / Case Law:

- *Article 6 of the Habitats Directive – Rulings of the European Court of Justice*. Final Draft September 2014;
- *Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities*. DEHLG (2009, revised 10/02/10);
- *Assessment of Plans and Projects Significantly Affecting Natura 2000 sites: Methodological Guidance on the Provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*. European Commission (2002);
- *Communication from the Commission on the Precautionary Principle*. European Commission (2000b);
- *EC study on evaluating and improving permitting procedures related to Natura 2000 requirements under Article 6.3 of the Habitats Directive 92/43/EEC*. European Commission (2013);
- *Guidance Document on Article 6(4) of the 'Habitats Directive' 92/43/EEC. Clarification of the concepts of: Alternative Solutions, Imperative Reasons of Overriding Public Interest, Compensatory Measures, Overall Coherence, Opinion of the Commission*. European Commission (2007); and
- *Managing Natura 2000 sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC*. European Commission (2018).

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 Zol to be considered during the AA process states the following:

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

A buffer of 15km is typically taken as the initial Zol extending beyond the reach of the footprint of a plan, although there may be scientifically appropriate reasons for extending this Zol further depending on pathways for potential effects. With regard to the current project, the 15km distance is considered inappropriate to screen all likely pathways to European Sites in view of all hydrological and hydrogeological connections to aquatic and water-dependant receptors. Therefore, the Zol for this project includes all of the hydrologically connected surface water sub catchments and groundwater bodies within the WSZ (**Figure 6**).

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 SSCO 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 SSCO in the context of maintaining and restoring favourable conservation condition as follows:

For SACs:

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

For SPAs:

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

Favourable Conservation status of a habitat is achieved when:

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

Favourable Conservation status of a species is achieved when:

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

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

2.5.3 Existing Threats and Pressures to EU Protected Habitats and Species

Given the nature of the proposed project, a review has been undertaken of those QIs/SCIs which have been identified as having sensitivity to orthophosphate loading. Information has been extracted primarily

from a number of NPWS authored reports, including recently available statutory assessments on the conservation status of habitats and species in Ireland namely; The status of EU protected Habitats and Species in Ireland (NPWS 2019 a, b &c) and on information contained in Ireland’s most recent Article 12 submission to the EU on the Status and trends of Birds species (NPWS 2013d). Water dependent species were identified as having the greatest connectivity and thus the highest sensitivity to the proposed dosing activity; 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

This Project examines the OP dosing of treated water from the Gortahork WTP. Gortahork WTP supplies the Gortahork Falcarragh Water Supply Zone (0600PUB1059) with approximately 2,135 m³/day of treated water. Approximately 49% of this treated water flow is accounted for across the WSZ. The WSZ boundary covers Gortahork, Falcarragh and Meenlaragh as well as surrounding rural areas which are serviced by Falcarragh WWTP and Gortahork WWTP. There are an estimated 2,049 properties across the WSZs that are serviced by DWWTs.

Based on an assessment of the risk of lead exceedances, high plumbosolvency risk areas were identified and in the Plumbosolvency Control Plan for Gortahork Falcarragh WSZ, universal dosing of the entire WSZ is recommended. Specifically, 1.2 mg/l P will be dosed at the outflow of the Gortahork WTP.

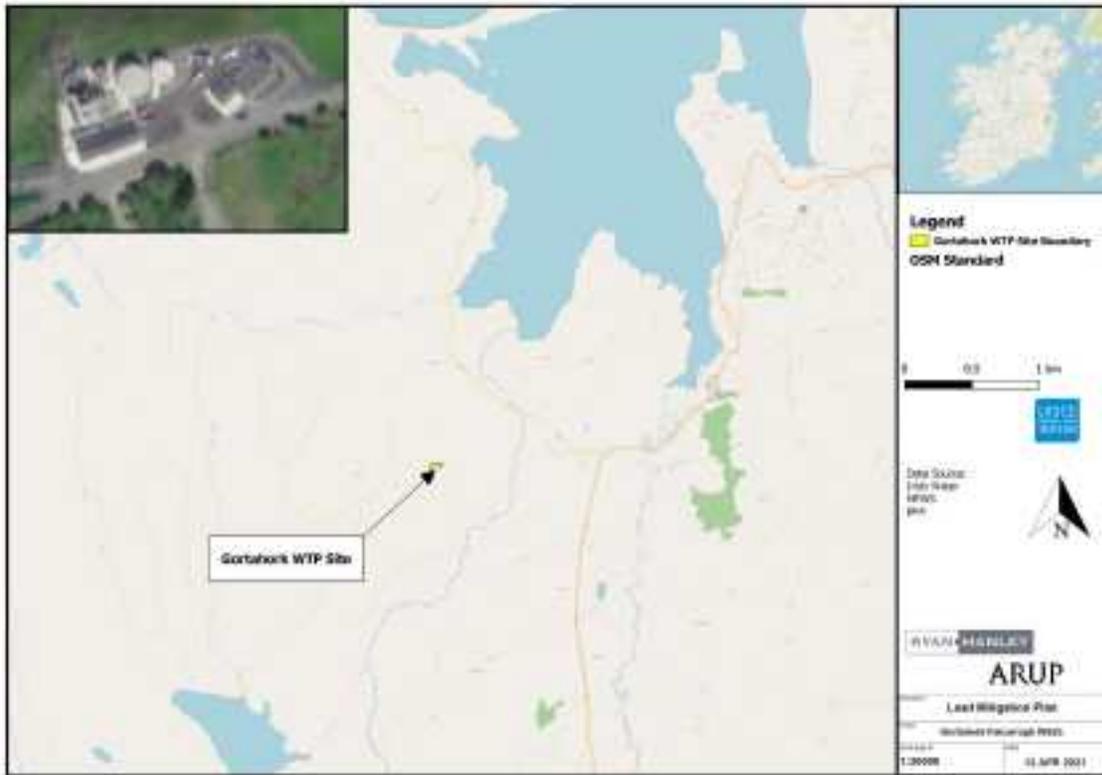


Figure 1 Location of the Gortahork WTP site, Co. Donegal

3.1.1 Construction Works

Orthophosphate dosing unit is already installed at the plant during the recent upgrade works undertaken at the WTP site and therefore construction of OP dosing facility is not considered as part of this assessment.

Proposed construction works involves installation of post treatment pH correction facility as detailed below.

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

- Initial site assessment, and site investigation works to determine existing conditions, services and pipe cable duct layouts at the site;
- Installation of sodium bicarbonate (commonly called bicarbonate of soda) dosing unit and storage area within the old plant building which is currently us for storage (see **Figure 2**) to increase alkalinity level leaving the plant and stabilise pH variation in the network. Sodium bicarbonate will be dosed in addition to the existing sodium hydroxide (commonly called Caustic soda) currently been dosed at the plant. The old plant room will be utilised to install batching area and storage of sodium bicarbonate access through installation of new roller doors. Proposed works will also include installation of pallet mechanical lifting equipment to be provide for offloading pallets of sodium bicarbonate at plant. The sodium bicarbonate dosing point will be prior post plant and prior to reservoir;
- No site clearance or building demolition is required;
- Works duration will not extend beyond 20 working days.



Figure 2 Old plant room currently used for storage to be utilised for sodium bicarbonate 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 1.2 mg/l P 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 the significance of project effects 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 risk of environmental impact and 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 assessment of any proposed OP treatment and provides a methodology to determine the potential loading 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 waterbodies; water quality information; available low flow estimation for gauged and ungauged catchments; and a new methodology which has been developed for the assessment of water quality risk from domestic wastewater treatment systems.

Depending on the potential impacts identified, appropriate measures may be built into the project proposal, as part of an iterative process, to avoid / reduce those potential impacts for the 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 3**), based on the source-pathway-receptor model, from the water distribution and wastewater collection systems.

- The *source* of phosphorus is defined as the OP dosing at water treatment plants which will be dependent on the water chemistry of the raw water quality, the integrity of the distribution network and the extent of lead piping.
- *Pathways* include discharges from the wastewater collection system (WWTP discharges and intermittent discharges – Storm Water Overflows (SWOs)), leakage from the distribution system and small point source discharges from Domestic Wastewater Treatment Systems (DWWTS).

- *Receptors*, and their sensitivity, is of key consideration in the EAM. A waterbody may be more sensitive to additional 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 could be affected by dosing at 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 4** 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 EAM risk assessment process.

A summary report outlining the EAM is available in **Appendix C**, which 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 an increase in OP loading arising from the proposed OP dosing.

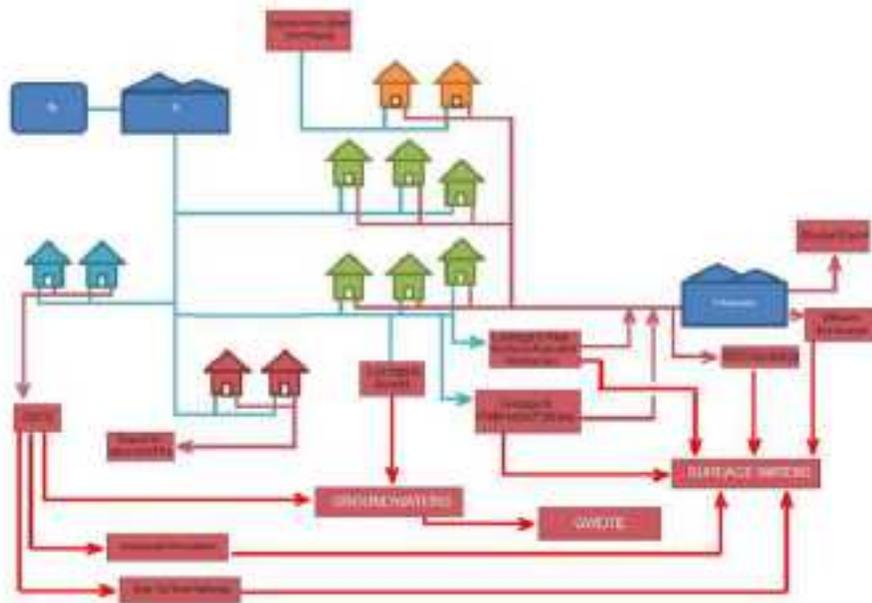


Figure 3 Conceptual Model of P Transfer

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.

Step 1 – Stage 1 Appropriate Assessment Screening

- Identify downstream European Sites and qualifying features using water dependent database (Appendix B)
- Determine if qualifying features are nutrient sensitive from list of nutrient sensitive qualifying features.
- Apply the EAM in the context of conservation objectives for European Sites.

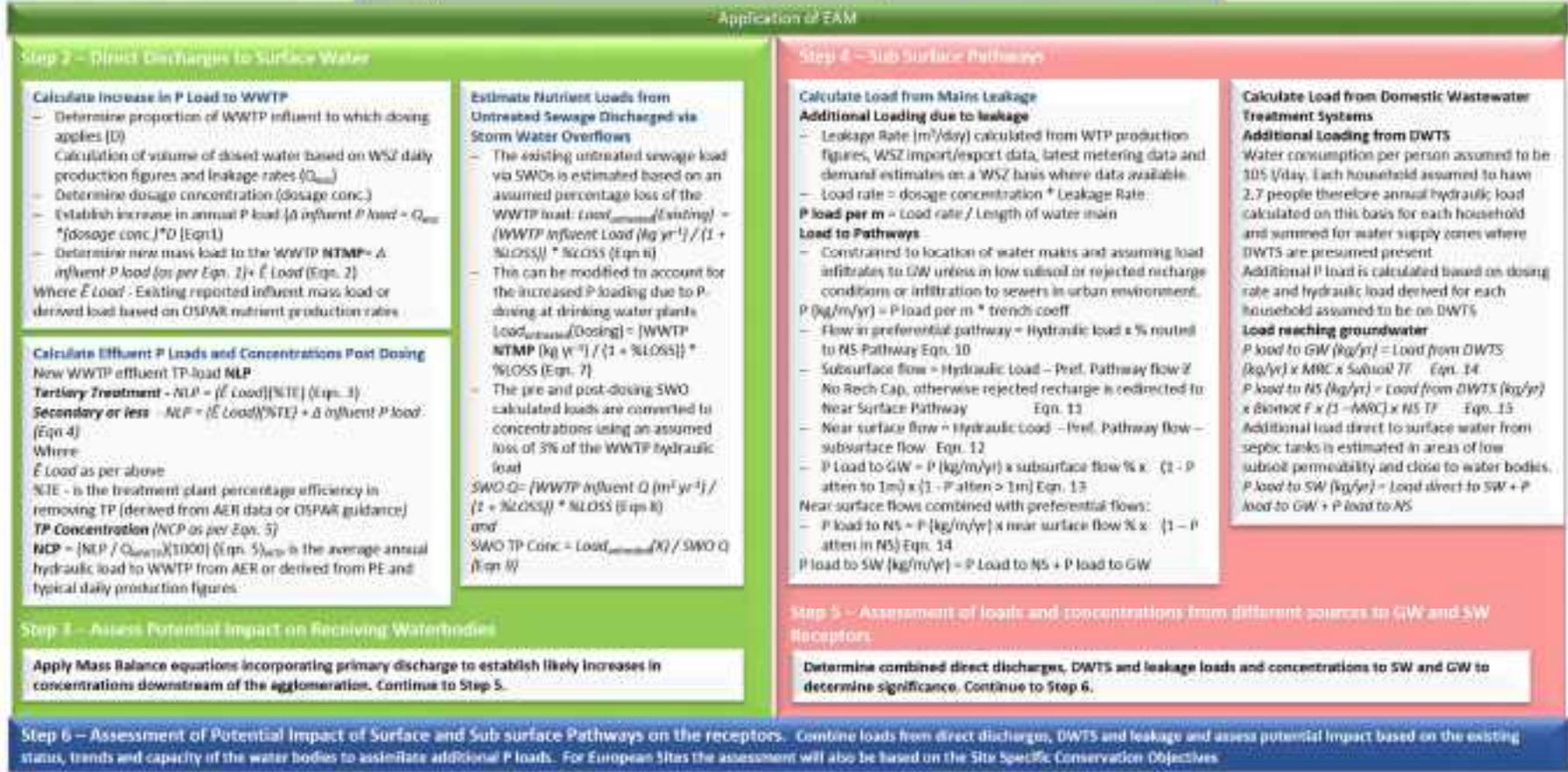


Figure 4 Stepwise Approach to the Environmental Assessment Methodology

4. PROJECT CONNECTIVITY TO EUROPEAN SITES

4.1 OVERVIEW OF THE PROJECT ZONE OF INFLUENCE

4.1.1 Construction Phase

The Gortahork WTP is located approximately 980 m from the nearest European Site, the Ballyness Bay SAC (001090) (see **Figure 5**). The closest watercourse is 184 m away and is the Owenawillin_010 (IE_NW_38O100200). This watercourse flows into the Ballyness Bay SAC approximately 1.1 km downstream of the WTP site. The existing WTP site is made up entirely of hard standing surface. All proposed works will be within the footprint of the WTP site. The construction works are limited to the placement of pH facility within an existing building thus requiring minimal excavation. The extent of excavation for pipework is further limited in scale.

It is considered that, given the scale of the construction within an existing building for the prefabricated Bicarbonate of soda dosing unit and associated pipework, the short duration of the works and the nature of the works that there is no potential for significant effects arising during the construction phase of the project. Consideration of potential construction impacts and pathways for significant effects is in the absence of mitigation and with the acknowledgement that the pH correction dosing unit is within the existing Gortahork WTP site compound. Construction impacts are therefore not discussed further in this report.

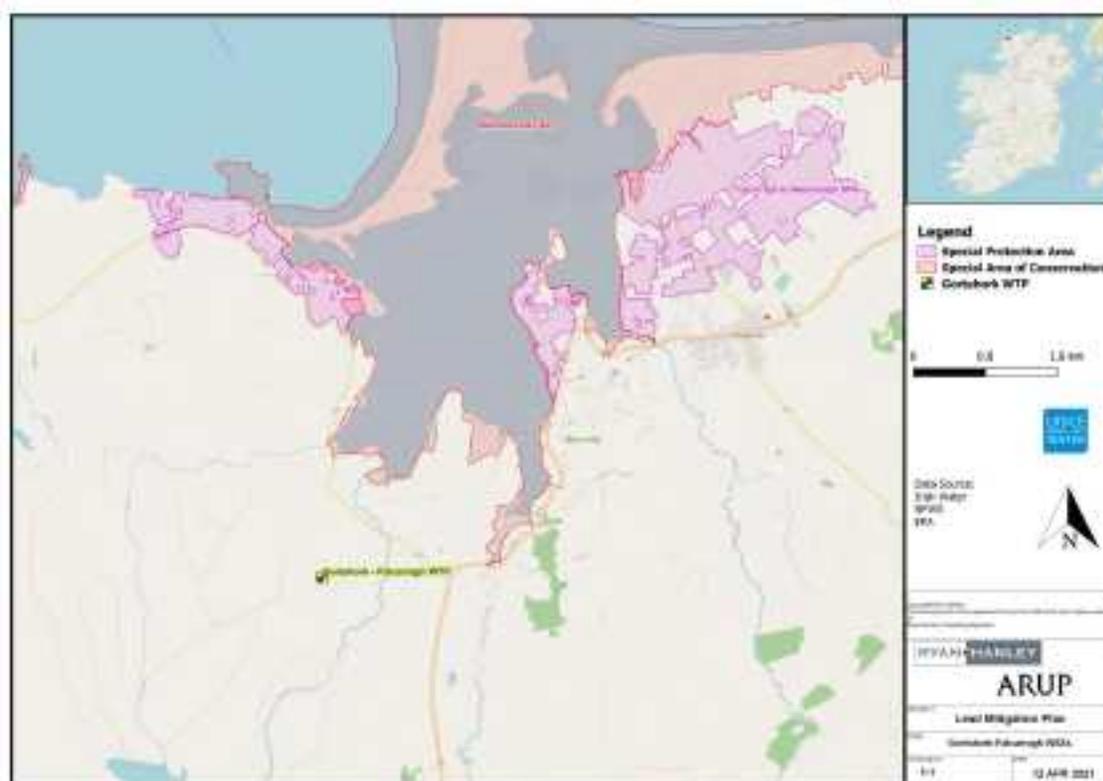


Figure 5 Location of the Gortahork WTP site with respect to European Sites

4.1.2 Operational Phase

With regard to the operation of the proposed project, the pathways by which the added OP may reach and / or affect environmental receptors is considered by means of an operational Zol, which was determined by establishing the potential for hydrological and hydrogeological connectivity between the Gortahork WTP and associated WSZ and European Sites. The Zol was therefore defined by the surface

water sub-catchments and groundwater bodies that are hydrologically and hydrogeologically connected with the Project. European Sites within the operational Zol are listed in **Table 1** and are displayed in **Figure 6**.

The EAM process identified 7 river waterbodies, 1 transitional waterbody and 1 coastal waterbody with connectivity to loadings of OP dosing to drinking water. This AA Screening evaluates the potential for significant effects arising from the connectivity between EAM identified surface waterbodies and downstream receiving waterbodies and European Sites via:

- Glen (Meenaclady)_010 (IE_NW_38G050200) river waterbody flows into the Northwestern Atlantic Seaboard (HAs 37; 38) (IE_NW_100_0000) coastal waterbody.
- Owenawillin_010 (IE_NW_38O100200), Glenna_010 (IE_NW_38G010200) and Tullaghobegly_020 (IE_NW_38T010400) river waterbodies flow into the Ballyness Bay (IE_NW_170_0000) coastal waterbody.
- Lough Agher Stream_010 (IE_NW_38L020200) river waterbody flows into the Ray_010 (IW_NW_38R010200) river waterbody, the An_Cheathrú_Cheanainn_010 (IE_NW_38C180660) river waterbody and the Ballyness Bay (IE_NW_170_0000) and Northwestern Atlantic Seaboard (HAs 37; 38) (IE_NW_100_0000) coastal waterbody.

The EAM process identified 1 groundwater body. Groundwater bodies touching or intersecting the proposed dosing area, are also included in the Zol. Hydrogeological linkages in karst areas are taken into account:

- Northwest Donegal (IE_NW_G_049)

Northwest Donegal is a large groundwater body (1451 km²) 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 (Groundwater Body Descriptions, Geological Survey Ireland, 2004). As a result of this only those European Sites within a 300 m radius are considered in the Zol. European Sites within the Zol are listed in **Table 1** and are displayed in **Figure 6**.

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

Site Name	SAC/ SPA Code	Water Dependent Species/ Habitats	Nutrient Sensitive	Potential Hydrological/ Hydro-geological Connectivity
Aran Island (Donegal) Cliffs SAC	000111	Yes	Yes	No
Fawnboy Bog/Lough Nacung SAC	000140	Yes	Yes	Yes
Horn Head and Rinclevan SAC	000147	Yes	Yes	No
Rathlin O'Birne Island SAC	000181	Yes	Yes	No
Slieve League SAC	000189	Yes	Yes	No
Slieve Tooney/ Tormore Island/ Loughros Beg Bay SAC	000190	Yes	Yes	No
Tranarossan And Melmore Lough SAC	000194	Yes	Yes	No
West of Ardara/Maas Road SAC	000197	Yes	Yes	No
Ballyness Bay SAC	001090	Yes	Yes	Yes
Gweedore Bay and Islands SAC	001141	Yes	Yes	Yes
Muckish Mountain SAC	001179	No	No	No
Ballyhoorisky Point to Fanad Head SAC	001975	Yes	Yes	No
North Inishowen Coast SAC	002012	Yes	Yes	No
Cloghernagore Bog and Glenveagh National Park SAC	002047	Yes	Yes	Yes
Mulroy Bay SAC	002159	Yes	Yes	No
Rutland Island and Sound SAC	002283	Yes	Yes	No

Derryveagh And Glendowan Mountains SPA	004039	Yes	Yes	Yes
Inishbofin, Inishdooley and Inishbeg SPA	004083	Yes	Yes	No
Rathlin O'Birne Island SPA	004120	Yes	Yes	No
Roaninish SPA	004121	Yes	Yes	No
Illancrone and Inishkeeragh SPA	004132	Yes	Yes	No
Falcarragh to Meenlaragh SPA	004149	Yes	Yes	Yes
West Donegal Coast SPA	004150	Yes	Yes	No
Horn Head to Fanad Head SPA	004194	Yes	Yes	No
West Donegal Islands SPA	004230	Yes	Yes	No

The following European Sites have potential hydrological connectivity to the dosing area via the Northwestern Atlantic Seaboard (HAs 37;38) (IE_NE_100_0000) coastal waterbody. The Northwestern Atlantic Seaboard is a substantially large coastal waterbody spanning 744 km². Given the distance between the dosing area and these European Sites (>10 km) and taking into consideration the dilution factor in this coastal waterbody it is considered that OP dosing will not have an impact on the below listed European site and as such, they are not considered further in this report:

- Aran Island (Donegal) Cliffs SAC (000111);
- Horn Head and Rinclevan SAC (000147);
- Rathlin O'Birne Island SAC (000181);
- Slieve League SAC (000189);
- Ballyhoorisky Point To Fanad Head SAC (001975);
- North Inishowen Coast SAC (002012);
- Tranarossan and Melmore Lough SAC (000194);
- West Of Ardara/Maas Road SAC (000197);
- Rutland Island And Sound SAC (002283);
- Mulroy Bay SAC (002159);
- Slieve Tooley/ Tormore Island/ Loughros Beg Bay SAC (000190);
- Rathlin O'Birne Island SPA (004120);
- Illancrone and Inishkeeragh SPA (004132);
- Inishbofin, Inishdooley and Inishbeg SPA (004083);
- Horn Head to Fanad Head SPA (004194);
- West Donegal Coast SPA (004150);
- West Donegal Islands SPA (004230); and
- Roaninish SPA (004121).

Muckish Mountain SAC (001179) has hydrogeological connectivity to the OP dosing area via the Northwest Donegal (IE_NW_G_049) groundwater body. However, there are no water dependent or nutrient sensitive habitats or species within this SAC, therefore there is no potential for OP dosed water to have an impact on this European site and it is not considered further in this report.

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. 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**.

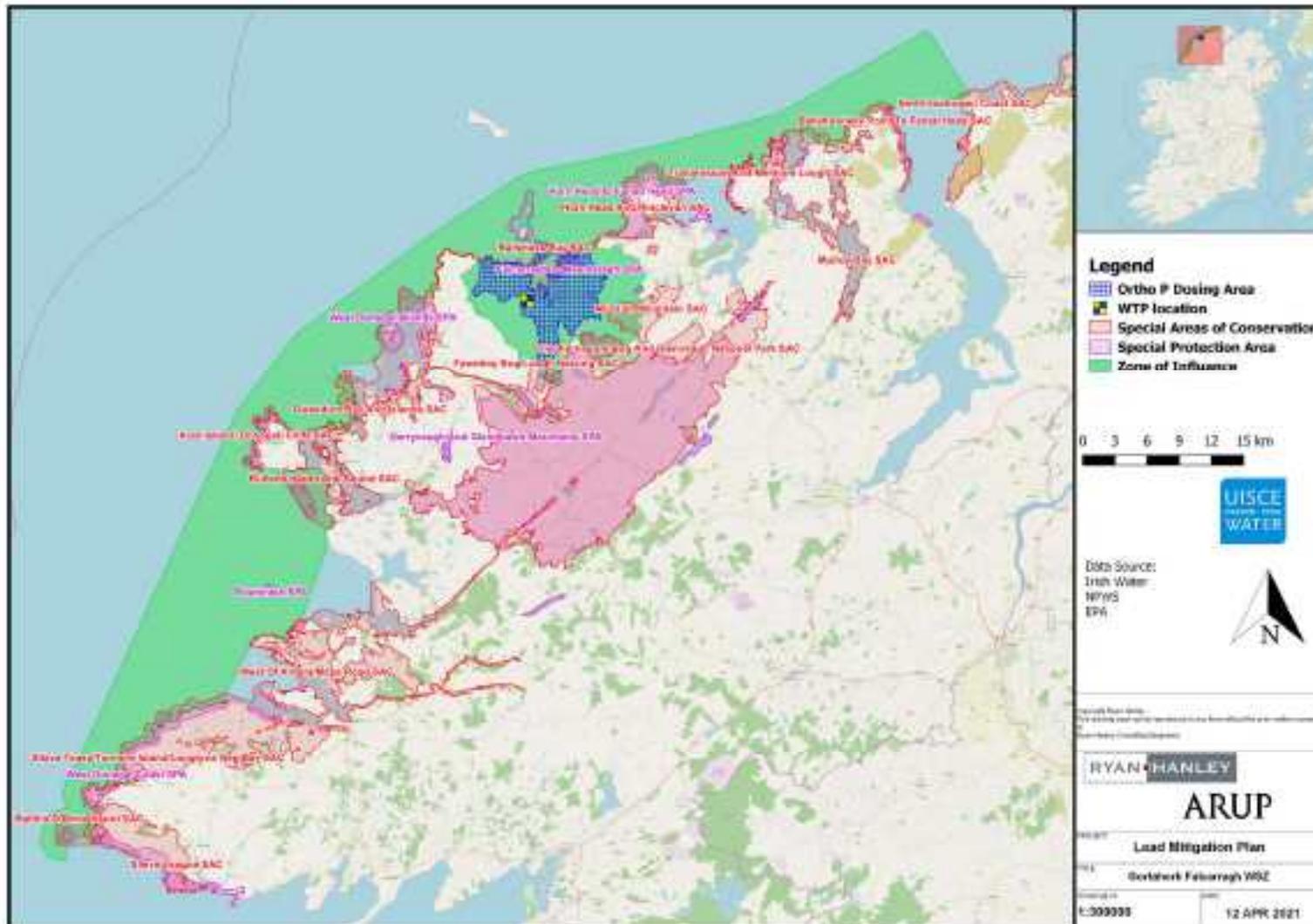


Figure 6 European Sites within the ZOI of the Proposed Project

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/ hydro-geological Connectivity
Ballyness Bay	SAC 001090	14 th May 2014	1013	Geyer's Whorl Snail <i>Vertigo geyeri</i>	Yes	Yes	Yes for operational impacts
			1130	Estuaries	Yes	Yes	
			1140	Mudflats and sandflats not covered by seawater at low tide	Yes	Yes	
			2110	Embryonic shifting dunes	Yes	Yes	
			2120	Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes)	Yes	Yes	
			2130	Fixed coastal dunes with herbaceous vegetation (grey dunes)*	Yes	Yes	
			2190	Humid dune slacks	Yes	Yes	
Fawnboy Bog/Lough Nacung	SAC 000140	13 th Sep 2016	1029	Freshwater Pearl Mussel <i>Margaritifera margaritifera</i>	Yes	Yes	Yes for operational impacts
			4010	Northern Atlantic wet heaths with <i>Erica tetralix</i>	Yes	Yes	
			7130	Blanket bogs (* if active bog)	Yes	Yes	
			7150	Depressions on peat substrates of the Rhynchosporion	Yes	Yes	
Gweedore Bay and Island	SAC 001141	03 rd Mar 2015	1355	<i>Lutra lutra</i> (Otter)	Yes	Yes	Yes for operational impacts
			1395	<i>Petalophyllum ralfsii</i> (Petalwort)	Yes	Yes	
			1833	<i>Najas flexilis</i> (Slender Naiad)	Yes	Yes	
			1150	Coastal lagoons	Yes	Yes	
			1170	Reefs	Yes	Yes	
			1220	Perennial vegetation of stony banks	Yes	No	
			1410	Mediterranean salt meadows (<i>Juncetalia maritima</i>)	Yes	Yes	
			2110	Embryonic shifting dunes	Yes	Yes	
			2120	Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes)	Yes	Yes	
			2130	Fixed coastal dunes with herbaceous vegetation (grey dunes)*	Yes	Yes	
			2140	Decalcified fixed dunes with <i>Empetrum nigrum</i>	Yes	Yes	
			2150	Atlantic decalcified fixed dunes (<i>Calluno-Ulicetea</i>)	Yes	Yes	
			2170	Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenariae</i>)	Yes	Yes	
			2190	Humid dune slacks	Yes	Yes	
			21A0	Machairs (* in Ireland)	Yes	Yes	
3110	Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>)	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/ hydro-geological Connectivity
			4030	European dry heaths	No	Yes	
			4060	Alpine and Boreal heaths	Yes	No	
			5130	Juniperus communis formations on heaths or calcareous grasslands	No	No	
Cloghernagore Bog and Glenveagh National Park	SAC 002047	24 th Aug 2017	1029	Freshwater Pearl mussel (<i>Margaritifera margaritifera</i>)	Yes	Yes	Yes for operational impacts
			1106	Atlantic salmon (<i>Salmo salar</i>)	Yes	Yes	
			1355	Otter (<i>Lutra lutra</i>)	Yes	Yes	
			1421	Killarney fern (<i>Trichomanes speciosum</i>)	Yes	Yes	
			3110	Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>)	Yes	Yes	
			3260	Water courses of plain to montane levels with the <i>Ranunculon fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation	Yes	Yes	
			4010	Northern Atlantic wet heaths with <i>Erica tetralix</i>	Yes	Yes	
			4030	European dry heaths	No	Yes	
			4060	Alpine and Boreal heaths	No	No	
			6410	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>)	Yes	Yes	
			7130	Blanket bogs (* if active bog)	Yes	Yes	
			7150	Depressions on peat substrates of the <i>Rhynchosporion</i>	Yes	Yes	
			91A0	Old sessile oak woods with Ilex and Blechnum in the British Isles	No	Yes	
Derryveagh And Glendowan Mountains	SPA 004039	21 st Feb 2018	A001	Red-throated Diver <i>Gavia stellata</i>	Yes	Yes	Yes for operational impacts
			A098	Merlin <i>Falco columbarius</i>	Yes	Yes	
			A103	Peregrine <i>Falco peregrinus</i>	Yes	Yes	
			A140	Golden Plover <i>Pluvialis apricaria</i>	Yes	Yes	
			A466	Dunlin <i>Calidris alpina schinzii</i>	Yes	Yes	
Falcarragh to Meenlaragh	SPA 004149	21 st Feb 2018	A122	Corncrake <i>Crex Crex</i>	Yes	Yes	Yes for operational impacts

* indicates a priority habitat under the Habitats Directive

5. EVALUATION OF POTENTIAL IMPACTS

5.1 CONTEXT FOR IMPACT PREDICTION

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

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

5.2 IMPACT IDENTIFICATION

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 likely 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).

Operational Phase

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.
- Phosphorus (P) in wastewater collection systems is the result of drinking water and derived from a number of other sources, including P imported from areas outside the agglomeration through import of sludges or leachates for treatment at the plant. The disposal and use of P removed in wastewater sludge is regulated (i.e. through nutrient management plans) and should not pose further threat of environmental impact;
- Leakage of phosphates from the drinking water supply network to the environment from use of OP;
- Direct discharges of increased P to waterbodies from the wastewater treatment plant licensed discharges; and

- Potential discharges to waterbodies of untreated effluent potentially high in OP Storm Water Overflows (SWOs).

5.3 ASSESSMENT OF 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 section of the Screening to inform AA is potential for significant effects arising from the additional OP load due to OP dosing at the Gortahork WTP site. 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 waterbody is a measure of its ability to absorb extra pressures before its status changes. For example, a river waterbody at Good Status will have mean phosphate values in the range 0.025 to 0.035 mg/l P. River waterbodies with mean phosphate concentrations of 0.0275 mg/l P have 75% capacity left, i.e. high capacity, while river waterbodies with a mean of 0.0325 mg/l P have lower capacity (25%) as the concentrations are closer to the Good/Moderate Status boundary. In assessing the additional loads from the proposed 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 waterbody will not result in deterioration in status by 2021 even where the distance to threshold is currently assessed to be far. Where the waterbody baseline concentration is “Near” to the threshold before the effect of OP dosing is considered, this does not cause an automatic fail for this test. If the predicted increase in concentration due to OP is very low (i.e. below 5%/ <0.00125 mg/l P of the High/Good status) this test will pass as the OP dosing itself is not having a significant impact on the OP indicative water quality and thus not having the potential for significant effects on connected European Sites in terms of aquatic and water-dependant QIs/SCIs and their conservation objectives

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

An additional test for groundwater bodies states that downward trends should not be reversed as a result of pollution. This test applies to GWB with statistically significant trends according to the WFD App and the Sens Slope provided is used to assess direction and strength of trend. If the trend is negative and the predicted increase in OP concentration is lower than the absolute value of the Sens Slope, then the test passes. This assessment has used the EPA WFD App data relating to waterbody monitoring and characterisation downloaded in December 2021.

Baseline Orthophosphate monitoring data and associated thresholds are available for three RWBs (Lough Agher Stream, Ray_010 and Tullaghobegly_020) and not available for four RWBs (An_Cheathrú_Cheanainn_010, Glen (Meenaclady)_010, Glenna_010 and Owenawillin_010). Where baseline OP monitoring data and associated thresholds were not available for any RWB, a surrogate status is derived from the OP indicative quality of adjacent RWBs. The mid-range of the surrogate status is used as the baseline concentration.

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

Site Name (Code)	Contributing WB Code_Name	WB Type ¹	Ortho P Status ² and Trends ³	Baseline ⁴ Ortho P Conc. ⁵ (mg/l)	75% of Status Threshold (mg/l)	Cumulative Ortho P load to SW and GW ⁶	Modelled Conc. ⁷ (mg/l)	Baseline Conc. @ 1.2 mg/l dosage rate	Evaluation
Ballyness Bay SAC (001090)	IE_NW_38C180660 An_Cheathrú_Cheanainn_010	RWB	<i>High</i>	<i>0.0125</i>	0.0188	41.3	0.0006	0.0131	No risk of deterioration in OP indicative WQ
	IE_NW_38T010400 Tullaghobegly_020	RWB	<i>Moderate</i>	<i>0.0364</i>	0.0508	24.1	0.0004	0.0368	No risk of deterioration in OP indicative WQ
	IE_NW_38G010200 Glenna_010	RWB	<i>Moderate</i>	<i>0.0455</i>	0.0508	14.9	0.0004	0.0459	No risk of deterioration in OP indicative WQ
	IE_NW_38O100200 Owenawillin_010	RWB	<i>High</i>	<i>0.0125</i>	0.0188	25.6	0.0010	0.0135	No risk of deterioration in OP indicative WQ
	IE_NW_38G050200 Glen (Meenaclady)_010	RWB	<i>High</i>	<i>0.0125</i>	0.0188	35.4	0.0012	0.0137	No risk of deterioration in OP indicative WQ
	IE_NW_170_0000 Ballyness Bay	CWB	<i>Summer Moderate/ Winter Moderate</i>	<i>0.0500</i>	0.0550	145.0	0.0006	0.0506	No risk of deterioration in OP indicative WQ
	IE_NW_100_0000 Northwestern Atlantic Seaboard	CWB	<i>Summer High/ Winter High</i>	<i>0.0025/ 0.0100</i>	<i>0.0188/ 0.0188</i>	145.0	0.0006	<i>0.0031/ 0.0106</i>	No risk of deterioration in OP indicative WQ
	IE_NW_G_049 Northwest Donegal	GWB	<i>Good</i>	<i>0.0175</i>	0.0263	25.5	0.0002	0.0177	No risk of deterioration in OP indicative WQ
Fawnboy Bog/Lough Nacuna SAC (000140)	IE_NW_38G010200 Glenna_010	RWB	<i>Moderate</i>	<i>0.0455</i>	0.0508	14.9	0.0004	0.0459	No risk of deterioration in OP indicative WQ
	IE_NW_G_049 Northwest Donegal	GWB	<i>Good</i>	<i>0.0175</i>	0.0263	25.5	0.0002	0.0177	No risk of deterioration in OP indicative WQ
	IE_NW_38G050200 Glen (Meenaclady)_010	RWB	<i>High</i>	<i>0.0125</i>	0.0188	35.4	0.0012	0.0137	No risk of deterioration in OP indicative WQ

¹ Monitoring period is annual unless specified.

² Surrogate Status indicated in italic.

³ Distance to threshold in parentheses.

⁴ Baseline year is 2018.

⁵ Surrogate concentration is given in italic mg/l

⁶ Cumulative Ortho P load to SW and GW from Leakage, DWWTS and agglomerations (kg/yr)

⁷ Values above 5% of Good / High boundary (0.00125 mg/l P) for SW or 5% of Good / Fail boundary (0.00175 mg/l P) for GW highlighted in yellow.

Site Name (Code)	Contributing WB Code_Name	WB Type ¹	Ortho P Status ² and Trends ³	Baseline ⁴ Ortho P Conc. ⁵ (mg/l)	75% of Status Threshold (mg/l)	Cumulative Ortho P load to SW and GW ⁶	Modelled Conc. ⁷ (mg/l)	Baseline Conc. @ 1.2 mg/l dosage rate	Evaluation
Gweedore Bay and Island SAC (001141)	IE_NW_100_0000 Northwestern Atlantic Seaboard	CWB	Summer High/ Winter High	0.0025/ 0.0100	0.0188/ 0.0188	145.0	0.0006	0.0031/ 0.0106	No risk of deterioration in OP indicative WQ
	IE_NW_G_049 Northwest Donegal	GWB	Good	0.0175	0.0263	25.5	0.0002	0.0177	No risk of deterioration in OP indicative WQ
Cloghernagore Bog And Glenveagh National Park SAC (002047)	IE_NW_G_049 Northwest Donegal	GWB	Good	0.0175	0.0263	25.5	0.0002	0.0177	No risk of deterioration in OP indicative WQ
Derryveagh And Glendowan Mountains SPA (004039)	IE_NW_G_049 Northwest Donegal	GWB	Good	0.0175	0.0263	25.5	0.0002	0.0177	No risk of deterioration in OP indicative WQ
Falcarragh to Meenlaragh SPA (004149)	IE_NW_38G050200 Glen (Meenaclady)_010	RWB	High	0.0125	0.0188	35.4	0.0012	0.0137	No risk of deterioration in OP indicative WQ
	IE_NW_38O100200 Owenawillin_010	RWB	High	0.0125	0.0188	25.6	0.0010	0.0135	No risk of deterioration in OP indicative WQ
	IE_NW_38T010400 Tullaghobegly_020	RWB	Moderate	0.0364	0.0508	24.1	0.0004	0.0368	No risk of deterioration in OP indicative WQ
	IE_NW_38C180660 An_Cheathrú_Cheanainn_010	RWB	High	0.0125	0.0188	41.3	0.0006	0.0131	No risk of deterioration in OP indicative WQ
	IE_NW_G_049 Northwest Donegal	GWB	Good	0.0175	0.0263	25.5	0.0002	0.0177	No risk of deterioration in OP indicative WQ

5.3.1 Assessment of direct impact from WWTPs and Storm Water Overflows

The conceptual model developed for P transfer identifies a number of pathways by which OP can reach receptors. In the case of these pathways, factors contributing to 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 OP 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 any SWOs 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 OP dosing downstream of each agglomeration is provided below.

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

Table 4: Increased loading/concentration due to OP Dosing – Dosing rate = 1.2 mg/l P at Gortahork WTP

Agglom. & Discharge Type	ELV from WWDL	TP Load Kg/yr	Ortho P Concentration mg/l TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)			
			0.5	0.4	0.68	
Gortahork Primary Discharge	No ELVs	Pre-Dosing	279	7.20	5.76	9.79
		Post Dosing	308	7.95	6.36	10.82
		% Increase	10.4%	10.4%	10.4%	10.5%
Falcarragh Primary Discharge	No ELVs	Pre-Dosing	810	8.00	6.40	10.88
		Post Dosing	887	8.77	7.01	11.92
		% Increase	9.5%	9.6%	9.5%	9.5%
Falcarragh SWOs (1 No.)		Pre-Dosing	24	1.14	0.91	1.55
		Post Dosing	26	1.25	1.00	1.70

Gortahork WWTP Agglomeration

Gortahork WWTP Agglomeration provides primary treatment to the influent and has no ELVs, therefore it is assumed that the additional load receives no treatment. As a result of dosing the treated water with OP, the annual average effluent OP concentration will increase from 7.20 mg/l P to 7.95 mg/l P (10.4% increase). There are no SWOs associated with this WWTP. The WWTP discharge to the Glenna River which flows into Ballyness Bay coastal waterbody (IE_NW_170_0000) which forms part of **Ballyness Bay SAC (001090)**.

Falcarragh WWTP Agglomeration

Falcarragh WWTP Agglomeration does not provide wastewater treatment and has no ELVs, therefore it is assumed that the additional load receives no treatment. As a result of dosing the treated water with

OP, the annual average effluent OP concentration will increase from 8.00 mg/l P to 8.77 mg/l P (9.6% increase). The annual average SWO effluent concentration will increase from 1.14 mg/l P to 1.25 mg/l P as a result of the drinking water dosing. The WWTP and three of its SWOs discharge Ballyness Bay coastal waterbody (IE_NW_170_0000) which forms part of **Ballyness Bay SAC (001090)**, the SWO discharge to a small stream tributary of the Rye River.

5.3.2 Combined assessment of direct and indirect impacts to receiving waterbodies

This section presents the results of the EAM regarding the combined loading as a result of increased OP dosing from the WWTP discharge, seepage from mains and DWWTS. There are no upstream dosing areas to the Gortahork WTP site, therefore a cumulative assessment of impacts from upstream EAM's has not been carried out.

River waterbodies

The OP dosing contributes OP load to receiving RWBs via loading from mains leakage and domestic wastewater treatment systems (DWWTS) via subsurface pathways.

- An_Cheathrú_Cheanainn_010 (IE_NW_38C180660), Tullaghobegly_020 (IE_NW_38T010400), Glenna_010 (IE_NW_38G010200), Owenawillin_010 (IE_NW_38O100200), Glen (Meenaclady)_010 (IE_NW_38G050200) river waterbodies are hydrologically connected to the **Ballyness Bay SAC (001090)**.
- Glenna_010 (IE_NW_38G010200) river waterbody is hydrologically connected to the **Fawnboy Bog/Lough Nacuna SAC (000140)**.
- Glen (Meenaclady)_010 (IE_NW_38G050200) river waterbody is hydrologically connected to the **Gweedore Bay and Island SAC (001141)**.
- An_Cheathrú_Cheanainn_010 (IE_NW_38C180660), Tullaghobegly_020 (IE_NW_38T010400), Owenawillin_010 (IE_NW_38O100200), Glen (Meenaclady)_010 (IE_NW_38G050200) river waterbodies are hydrologically connected to the **Falcarragh to Meenlaragh SPA (004149)**.

The OP dosing contributes OP load to receiving RWBs via loading from mains leakage and domestic wastewater treatment systems (DWWTS) via subsurface pathways. The increase in OP concentrations in river waterbodies following dosing is estimated to be as much as 0.0012 mg/l P. The resulting Orthophosphate concentrations following dosing ranges from 0.0072 mg/l P to 0.0459 mg/l P. All RWBs will receive a predicted dosing concentration below the 5% Good/ High boundary (0.00125mg/l P) (see Table 3 above) and therefore there is no risk of deterioration in the OP indicative water quality of these RWBs.

Groundwater bodies

- Northwest Donegal (IE_NW_G_049) groundwater body is hydrologically linked to the **Ballyness Bay SAC (001090)**, **Fawnboy Bog/Lough Nacuna SAC (000140)**, **Gweedore Bay and Island SAC (001141)** **Cloghernagore Bog and Glenveagh National Park SAC (002047)** and **Derryveagh and Glendowan Mountains SPA (004039)**.

The OP dosing contributes OP load to receiving GWBs via subsurface and surface pathways. The increase in OP concentrations in the ground waterbody as a result of the OP dosing is up to 0.0002 mg/l P. The Northwest Donegal groundwater body has a predicted dosing concentration below the 5% of Good/ Fail boundary (0.00175 mg/l P) and within the 75% of upper threshold and therefore there is no risk of deterioration in the OP indicative water quality of this ground waterbody.

Coastal waterbodies

- Ballyness Bay (IE_NW_170_0000) coastal waterbody is hydrologically linked to the **Ballyness Bay SAC (001090)**
- Northwestern Atlantic Seaboard (HAs 37;38) (IE_NW_100_0000) coastal waterbody is hydrologically linked to the **Ballyness Bay SAC (001090), Gweedore Bay and Island SAC (001141)**.

The increase in OP concentrations in the coastal waterbodies as a result of OP dosing in the drinking water is up to 0.0006 mg/l P. The resulting OP concentrations following dosing ranges from 0.0031 mg/l P to 0.0506 mg/l P, as outlined in Table 3. All coastal waterbodies have a predicted dosing concentration below the 5% of Good/ Fail boundary (0.00125 mg/l P), therefore there is no risk of deterioration in the OP indicative water quality status for the above listed coastal waterbodies.

5.3.3 Conclusions

The EAM model data identifies that additional OP dosing as part of this Project does not cause a deterioration in the OP indicative water quality of any surface waterbody or groundwater body listed in **Table 3**. Section 6 evaluates the 'no deterioration' in the context of AA and the QIs of the European Sites.

6. EVALUATION OF POTENTIAL FOR SIGNIFICANT EFFECTS

The key pressure associated with the proposed OP dosing is the potential for increased OP levels in the receiving waters and the connectivity to the qualifying interests (habitats and species) identified in **Table 2** that are both water dependent and nutrient sensitive (**Appendix B**). Six European sites remain for evaluation of potential for significant effect: **Ballyness Bay SAC (001090)**, **Fawnboy Bog/Lough Nacuna SAC (000140)**, **Gweedore Bay and Island SAC (001141)**, **Cloghernagore Bog and Glenveagh National Park SAC (002047)**, **Derryveagh and Glendowan Mountains SPA (004039)** and the **Falcarragh to Meenlaragh SPA**. The potential for the proposed orthophosphate dosing to give rise to significant effects on these habitats and species, in view of their conservation objectives, are assessed in detail below.

6.1 BALLYNESS BAY SAC 001090

6.1.1 (1013) Geyer's whorl snail *Vertigo geyeri*

Vertigo geyeri is stringent in its requirement of saturated water conditions in calcareous, groundwater-fed flushes that are often limited in size to a few metres square. Their habitats often occur in mosaics of suitable patches within wider fen macrohabitats, that in Ireland can themselves fall within habitats as diverse as raised bog laggs, transition mires, lake shores, hill or mountain slopes, and wetlands associated with coastal dunes and machair (Moorkens and Killeen, 2011).

There is one known site for *Vertigo geyeri* in the Ballyness Bay SAC where it is associated with flushed fen grassland (NPWS, 2014). Geyer's whorl snail is associated with wetlands, marshy flushes and flat lowland fens with a constant water table and is threatened by drainage, or any change to the water table and habitat disturbance (Moorkens and Killeen, 2011). The SSCO for this species does not make specific reference to water quality and nutrient condition (NPWS, 2014). However, the COs supporting document for monitoring and condition assessment of populations of *Vertigo geyeri* stresses the importance of groundwater quantity and quality in the protection of this species (Moorkens and Killeen, 2011). Furthermore, the IUCN Red List reports eutrophication as a major threat for this species (Killeen et al., 2011). The OP dosing project has the potential to impact on groundwater quality with effects on the specific habitat requirements of *Vertigo geyeri*.

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

- Northwest Donegal (IE_NW_G_049) groundwater body has 'Good' OP status, an estimated modelled increase of 0.0002 mg/l P, a baseline concentration of 0.0175 mg/l P, a baseline following dosing of 0.0177 mg/l P. The WFD OP indicative water quality does not change, i.e. Good, therefore there is no deterioration in water quality from the proposed project on this groundwater body. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00175 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

The EAM assessment results which evaluate the additional OP loading from dosing at Gortahork WTP on WFD OP statuses have demonstrated that there will be no change in the OP WFD indicative water quality of the above-mentioned groundwater body, there is sufficient capacity within the status threshold, and there will be no alteration to water quality meaning there will be no potential for significant effect on the Geyer's Whorl Snail in Ballyness Bay SAC.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of the species / no deterioration of its favourable conservation condition is identified as no change to the indicative water quality status for these waterbodies has been demonstrated.

6.1.2 (2110) Embryonic shifting dunes, (2120) Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes), (2130) Fixed coastal dunes with herbaceous vegetation (grey dunes)*, (2190) Humid dune slacks

Ballyness Bay SAC is designated for a range of dune habitat as listed above that are found in close association with each other. The SSCOs (NPWS, 2015) and coastal supporting document (NPWS, 2015) set out the conservation objectives for these habitats and species which 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. Vegetation composition includes the target to maintain a typical flora (species and sub communities) for the particular sand dune habitat and the target that negative indicators (eg nettles indicative of change in nutrient status) should make up less than 5% vegetation cover. This OP dosing project has the potential to impact on the vegetation composition of these habitats where there is a change in nutrient inputs.

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 dune habitats in the Ballyness Bay SAC. The above listed habitats are associated with transitional and coastal waterbodies and therefore only these waterbodies are assessed. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Ballyness Bay (IE_NW_170_0000) coastal waterbody and estimated a modelled increase of 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0506 mg/l P for summer and winter. The CWB WFD OP indicative water quality is unchanged following dosing, i.e. *Moderate* for both summer and winter and dosing will not prevent the restoration to favourable status, i.e. high. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Gortahork WTP for this coastal waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00125 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status
- Northwestern Atlantic Seaboard (IE_NW_100_0000) coastal waterbody and estimated a modelled increase of 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0031 mg/l P for summer and 0.0106 mg/l P for winter. The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High for both summer and winter. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Gortahork WTP for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Gortahork 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 will be no potential for significant effect on dune habitats in Ballyness Bay SAC.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of the habitats / no deterioration of its favourable conservation condition is identified as no change to the OP indicative water quality status for these waterbodies has been demonstrated.

6.1.3 (1140) Mudflats and sandflats not covered by seawater at low tide, (1130) Estuaries

Ballyness Bay is a large and very shallow estuarine complex, with extensive areas of sandflat that are exposed at low tide. SSCOs for the estuarine and mud and sand flat habitats in Ballyness Bay do not make specific reference to water quality and nutrient conditions (NPWS, 2014) however there is a requirement to conserve community types in their natural condition. The SSCO attributes and targets with specific relevance are to maintain the communities: 'Coarse sediment to sandy mud with oligochaetes and polychaetes community complex' and 'Mobile sand community complex' (NPWS, 2014). Pressures and threats to these habitats associated with the current project include nutrient/ P enrichment which can be

associated with accelerated growth of macroalgae/ phytoplankton or reduced concentrations of dissolved oxygen.

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to the above listed habitats in Ballyness Bay SAC. The above listed habitats are associated with transitional and coastal waterbodies and therefore only these waterbodies are assessed. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Ballyness Bay (IE_NW_170_0000) coastal waterbody and estimated a modelled increase of 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0506 mg/l P for summer and winter. The CWB WFD OP indicative water quality is unchanged following dosing, i.e. *Moderate* for both summer and winter and dosing will not prevent the restoration to favourable status, i.e. high. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Gortahork WTP for this coastal waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00125 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status
- Northwestern Atlantic Seaboard (IE_NW_100_0000) coastal waterbody and estimated a modelled increase of 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0031 mg/l P for summer and 0.0106 mg/l P for winter. The CWB WFD OP indicative water quality is unchanged following dosing, i.e. *High* for both summer and winter. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Gortahork WTP for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Gortahork 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 will be no potential for significant effect on dune habitats in Ballyness Bay SAC.

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

6.2 FAWNBOY BOG/ LOUGH NACUNG SAC 000140

6.2.1 (1029) Freshwater Pearl mussel (*Margaritifera margaritifera*)

Mussels are distributed in the Clady River from near to Lough Nacung to the tidal limits downstream of Bunbeg. Mussels are occasional in the upper stretches near Lough Nacung, becoming frequent - common after 300 m and abundant from 1 km downstream of Gweedore to Bunbeg (NPWS, 2016). At present, the Clady population is unsustainable owing to lack of survival of juvenile mussels.

Examination of the SSCOs for the Fawnboy bog/ Lough Nacung SAC (NPWS< 2016) have highlighted that the conservation objective for *Margaritifera margaritifera* is to: 'restore' to favourable conservation condition. This will be achieved through a number of objectives, the main two being to restore the restore sufficient habitat in suitable condition (siltation and nutrient enrichment are key pressures on pearl mussel habitat) and to restore water quality macroinvertebrates: EQR greater than 0.90 (Q4-5 or Q5); phytobenthos: EQR greater than 0.93. These EQRs correspond to high ecological status for these two Water Framework Directive biological quality elements. They represent high water quality with very low nutrient concentrations (oligotrophic conditions).

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 Freshwater pearl mussel in the

Fawnboy bog/ Lough Nacung SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Glenna_010 (IE_NW_38G010200) river waterbody and estimated a modelled increase of 0.0004 mg/l P. The resulting orthophosphate concentration following dosing is 0.0459 mg/l P. The RWB WFD OP indicative water quality is unchanged following dosing, i.e. *Moderate*. The baseline water quality is not conducive to supporting FPM, however, dosing will not prevent the restoration to favourable status, i.e high. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Gortahok WTP for this river waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00125 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.
- Northwest Donegal (IE_NW_G_049) groundwater body has 'Good' OP status, an estimated modelled increase of 0.0002 mg/l P, a baseline concentration of 0.0175 mg/l P, a baseline following dosing of 0.0177 mg/l P. The WFD OP indicative water quality does not change, i.e. *Good*, therefore there is no deterioration in water quality from the proposed project on this groundwater body. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00175 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

The EAM assessment results which evaluate the additional OP loading from dosing at Gortahok WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and groundwater bodies connected to freshwater pearl mussel in Fawnboy Bog/Lough Nacung SAC. Therefore, potential for significant effects on this species can be excluded.

Furthermore, dosing will not prevent the maintenance/ restoration of the favourable conservation condition of freshwater pearl mussel in Fawnboy Bog/Lough Nacung SAC / no deterioration of its favourable conservation condition is identified as no change to the OP indicative water quality status for these surface water and groundwater bodies has been demonstrated.

6.2.2 (4010) Northern Atlantic wet heaths with *Erica tetralix*, (7130) Blanket bogs (* if active bog), (7150) Depressions on peat substrates of the *Rhynchosporion*

The aforementioned peat habitats occur in mosaics together and have not been mapped in detail for this SAC (NPWS, 2016). The SSCO's for these habitats include an attribute which relates to Ecosystem function and specifically to soil nutrients, with a target to maintain soil nutrient status within the natural range. Relevant nutrients and their natural ranges are yet to be defined. A further attribute is Vegetation Composition: negative indicator species and a percentage cover threshold for negative indicator species, including those indicating nutrient enrichment, has been set.

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 peat habitats in the Fawnboy bog/ Lough Nacung SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Glenna_010 (IE_NW_38G010200) river waterbody and estimated a modelled increase of 0.0004 mg/l P. The resulting orthophosphate concentration following dosing is 0.0459 mg/l P. The RWB WFD OP indicative water quality is unchanged following dosing, i.e. *Moderate*. The baseline water quality is not conducive to supporting FPM, however, dosing will not prevent the restoration to favourable status, i.e high. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Gortahok WTP for this river waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00125 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

- Northwest Donegal (IE_NW_G_049) groundwater body has 'Good' OP status, an estimated modelled increase of 0.0002 mg/l P, a baseline concentration of 0.0175 mg/l P, a baseline following dosing of 0.0177 mg/l P. The WFD OP indicative water quality does not change, i.e. Good, therefore there is no deterioration in water quality from the proposed project on this groundwater body. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00175 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

The EAM assessment results which evaluate the additional OP loading from dosing at Gortahork WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and groundwater bodies connected to peatland habitats in Fawnboy Bog/Lough Nacung SAC. Therefore, potential for significant effects on these habitats can be excluded

Furthermore, dosing will not prevent the maintenance/ restoration of the favourable conservation condition of peatland habitats in Fawnboy Bog/Lough Nacung SAC / no deterioration of its favourable conservation condition is identified as no change to the OP indicative water quality status for these waterbodies has been demonstrated.

6.3 GWEDDRE BAY AND ISLAND SAC (001141)

6.3.1 (1150) Coastal lagoons

The main attributes and targets associated with this habitat and relevant to this project are to maintain the annual median chlorophyll *a* within natural ranges and <5 µg/L; to maintain annual median MRP < 0.1 mg/L; Annual median DIN within natural ranges and < 0.15 mg/L; to maintain/increase the depth of submergent macrophyte colonisation of the lagoon to at least 2 m; to maintain number and extent of listed flora and fauna lagoonal specialists, subject to natural variation; and that negative indicator species be kept absent or under control (NPWS, 2015). With regard to negative indicator species, increased P could give rise to eutrophication which would favour phytoplankton blooms at the expense of submerged macrophytes. SSCOs supporting document for coastal lagoons indicates that two lagoons are listed for this SAC, Kincas Lough and Moirlagh, however there may be further lagoons within the SAC. These lagoons are reported to be in unfavourable – inadequate conservation condition (NPWS, 2013). NPWS, 2013 (Article 17 Report habitats) finds that main pressures and threats are pollution to surface waters, erosion, fertilisation, modification to hydrographic functioning and reclamation.

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

- Northwestern Atlantic Seaboard (IE_NW_100_0000) coastal waterbody and estimated a modelled increase of 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0031 mg/l P for summer and 0.0106 mg/l P for winter. The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High for both summer and winter. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Gortahork WTP for this coastal waterbody.
- Northwest Donegal (IE_NW_G_049) groundwater body has 'Good' OP status, an estimated modelled increase of 0.0002 mg/l P, a baseline concentration of 0.0175 mg/l P, a baseline following dosing of 0.0177 mg/l P. The WFD OP indicative water quality does not change, i.e. Good, therefore there is no deterioration in water quality from the proposed project on this groundwater body. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00175 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

The EAM assessment results which evaluate the additional OP loading from dosing at Gortahork WTP have demonstrated that there will be no change in the OP indicative water quality status of surface waterbodies and groundwater bodies connected to coastal lagoon habitat in Gweedore Bay and Islands SAC. Therefore, potential for significant effects on this habitat can be excluded.

Furthermore, dosing will not prevent the maintenance/ restoration of the favourable conservation condition of coastal lagoon habitats in Gweedore Bay and Islands SAC / no deterioration of its favourable conservation condition is identified as no change to the OP indicative water quality status for these waterbodies has been demonstrated.

6.3.2 (1170) Reefs

Subtidal reef habitat is estimated at 369ha in Gweedore Bay and Islands SAC (NPWS, 2015). The conservative objective for this site is: to maintain the favourable conservation condition of Reefs in to Gweedore Bay and Islands SAC. The SSCOs describe the main attributes and targets associated with this habitat and relevant to this project. A main attribute relates to reef distribution where the target is to retain a stable distribution subject to natural processes. A further attribute is community structure where the target is to conserve community types in their natural condition.

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 Reefs in Gweedore Bay and Islands SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Northwestern Atlantic Seaboard (IE_NW_100_0000) coastal waterbody and estimated a modelled increase of 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0031 mg/l P for summer and 0.0106 mg/l P for winter. The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High for both summer and winter. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Gortahork WTP for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Gortahork WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and ground water bodies connected to Reef habitat in Gweedore Bay and Islands SAC. Therefore, potential for significant effects on this habitat can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of Reefs habitat in Gweedore Bay and Islands SAC / no deterioration of its favourable conservation condition is identified as no change to the OP indicative water quality status for these waterbodies has been demonstrated.

6.3.3 (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*, (2150) Atlantic decalcified fixed dunes (*Calluno-Ulicetea*), (2170) Dunes with *Salix repens ssp. argentea* (*Salicion arenariae*), (2190) Humid dune slacks, (21A0) Machairs (* in Ireland), (1395) Petalwort *Petalophyllum ralfsii*

Gweedore Bay and Island SAC is designated for a range of dune habitats which occur as a complex mosaic of constantly changing and evolving ecological communities. They are inextricably linked in terms of their ecological functioning and no dune habitat should be considered in isolation from another or the adjoining semi natural habitats which often form important transitional communities (NPWS, 2015). The SSCO (NPWS, 2015) 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. Under the attribute physical structure, the target is to ensure that the hydrological regime continues to function naturally and that there are no increased nutrient inputs in the groundwater. Under the attribute vegetation composition: typical species and sub communities, species diversity and plant distribution

(including the presence of the rare Annex II liverwort, Petalwort *Petallophyllum ralfsii*) is described as 'strongly controlled by a range of factors, including nutrient gradients' and the target is to maintain a typical flora for the particular sand dune habitat. Under the attribute vegetation composition: negative indicator species, negative indicators include species indicative of changes in nutrient status (e.g. nettles *Urtica dioica*) and the target is that negative indicators should make up less than 6% of the vegetation cover.

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to dune habitats in **Gweedore Bay and Island SAC**. The above listed habitats are associated with transitional and coastal waterbodies and therefore only these waterbodies are assessed. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Northwestern Atlantic Seaboard (IE_NW_100_0000) coastal waterbody and estimated a modelled increase of 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0031 mg/l P for summer and 0.0106 mg/l P for winter. The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High for both summer and winter. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Gortahork WTP for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Gortahork WTP on WFD OP statuses have demonstrated that there will be no change in the OP WFD indicative water quality of the Northern Atlantic Seaboard coastal waterbody, there is sufficient capacity within the status threshold, and there will be no alteration to water quality meaning there will be no potential for significant effect on the aforementioned habitats in Gweedore Bay and Island SAC.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of their habitats / no deterioration of their favourable conservation condition is identified as no change to the OP indicative water quality status for these waterbodies has been demonstrated.

6.3.4 (1410) Mediterranean salt meadows (*Juncetalia maritimi*)

Mediterranean salt meadows have a maintain conservation objective. Saltmarshes are stands of vegetation that occur along sheltered coasts, mainly on mud or sand, and are flooded periodically by the sea. They are restricted to the area between mid-neap tide level and high-water spring tide level. Mediterranean salt meadow habitat has been estimated at 0.09ha with a further 9.66 of potential habitat (NPWS, 2015). Changes in nutrient gradient can alter vegetation composition and structure, and therefore there should be no increases in nutrient inputs.

Table 3 identifies surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to the aforementioned Mediterranean salt meadows in **Gweedore Bay and Island SAC**. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on water quality and nutrient conditions on:

- Northwestern Atlantic Seaboard (IE_NW_100_0000) coastal waterbody and estimated a modelled increase of 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0031 mg/l P for summer and 0.0106 mg/l P for winter. The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High for both summer and winter. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Gortahork WTP for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Gortahork WTP on WFD OP statuses have demonstrated that there will be no change in the OP WFD indicative water quality of the Northern Atlantic Seaboard coastal waterbody, there is sufficient capacity within the status threshold, and there will be no alteration to water quality meaning there will be no potential for significant effect on the aforementioned habitats in Gweedore Bay and Island SAC.

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

6.3.5 (1833) Slender Naiad *Najas flexilis*

Najas flexilis is a small, annual, submerged macrophyte of freshwater lakes that is listed on Annex II and IV of the Habitats Directive. In Ireland, the species is also protected under the Wildlife Acts (1976 and 2000), being listed on the Flora Protection Order (S.I. 94 of 1999) (NPWS, 2015). The core of the species European range is in Scotland and Ireland. Eutrophication is considered a significant pressure on the species which grows at the lower levels of the euphotic zone and can easily be out-competed by perennials such as pondweed (*Potamogeton* spp.) and 'shaded' by abundant phytoplankton (NPWS, 2015). The species, in Ireland at least, appears to be strongly associated with lakes that are naturally oligotrophic, as defined by freshwater ecologists, that is naturally low in dissolved and particulate forms of phosphorus and nitrogen. In Ireland the poor/inadequate conservation status of *Najas flexilis* is considered to be as a result of eutrophication as well as impacts linked to peatland damage. Diffuse losses from agriculture and domestic wastewater systems (septic tanks) and point sources from urban wastewater treatment plants are considered the principal sources of nutrients in *Najas flexilis* catchments (NPWS, 2015).

Table 3 identifies the surface and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to the **Gweedore Bay and Island SAC**. Slender naiad is associated with three freshwater lakes in this SAC. These lakes are outside of the zone of influence of this project and dosing at Gortahork WTP will not prevent the maintenance of the favourable conservation condition of Slender naiad/ no deterioration of its favourable conservation condition is identified as there will be no change to the OP indicative water quality status of lake waterbodies associated with Slender naiad.

6.3.6 (3110) Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)

Habitat 3110, the oligotrophic lake habitat (in the Directive entitled 'Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)' typically occurs in soft-water, nutrient poor lakes frequently associated with acid bedrock catchments (notably granite and old red sandstone) overlain by peatland.

The selection of this SAC for habitat 3110 was based on data for Mullaghderg West lake and Mullaghderg East lake. However, re-examination of these data and the occurrence of Slender naiad suggest that their vegetation is more closely aligned to habitat 3130 (NPWS, 2015b) (non-qualifying interest for the SAC). It is considered possible that lake habitat 3110 may occur in the small lake in Derrybeg townland; it is highly unlikely to occur in lakes influenced by calcareous sand and the sea, both of which are prevalent in this SAC (NPWS, 2015b).

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 **Gweedore Bay and Island SAC**. 3110 lake habitats are outside of the zone of influence of this project and dosing at Gortahork WTP will not prevent the maintenance of the favourable conservation condition of Slender naiad/ no deterioration of their favourable conservation condition is identified as there will be no change to the OP indicative water quality status of lake waterbodies associated with 3110 habitats.

6.3.7 (1355) Otter *Lutra lutra*

A review of the SSCOs for otter (NPWS, 2015) found no specific attributes or targets relating to water quality however the National Parks and Wildlife Service's Threat Response Plan for Otter (NPWS, 2009), was reviewed 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 Gweedore Bay and Island 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 Gweedore Bay and Island 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 in the Gweedore Bay and Island SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on water quality and nutrient conditions on:

- Glen (Meenaclady)_010 (IE_NW_38G050200) river waterbody has a baseline concentration of 0.0125 mg/l P and a surrogate 'Good' OP indicative water quality status. It has an estimated a modelled increase of 0.0012 mg/l P. The resulting OP concentration following dosing is 0.0137 mg/l P. The RWB WFD OP indicative water quality is unchanged following dosing, i.e. Good. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Gortahork WTP for this river waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00125 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.
- Northwestern Atlantic Seaboard (IE_NW_100_0000) coastal waterbody and estimated a modelled increase of 0.0006 mg/l P. The resulting OP concentration following dosing is 0.0031 mg/l P for summer and 0.0106 mg/l P for winter. The CWB WFD OP indicative water quality is unchanged following dosing, i.e. High for both summer and winter. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Gortahork WTP for this coastal waterbody.

The EAM assessment results which evaluate the additional OP loading from dosing at Gortahork 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 will be no potential for significant effect on otter in Gweedore Bay and Island SAC.

Furthermore, dosing will not prevent the maintenance of favourable conservation condition of otter in this SAC.

6.4 Cloghernagore Bog and Glenveagh National Park SAC 002047

6.4.1 (1029) Freshwater pearl mussel *Margaritifera margaritifera*

The conservation objective for this SAC is to restore the Glaskeelan and Owencarrow freshwater pearl mussel populations (NPWS, 2017). These populations do not lie within the OP dosing zone of influence. The freshwater pearl mussel populations of this SAC do not interact with the zone of influence of the dosing area and this species is not considered further.

6.4.2 (1106) Atlantic salmon *Salmo salar*

The SSCOs for salmon in the Cloghernagore Bog and Glenveagh National Park SAC (NPWS, 2017) are to 'maintain' favourable conservation condition. 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 and groundwater bodies that are hydrologically or hydrogeologically connected to the proposed OP dosing and which are further connected to salmon in this SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality:

- Northwest Donegal (IE_NW_G_049) groundwater body has 'Good' OP status, an estimated modelled increase of 0.0002 mg/l P, a baseline concentration of 0.0175 mg/l P, a baseline following dosing of 0.0177 mg/l P. The WFD OP indicative water quality does not change, i.e. Good, therefore there is no deterioration in water quality from the proposed project on this groundwater body. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00175 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

The EAM assessment results which evaluate the additional OP loading from dosing at Gortahork WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and ground water bodies connected to Salmon in the Cloghernagore Bog and Glenveagh National Park SAC. Therefore, potential for significant effects on this species can be excluded.

Furthermore, dosing will not prevent the maintenance or restoration of favourable conservation condition of salmon in this SAC / no deterioration of its favourable conservation condition is identified as no change to the WFD status for these waterbodies has been demonstrated.

6.4.3 (1355) Otter *Lutra lutra*

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), provides a review of and response to the pressures and threats to otters in Ireland. Three principal risks to otters are categorised: 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 Cloghernagore Bog and Glenveagh National Park 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 Cloghernagore Bog and Glenveagh National Park 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 in the Cloghernagore Bog and Glenveagh National Park SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Northwest Donegal (IE_NW_G_049) groundwater body has 'Good' OP status, an estimated modelled increase of 0.0002 mg/l P, a baseline concentration of 0.0175 mg/l P, a baseline following dosing of 0.0177 mg/l P. The WFD OP indicative water quality does not change, i.e. Good, therefore there is no deterioration in water quality from the proposed project on this groundwater body. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00175 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

The EAM assessment results which evaluate the additional OP loading from dosing at Gortahork WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and ground water bodies connected to Otter in the Cloghernagore Bog and Glenveagh National Park SAC. Therefore potential for significant effects on this species can be excluded.

Furthermore, dosing will not prevent the maintenance or restoration of favourable conservation condition of otter in this SAC / no deterioration of its favourable conservation condition is identified as no change to the OP indicative water quality status for these waterbodies has been demonstrated.

6.4.4 (1421) Killarney fern (*Trichomanes speciosum*)

Killarney fern is currently known from one location in Cloghernagore Bog and Glenveagh National Park SAC, within hectad B91. A review of the SSCOs for Killarney fern (NPWS, 2017) found no specific attributes or targets relating to nutrients or water quality. Hectad B91 is upstream of the dosing area; it is therefore considered that dosing will not prevent the maintenance or restoration of favourable conservation condition of Killarney fern in the Cloghernagore Bog and Glenveagh National Park SAC / no deterioration of its favourable conservation condition is identified.

6.4.5 (3110) Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)

Habitat 3110, the oligotrophic lake habitat (in the Directive entitled 'Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)' typically occurs in soft-water, nutrient poor lakes frequently associated with acid bedrock catchments (notably granite and old red sandstone) overlain by peatland (NPWS, 2013).

All lakes larger than 1ha were mapped as potential 3110 habitat. SSCOs (NPWS, 2017) for lake habitat 3110, include attributes and targets related to water quality and specifically nutrients where: annual average Total Phosphorus (TP) concentration should $\leq 10\mu\text{g/l}$ TP.. Targets for phytoplankton biomass are also specified where: during the average growing season (March – October) Chlorophyll a concentration must be $< 5.8 \mu\text{g/l}$; the annual Chlorophyll a concentration must be $< 2.5 \mu\text{g/l}$ and the annual peak chlorophyll a concentration should be $\leq 8 \mu\text{g/l}$.

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 oligotrophic waters (habitat 3110) in Cloghernagore Bag and Glenveagh National Park SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Northwest Donegal (IE_NW_G_049) groundwater body has 'Good' OP status, an estimated modelled increase of 0.0002 mg/l P, a baseline concentration of 0.0175 mg/l P, a baseline following dosing of 0.0177 mg/l P. The WFD OP indicative water quality does not change, i.e. Good, therefore there is no deterioration in water quality from the proposed project on this groundwater body. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00175 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

The EAM assessment results which evaluate the additional OP loading from dosing at Gortahork WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and groundwater bodies connected to Oligotrophic waters in the Cloghernagore Bog and Glenveagh National Park SAC. Therefore, potential for significant effects on this habitat can be excluded.

Furthermore, dosing will not prevent the maintenance or restoration of favourable conservation condition of otter in this SAC / no deterioration of its favourable conservation condition is identified as no change to the OP indicative water quality status for these waterbodies has been demonstrated

6.4.6 (3260) Water courses of plain to montane levels with the *Ranunculus fluitantis* and *Callitriche-Batrachion* vegetation

The EU definition of this habitat is very broad. This habitat type can occur over a wide range of physical conditions, from acid, oligotrophic, flashy upland streams to more eutrophic slow flowing streams (NPWS, 2017). The distribution of water courses of plain to montane levels habitat and their sub-types has not been fully determined in the Cloghernagore Bog and Glenveagh National Park SAC. The SSCO attributes and targets relevant to the current project are ‘water quality: various’ and to ‘maintain appropriate water quality to support the natural structure and functioning of the habitat’. While specific targets will vary with sub types it is noted (SSCO, NPWS, 2017) that the rivers within this SAC are naturally very nutrient poor and therefore typically require WFD high status in terms of nutrient and oxygenation standards.

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 water courses of plain to montane levels (Habitat 3260) in the Cloghernagore Bog and Glenveagh National Park SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Northwest Donegal (IE_NW_G_049) groundwater body has ‘Good’ OP status, an estimated modelled increase of 0.0002 mg/l P, a baseline concentration of 0.0175 mg/l P, a baseline following dosing of 0.0177 mg/l P. The WFD OP indicative water quality does not change, i.e. Good, therefore there is no deterioration in water quality from the proposed project on this groundwater body. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00175 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

The EAM assessment results which evaluate the additional OP loading from dosing at Gortahork WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and ground water bodies connected to Water courses of plain to montane levels with the *Ranunculus fluitantis* and *Callitriche-Batrachion* vegetation in the Cloghernagore Bog and Glenveagh National Park SAC. Therefore, potential for significant effects on this habitat can be excluded.

Furthermore, dosing will not prevent the maintenance or restoration of favourable conservation condition of this habitat in this SAC / no deterioration of its favourable conservation condition is identified as no change to the OP indicative water quality status for these waterbodies has been demonstrated.

6.4.7 (4010) Northern Atlantic wet heaths with *Erica tetralix*, (7130) Blanket bogs (*if active bog), (7150) Depressions on peat substrates of the *Rhynchosporion*.

The aforementioned peat habitats occur in mosaics together and have not been mapped in detail for this SAC. The SSCO’s for these habitats include an attribute which relates to Ecosystem function and specifically to soil nutrients, with a target to maintain soil nutrient status within the natural range suited to the habitat. Relevant nutrients and their natural ranges are yet to be defined however, Appendix B lists these habitats as water sensitive and nutrient dependent for the purposes of this OP dosing project.

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 peat habitats in the Cloghernagore Bog and Glenveagh National Park SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Northwest Donegal (IE_NW_G_049) groundwater body has 'Good' OP status, an estimated modelled increase of 0.0002 mg/l P, a baseline concentration of 0.0175 mg/l P, a baseline following dosing of 0.0177 mg/l P. The WFD OP indicative water quality does not change, i.e. Good, therefore there is no deterioration in water quality from the proposed project on this groundwater body. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00175 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

The EAM assessment results which evaluate the additional OP loading from dosing at Gortahork WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and ground water bodies connected to the abovementioned peat habitats in Cloghernagore Bog and Glenveagh National Park SAC. Therefore, potential for significant effects on these habitats can be excluded.

Furthermore, dosing will not prevent the maintenance/ restoration of favourable conservation condition of the above-mentioned peat habitats in this SAC/ no deterioration of its favourable conservation condition is identified as no change to the OP indicative water quality status for these waterbodies has been demonstrated.

6.4.8 (6410) *Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)*

The Annex I habitat 6410 is represented in Ireland by both fen and grassland communities on nutrient poor soils. Within Ireland *Molinia meadows* occur in lowland plains on neutral to calcareous gleys, sometimes with a Marl layer beneath the surface, or on peaty soils both in lowland and upland situations (NPWS, 2013b). *Molinia meadows* have not been mapped in detail for Cloghernagore Bog and Glenveagh National Park SAC (SSCO's), however they are known to occur in areas that are subjected to occasional flooding in the SAC. An attribute for this habitat relates to vegetation composition and specifically: typical species and negative indicator species, both of which may be affected by changes in nutrient inputs arising from water quality changes. The target for these attributes is to maintain at least seven positive indicator species and to control negative indicator 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 *Molinia meadow* habitats in the Cloghernagore Bog and Glenveagh National Park SAC. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Northwest Donegal (IE_NW_G_049) groundwater body has 'Good' OP status, an estimated modelled increase of 0.0002 mg/l P, a baseline concentration of 0.0175 mg/l P, a baseline following dosing of 0.0177 mg/l P. The WFD OP indicative water quality does not change, i.e. Good, therefore there is no deterioration in water quality from the proposed project on this groundwater body. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00175 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

The EAM assessment results which evaluate the additional OP loading from dosing at Gortahork WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and ground water bodies connected to the above mentioned *Molinia meadow* habitat in Cloghernagore Bog and Glenveagh National Park SAC. Therefore, potential for significant effects on this habitat can be excluded.

Furthermore, dosing will not prevent the maintenance/ restoration of favourable conservation condition of this habitat in the SAC/ no deterioration of its favourable conservation condition is identified as no change to the OP indicative water quality status for these waterbodies has been demonstrated.

6.5 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 a SPA for its breeding populations of (A001) Red-throated Diver, (A098) Merlin, (A103) Peregrine, (A140) Golden Plover, and (A466) Dunlin. Red-throated diver breed on small (<5 Ha) bog loughs within the SAC (Cromie, 2002) and feed away from their nest site on nearby lakes or coastal waters. Ireland holds a small population of under 10 pairs (Cromie, 2002). Changes in water quality may affect the foraging resources available to Red-throated diver. The COs (NPWS, 2016) 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 OP indicative water quality on:

- Northwest Donegal (IE_NW_G_049) groundwater body has ‘Good’ OP status, an estimated modelled increase of 0.0002 mg/l P, a baseline concentration of 0.0175 mg/l P, a baseline following dosing of 0.0177 mg/l P. The WFD OP indicative water quality does not change, i.e. Good, therefore there is no deterioration in water quality from the proposed project on this groundwater body. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00175 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

The EAM assessment results which evaluate the additional OP loading from dosing at Gortahork WTP have demonstrated that there will be no change in the OP indicative water quality status of surface and ground water bodies connected to habitats associated with the above-mentioned bird species in Derryveagh and Glendowan Mountains SPA. Therefore, potential for significant effects on these species can be excluded.

Furthermore, dosing will not prevent the maintenance or restoration of favourable conservation condition of habitats associated with the above-mentioned bird species in this SAC / no deterioration of its favourable conservation condition is identified as no change to the OP indicative water quality status for these waterbodies has been demonstrated.

6.6 FALCARRAGH TO MEENLARAGH SPA 004149

Falcarragh to Meenlaragh SPA is located on the eastern and western sides of Ballyness Bay on the north-west coast of Co. Donegal. This large site follows the coastline from Falcarragh to Meenlaragh and encompasses three areas of mixed agricultural grassland. The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: (A122) Corncrake *Crex crex*.

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 Falcarragh to Meenlaragh 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 water quality and nutrient conditions on:

- An_Cheathrú_Cheanainn_010 (IE_NW_38C180660) river waterbody and estimated a modelled increase of 0.0006 mg/l P. The resulting orthophosphate concentration following

dosing is 0.0131 mg/l P. The RWB WFD OP indicative water quality is unchanged following dosing, i.e. *High*. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Gortahork WTP for this river waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00125 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

- Tullaghobegly_020 (IE_NW_38T010400) river waterbody and estimated a modelled increase of 0.0004 mg/l P. The resulting orthophosphate concentration following dosing is 0.0368 mg/l P. The RWB WFD OP indicative water quality is unchanged following dosing, i.e. *Moderate* and dosing will not prevent the restoration to favourable status, i.e. *high*. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Gortahork WTP for this river waterbody.
- Glen (Meenacldy)_010 (IE_NW_38G050200) river waterbody has a baseline concentration of 0.0125 mg/l P and a surrogate 'Good' OP indicative water quality status. It has an estimated a modelled increase of 0.0012 mg/l P. The resulting OP concentration following dosing is 0.0137 mg/l P. The RWB WFD OP indicative water quality is unchanged following dosing, i.e. *Good*. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Gortahork WTP for this river waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00125 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.
- Owenawillin_010 (IE_NW_38O100200) river waterbody and estimated a modelled increase of 0.0010 mg/l P. The resulting orthophosphate concentration following dosing is 0.0135 mg/l P. The RWB WFD OP indicative water quality is unchanged following dosing, i.e. *High* and dosing will not prevent the restoration to favourable status, i.e. *high*. Therefore, there is no risk of deterioration in WFD OP indicative water quality following OP dosing in Gortahok WTP for this river waterbody. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00125 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.
- Northwest Donegal (IE_NW_G_049) groundwater body has 'Good' OP status, an estimated modelled increase of 0.0002 mg/l P, a baseline concentration of 0.0175 mg/l P, a baseline following dosing of 0.0177 mg/l P. The WFD OP indicative water quality does not change, i.e. *Good*, therefore there is no deterioration in water quality from the proposed project on this groundwater body. On the basis of predicted loading, the risk of using surrogate data is excluded because the loading values are significantly below the 0.00175 mg/l P significance threshold and would not register a significant effect even on high status waterbodies with QI receptors that require high status.

The EAM assessment results which evaluate the additional OP loading from dosing at Gortahork WTP on OP indicative water quality statuses have demonstrated that there will be no change in the OP indicative water quality status of the above mentioned groundwater body, there is sufficient capacity within the status threshold, and there will be no alteration to water quality meaning there will be no potential for significant effect on habitats associated with the above-mentioned bird species in Falcarragh to Meenlaragh SPA.

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

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

In order to ensure all potential impacts upon European sites within the project's Zol were considered, including those direct and indirect impacts that are a result of cumulative or in-combination impacts, 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 impacts are likely to be significant.

Donegal County Council Development Plan was reviewed for developments that may have in-combination effects on European Sites with the Zol. 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 Impacts 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 and Mitigation
<p>Donegal County Council Development Plan 2018 – 2024.</p> <p>The objectives of relevance in the Donegal County Development Plan include under Infrastructure (Water and Environmental Services):</p> <p>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.</p> <p>WES-0-5: Maintain, protect, improve and enhance surface waters and groundwater quality in accordance with the relevant River Basin Management Plan.</p> <p>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.</p> <p>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.</p>	<ul style="list-style-type: none"> ▪ N/A 	<p>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 National Plan 2018-2021⁸), and emphasises compliance with environmental objectives. There is no potential for cumulative impacts with these plans.</p>
<p>River Basin Management Plan For Ireland 2018 – 2021</p> <p>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’ ecological status, appear to have declined by 3% since 2007 – 2009;</p>	<ul style="list-style-type: none"> ▪ N/A 	<p>The objectives of the RBMP are to:</p> <ul style="list-style-type: none"> ▪ Prevent deterioration; ▪ Restore good status; ▪ Reduce chemical pollution; and ▪ Achieve water related protected areas objectives.

⁸ DHPLG (2016) Public Consultation on the River Basin Management Plan for Ireland (2018-2021)

<p>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.</p> <p>Chapter 5 of the RBMP presents results of the catchment characterisation process, which identifies the significant pressures on each water body that is <i>At Risk</i> 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 <i>At Risk</i> 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 <i>At Risk</i>. Urban waste water, hydromorphology and forestry were also significant pressures amongst others.</p>		<p>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.</p>
<p>Catchment based Flood Risk Assessment and Management (CFRAM) Programme, under the Floods Directive</p> <p>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.</p>	<ul style="list-style-type: none"> ▪ 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 	<p>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 impacts with the CFRAMS programme as no infrastructure is proposed as part of this project.</p>

<p>Foodwise 2025 Foodwise 2025 strategy identifies significant growth opportunities across all subsectors of the Irish agri-food industry. Growth Projection includes increasing the value added in the agri-food, fisheries and wood products sector by 70% to in excess of €13 billion.</p>	<ul style="list-style-type: none"> ▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition; and ▪ Disturbance to habitats / species 	<p>Foodwise 2025 was subject to its own AA. Growth is to be achieved through sustainable intensification to maximise production efficiency whilst minimising the effects on the environment however there is increased risk of nutrient discharge to receiving waters and in turn a potential risk to biodiversity and Europe Sites if not controlled. With the required mitigation in the Food Wise Plan, no significant in-combination impacts are predicted. Mitigation measures 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.</p>
<p>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 '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</p>	<ul style="list-style-type: none"> ▪ Overgrazing; ▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition; and ▪ Disturbance to habitats / species; 	<p>The RDP for 2014 – 2020 has been subject to SEA, and AA. 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 impacts on Natura 2000 sites.</p>

<p>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.</p>		
<p>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.</p>	<ul style="list-style-type: none"> ▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition; and ▪ Disturbance to habitats / species 	<p>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. 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.</p>
<p>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 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.</p>	<ul style="list-style-type: none"> ▪ Habitat loss or destruction; ▪ Habitat fragmentation or degradation; ▪ Water quality changes; and ▪ Disturbance to species. 	<p>Ireland's Forestry Programme 2014 – 2020 has undergone AA. 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 impacts with the proposed project.</p>
<p>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</p>	<ul style="list-style-type: none"> ▪ Habitat loss and disturbance from new / upgraded infrastructure; ▪ Species disturbance; 	<p>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.</p>

<p>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.</p>	<ul style="list-style-type: none"> ▪ Changes to water quality or quantity; and ▪ Nutrient enrichment /eutrophication. 	
<p>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.</p>	<ul style="list-style-type: none"> ▪ Habitat loss and disturbance from new / upgraded infrastructure; ▪ Species disturbance; ▪ Changes to water quality or quantity; and ▪ Nutrient enrichment /eutrophication. 	<p>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.</p>
<p>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.</p>	<ul style="list-style-type: none"> ▪ Changes to water quality or quantity; and ▪ Nutrient enrichment /eutrophication. 	<p>The plan is subject to SEA and AA which have also been published and are available at http://www.water.ie. Upstream dosing areas have been considered in the EAM and the cumulative effect of dosing taken into account.</p>

7. SCREENING CONCLUSION STATEMENT

This Screening for AA has considered the potential for significant effects arising from the proposed OP dosing at the Gortahork WTP sites within the Gortahork Falcarragh WSZ, with reference to the potential for significant effects on the European Sites within the Zol. 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 **Ballyness Bay SAC (001090)**, **Fawnboy Bog/Lough Nacuna SAC (000140)**, **Gweedore Bay and Island SAC (001141)**, **Cloghernagore Bog and Glenveagh National Park SAC (002047)**, **Derryveagh and Glendowan Mountains SPA (004039)** and the **Falcarragh to Meenlaragh SPA** 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 there is not potential for significant direct, indirect or cumulative impacts which could affect the qualifying interests/special conservation interests of the European sites within the study area. It is therefore concluded, beyond reasonable scientific doubt, that the proposed project will not give rise to significant effects, either individually or in combination with other plans and projects, within the identified European Site(s).

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

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Appendix A

European Sites - Conservation Objectives

National Parks and Wildlife Service

Conservation Objectives Series

Fawnboy Bog/Lough Nacung SAC 000140



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

Department of Arts, Heritage,
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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

000140	Fawnboy Bog/Lough Nacung SAC
1029	Freshwater Pearl Mussel <i>Margaritifera margaritifera</i>
4010	Northern Atlantic wet heaths with <i>Calluna vulgaris</i>
7130	Blanket bogs (* if active bog)
7150	Depressions on peat substrates of the Rhynchosporion

Please note that this SAC overlaps with Derryveagh and Glendowan Mountains SPA (004039) and adjoins 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 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 :	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 :	2009
Title :	NS II freshwater pearl mussel sub-basin management plans: monitoring of the freshwater pearl mussel in the Clady
Author :	Moorkens, E.
Series :	unpublished report to NPWS
Year :	2009
Title :	NS II freshwater pearl mussel sub-basin management plans: fisheries survey. Stage 1 report
Author :	Paul Johnston Associates
Series :	Unpublished report to NPWS
Year :	2009
Title :	NS II freshwater pearl mussel sub-basin management plans: phytobenthos monitoring of the Clady catchment, Co. Donegal
Author :	Ni Chathain, B.
Series :	Unpublished report to NPWS
Year :	2009
Title :	NS II freshwater pearl mussel sub-basin management plans. Report on biological monitoring of surface water quality in the Clady catchment, Co. Donegal
Author :	Williams, L.
Series :	Unpublished report to NPWS
Year :	2010
Title :	Second draft Clady freshwater pearl mussel sub-basin management plan (2009-2015) March 2010
Author :	NPWS
Series :	Unpublished document to the Department of Environment, Heritage and Local Government
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 :	The status of EU protected habitats and species in Ireland. Volume 2. Habitats assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 3. Species 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 : Monitoring populations of the freshwater pearl mussel *Margaritifera margaritifera*. 2014 monitoring survey of the river Clady, Co. Donegal
Author : Moorkens, E.
Series : Unpublished report to NPWS

Year : 2016
Title : Fawnboy Bog/Lough Nacung SAC (site code: 140) Conservation objectives supporting document- upland habitats V1
Author : NPWS
Series : Conservation objectives supporting document

Other References

Year : 1988
Title : The Irish red data book 1. Vascular plants
Author : Curtis, T.G.F; McGough, H.N.
Series : Wildlife Service, Dublin

Year : 2006
Title : The status of host fish populations and fish species richness in European freshwater pearl mussel (*Margaritifera margaritifera*) streams
Author : Geist, J.; Porkka, M.; Kuehn, R.
Series : Aquatic Conservation: Marine and Freshwater Ecosystems, 16: 251-266

Year : 2010
Title : Addressing the conservation and rehabilitation of *Margaritifera margaritifera* populations in the Republic of Ireland within the framework of the habitats and species directive
Author : Moorkens, E.
Series : Journal of Conchology, 40: 339

Year : 2014
Title : Assessing near-bed velocity in a recruiting population of the endangered freshwater pearl mussel (*Margaritifera margaritifera*) in Ireland
Author : Moorkens, E.; Killeen, I.
Series : Aquatic Conservation: Marine and Freshwater Ecosystems 24(6), 853-862

Spatial data sources

Year :	Revision 2012
Title :	Margaritifera Sensitive Areas data
GIS Operations :	Relevant catchment boundaries identified. Expert opinion used as necessary to resolve any issues arising
Used For :	1029 (map 3)
<hr/>	
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 :	1029 (map 3)
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4010 Northern Atlantic wet heaths with *Erica tetralix*

To restore the favourable conservation condition of Northern Atlantic wet heaths with *Erica tetralix* in Fawnboy Bog/Lough Nacung 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 <i>Erica tetralix</i> habitat has not been mapped in detail for Fawnboy Bog/Lough Nacung SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 150ha. Further information can be found in Douglas et al. (1990). Further details on this and the following attributes can be found in the Fawnboy Bog/Lough Nacung SAC conservation objectives supporting document for upland habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	Areas of wet heath appear to be most extensive in the areas of the SAC north of Lough Nacung; information from the GIS files associated with NPWS (2013). Further information can be found within this source and the uplands 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 uplands supporting document for further details
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	The diversity of wet heath communities within this SAC is unknown. 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 2m x 2m monitoring stops	Cross-leaved heath (<i>Erica tetralix</i>) present near each monitoring stop	Based on Perrin et al. (2014). See the uplands supporting document for further details
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%	Based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented. Further details can be found in the uplands supporting document
Vegetation composition: lichens and bryophytes	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of <i>Cladonia</i> and <i>Sphagnum</i> species, <i>Racomitrium lanuginosum</i> and pleurocarpous mosses at least 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation composition: ericoid species and crowberry	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of ericoid species and crowberry (<i>Empetrum nigrum</i>) at least 15%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation composition: dwarf shrub species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of dwarf shrubs less than 75%	Based on Perrin et al. (2014). See the uplands supporting document for further details
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%	Based on Perrin et al. (2014), where the list of negative indicator species is also presented. Further details can be found in the uplands supporting document
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%	Based on Perrin et al. (2014). See the uplands supporting document for further details
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%	Based on Perrin et al. (2014). See the uplands supporting document for further details

Vegetation composition: bracken	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of bracken (<i>Pteridium aquilinum</i>) less than 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation composition: soft rush	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of soft rush (<i>Juncus effusus</i>) less than 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation structure: <i>Sphagnum</i> condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the <i>Sphagnum</i> cover is crushed, broken and/or pulled up	Based on Perrin et al. (2014). See the uplands supporting document for further details
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 (<i>Empetrum nigrum</i>) and bog-myrtle (<i>Myrica gale</i>) showing signs of browsing	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation structure: burning	Occurrence in local vicinity of a representative number of 2m x 2m monitoring stops	No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Based on Perrin et al. (2014), where the list of sensitive areas is also presented. Further details can be found in the uplands supporting document
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%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Physical structure: drainage	Percentage cover in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
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, Curtis and McGough (1988) and Lockhart et al. (2012). See the uplands supporting document for further details. The red data book species <i>Erica mackaiana</i> is noted as being present within wet heath in the SAC (NPWS internal files)

Conservation Objectives for : Fawnboy Bog/Lough Nacung SAC [000140]

7130 Blanket bogs (* if active bog)

To restore the favourable conservation condition of Blanket bogs in Fawnboy Bog/Lough Nacung 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 Fawnboy Bog/Lough Nacung SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 250ha. Further information can be found in Douglas et al. (1990). Further details on this and the following attributes can be found in the Fawnboy Bog/Lough Nacung SAC conservation objectives supporting document for upland habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	Extensive areas of blanket bog were recorded by Douglas et al. (1990). Further information can be found within this source and the uplands 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 uplands 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 uplands 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 uplands supporting document
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	Douglas et al. (1990) recorded a variety of blanket bog vegetation communities at this site, one of which corresponds to a community recorded in the National Survey of Upland Habitats and listed in the provisional list of vegetation communities described in Perrin et al. (2014). See the uplands supporting document for further details
Vegetation composition: positive indicator species	Number of species at a representative number of 2m x 2m monitoring stops	Number of positive indicator species at each monitoring stop is at least seven	Based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented. See the uplands supporting document for further details
Vegetation composition: lichens and bryophytes	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of bryophytes or lichens, excluding <i>Sphagnum fallax</i> , at least 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
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%	Based on Perrin et al. (2014). See the uplands supporting document for further details, including the list of potentially 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%	Based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented. See the uplands supporting document for further details
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%	Based on Perrin et al. (2014). See the uplands supporting document for further details. The non-native species <i>Campylopus introflexus</i> was recorded by Douglas et al. (1990) within areas of fire damaged blanket bog in the SAC
Vegetation composition: native trees and scrub	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details

Vegetation structure: <i>Sphagnum</i> condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the <i>Sphagnum</i> cover is crushed, broken and/or pulled up	Based on Perrin et al. (2014). See the uplands supporting document for further details
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 (<i>Empetrum nigrum</i>) and bog-myrtle (<i>Myrica gale</i>) showing signs of browsing collectively less than 33%	Based on Perrin et al. (2014). See the uplands supporting document for further details
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	Based on Perrin et al. (2014), where the list of sensitive areas is also presented. See the uplands supporting document for further details
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%	Based on Perrin et al. (2014). See the uplands supporting document for further details
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%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Physical structure: erosion	Occurrence in local vicinity of a representative number of monitoring stops	Less than 5% of the greater bog mosaic comprises erosion gullies and eroded areas	Based on Perrin et al. (2014). See the uplands supporting document for further details
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, Curtis and McGough (1988) and Lockhart et al. (2012). See the uplands supporting document for further details. The red data book species <i>Erica mackaiana</i> has been recorded within blanket bog in the SAC (Douglas et al., 1990)

Conservation Objectives for : Fawnboy Bog/Lough Nacung SAC [000140]

7150 Depressions on peat substrates of the Rhynchosporion

To restore the favourable conservation condition of Depressions on peat substrates of the Rhynchosporion in Fawnboy Bog/Lough Nacung 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	Depressions on peat substrates of the Rhynchosporion habitat has not been mapped in detail for Fawnboy Bog/Lough Nacung SAC and thus total area of the qualifying habitat is unknown. Further information can be found in Douglas et al. (1990). Further details on this and the following attributes can be found in the Fawnboy Bog/Lough Nacung SAC conservation objectives supporting document for upland habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	Further information can be found within Douglas et al. (1990) and the uplands 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 uplands supporting document for further details
Vegetation composition: positive indicator species	Number of species at a representative number of 2m x 2m monitoring stops	Number of positive indicator species at each monitoring stop is at least five	Based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented. See the uplands supporting document for further details
Vegetation composition: <i>Rhynchospora</i> spp.	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of white beaked sedge (<i>Rhynchospora alba</i>) and brown beaked sedge (<i>R. fusca</i>) at least 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
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 35%	Based on Perrin et al. (2014). See the uplands supporting document for further details
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%	Based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented. See the uplands supporting document for further details
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%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation composition: native trees and scrub	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation structure: <i>Sphagnum</i> condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the <i>Sphagnum</i> cover is crushed, broken and/or pulled up	Based on Perrin et al. (2014). See the uplands supporting document for further details
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 (<i>Empetrum nigrum</i>) and bog-myrtle (<i>Myrica gale</i>) showing signs of browsing collectively less than 33%	Based on Perrin et al. (2014). See the uplands supporting document for further details
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	Based on Perrin et al. (2014), where the list of sensitive areas is also presented. See the uplands supporting document for further details

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%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Physical structure: drainage	Occurrence in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Physical structure: erosion	Occurrence in local vicinity of a representative number of monitoring stops	Less than 5% of the greater bog mosaic comprises erosion gullies and eroded areas	Based on Perrin et al. (2014). See the uplands supporting document for further details
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, Curtis and McGough (1988) and Lockhart et al. (2012). See the uplands supporting document for further details

Conservation Objectives for : Fawnboy Bog/Lough Nacung SAC [000140]

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

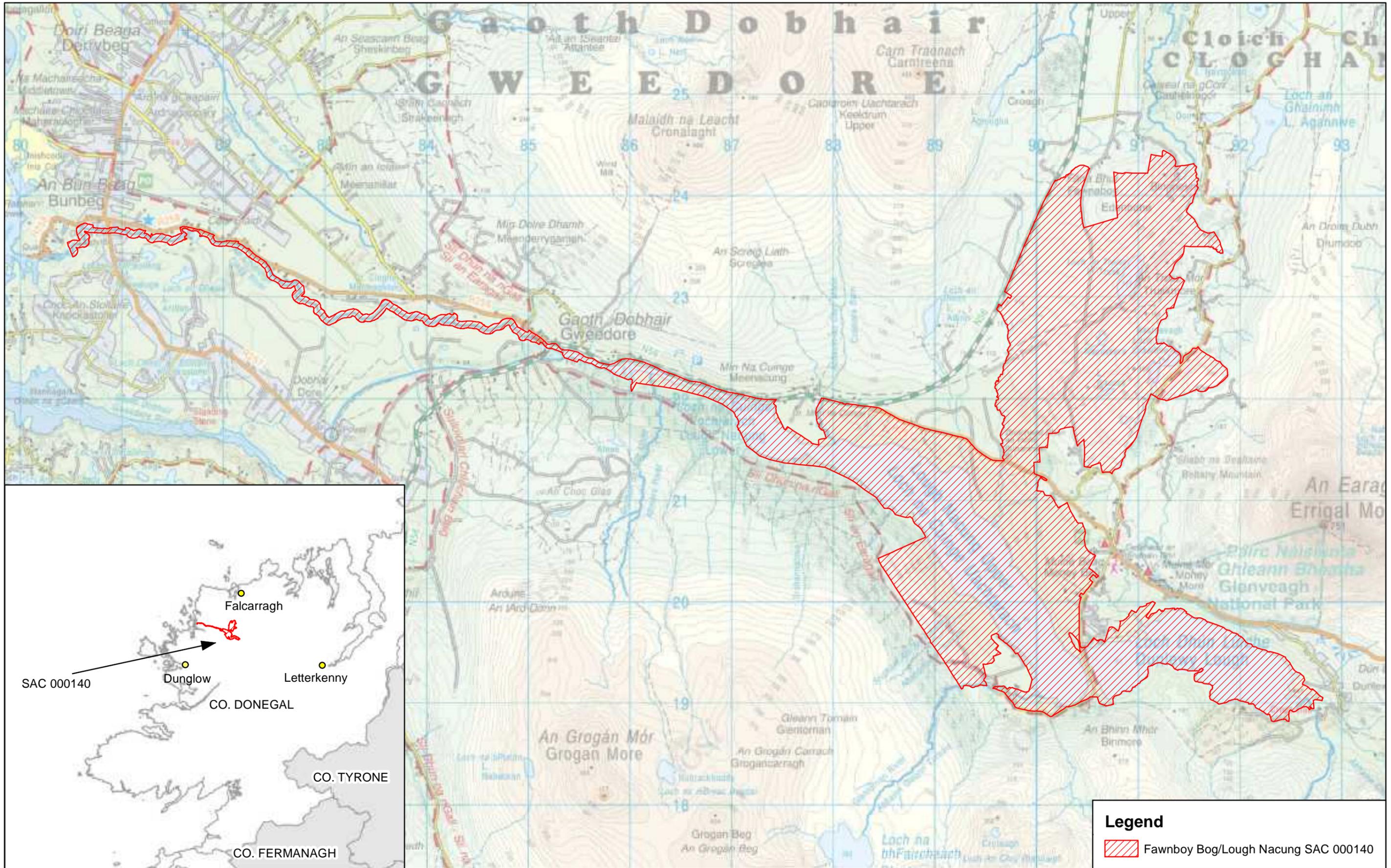
To restore the favourable conservation condition of Freshwater Pearl Mussel in Fawnboy Bog/Lough Nacung SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Kilometres	Maintain at 7.81km. See map 3	The conservation objective applies to the Clady freshwater pearl mussel (<i>Margaritifera margaritifera</i>) population, which is listed on SI 296 of 2009. The distribution and abundance of the freshwater pearl mussel in the Clady was mapped in 2006, as part of full, baseline monitoring (Moorkens, 2007). Mussels are distributed in the Clady River from near to Lough Nacung to the tidal limits downstream of Bunbeg. Mussels are occasional in the upper stretches near Lough Nacung, becoming frequent to common after 300m and abundant from 1km downstream of Gweedore to Bunbeg. The target is for the species to be sufficiently widespread to maintain itself on a long-term basis as a viable component of the Clady system. See NPWS (2010) for further information
Population size	Number of adult mussels	Restore Clady population to at least 250,000 adult mussels	Moorkens (2007) estimated the Clady population as at least 250,000. No elevated losses of adult mussels have been recorded since that baseline (Moorkens, 2009, 2015). As noted above, mussels were abundant from c.1km downstream of Gweedore to Bunbeg, and in one stretch downstream of Bunbeg (Moorkens, 2007). In 2006, mussel density of more than 100/m ² was recorded in places, while maximum density in transects was 58/m ² (Moorkens, 2007). The target is for the species to be sufficiently abundant to maintain itself on a long-term basis as a viable component of the Clady system
Population structure: recruitment	Percentage per size class	Restore to at least 20% of population no more than 65mm in length; and at least 5% of population no more than 30mm in length.	Mussels of no more than 65mm are considered 'young mussels' and may be found buried in the substratum and/or beneath adult mussels. Mussels of no more than 30mm are 'juvenile mussels' and are always buried in the substratum. See also the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. The Clady is a steadily ageing population with no evidence for successful recruitment in recent times. In 2006, the Clady failed both targets and no mussels under 71mm were found (Moorkens, 2007). It failed both targets again in 2009, with no mussels under 75mm (Moorkens, 2009; NPWS, 2010). In 2014, no mussels under 81mm were found (Moorkens, 2015). The Clady population is unsustainable owing to lack of survival of juvenile mussels. The target is for sufficient juvenile recruitment to allow the species to maintain itself on a long-term basis as a viable component of the Clady system
Population structure: adult mortality	Percentage	No more than 5% decline from previous number of live adults counted; dead shells less than 1% of the adult population and scattered in distribution	5% is considered the cut-off between the combined errors associated with natural fluctuations and sampling methods and evidence of true population decline. 1% of dead shells is considered to be indicative of natural losses. There is no evidence for unnatural levels of mortality in the Clady since the baseline survey in 2006, and it passed both targets in 2009 and 2014 (Moorkens, 2007, 2009, 2015; NPWS, 2010). The Clady population is unsustainable owing to lack of survival of juvenile mussels. The target is for sufficient survival of adults to allow the species to maintain itself on a long-term basis as a viable component of the Clady system

Suitable habitat: extent	Kilometres	Restore suitable habitat in more than 7.81km in the Clady system (see map 3) and any additional stretches necessary for salmonid spawning	The extent of the mussel habitat in the Clady River is from downstream of Lough Nacung to the tidal limits (Moorkens, 2007, 2009; NPWS, 2010). Flow regulation and associated hydromorphological impacts are key issues for the mussel habitat in the Clady (Moorkens, 2007, 2009, 2015; NPWS, 2010). The mussel habitat also suffers from siltation and nutrient-enrichment, and drainage and other disturbance to peatland is a significant pressure. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clady system
Suitable habitat: condition	Kilometres	Restore condition of suitable habitat	The species' habitat is a combination of 1) the area of habitat adult and juvenile mussels can occupy and 2) the area of spawning and nursery habitats the host fish can occupy. Fish nursery and mussel habitat typically overlap. Fish spawning habitat is generally adjacent to mussel habitat, but may lie upstream of the generalised mussel distribution. Only those spawning areas that can regularly contribute juvenile fish to areas occupied by adult mussels should be considered. The availability of mussel and fish spawning/nursery habitat is determined by flow and substratum conditions. It is highly sensitive to hydromorphological changes, sedimentation and nutrient enrichment. Pressures from throughout the catchment (map 3) contribute to such impacts. The habitat in the Clady cannot support sufficient juvenile survival. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clady system
Water quality: macroinvertebrate and phytobenthos (diatoms)	Ecological quality ratio (EQR)	Restore water quality-macroinvertebrates: EQR greater than 0.90 (Q4-5 or Q5); phytobenthos: EQR greater than 0.93	These EQRs correspond to high ecological status for these two Water Framework Directive biological quality elements. They represent high water quality with very low nutrient concentrations (oligotrophic conditions). In 2009, the habitat in the Clady system failed the macroinvertebrate target, but passed the diatom target, however, the diatom coating was quite heavy in places (Ní Chatháin, 2009; Williams, 2009; NPWS, 2010). See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clady system
Substratum quality: filamentous algae (macroalgae); macrophytes (rooted higher plants)	Percentage	Restore substratum quality- filamentous algae: absent or trace (less than 5%); macrophytes: absent or trace (less than 5%)	The Clady failed both targets in 2009 (NPWS, 2010). High cover abundance of filamentous algae (up to 100%) and macrophytes (up to 75%) was recorded in the mussel quadrats (Moorkens, 2009). Plant abundance varied spatially and temporally, but failed the targets throughout the Clady system (Ní Chatháin, 2009; Williams, 2009; NPWS, 2010). There was evidence of significant enrichment just upstream of Bunbeg Bridge, including 50% <i>Myriophyllum</i> cover (Williams, 2009). The Clady failed the targets again in 2014, with both living and dead filamentous algae throughout the mussel habitat and very dense cover in most quadrats sampled (Moorkens, 2015). <i>Myriophyllum</i> cover was up to 10% in some quadrats (Moorkens, 2015). The poor condition of the river substratum is preventing sufficient recruitment of juvenile mussels. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clady system

Substratum quality: sediment	Occurrence	Restore substratum quality- stable cobble and gravel substrate with very little fine material; no artificially elevated levels of fine sediment	The Clady failed the target for the Sub-basin Management Plan (NPWS, 2010), with significant silt plumes in mussel habitat (Moorkens, 2009). Siltation impacts were patchily distributed throughout the Clady in both 2006 and 2009 (Moorkens, 2007; Williams, 2009). The Clady passed the target in 2014, when surface siltation was not evident (Moorkens, 2015). Siltation impacts in the Clady may be episodic and linked to flow regulation and/or damage to peatland. Sufficient survival of juvenile mussels is being prevented by the poor condition of the river substratum. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clady system
Substratum quality: oxygen availability	Redox potential	Restore to no more than 20% decline from water column to 5cm depth in substrate	Differences in redox potential between the water column and the substrate correlate with differences in oxygen levels. Juvenile mussels require full oxygenation while buried in gravel. In suitable habitat, there should be very little loss of redox potential between the water column and underlying gravels. The Clady failed the redox target in 2009, with an average loss of 29% redox potential at 5cm (Moorkens, 2009; NPWS, 2010). It failed again (marginally) in 2014, when the average redox loss was 20% (Moorkens, 2015). The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clady system
Hydrological regime: flow variability	Metres per second	Restore appropriate hydrological regimes	The availability of suitable habitat is largely determined by flow (catchment geology being the other important factor). To restore habitat for the species, flow variability over the annual cycle must be such that: 1) high flows can wash fine sediments from the substratum; 2) high flows are not artificially increased causing excessive scour of mussel habitat; 3) low flows do not exacerbate deposition of fine sediment or growth of algae/macrophytes and 4) low flows do not cause stress to mussels in terms of exposure, water temperatures, food availability or aspects of the reproductive cycle; see Moorkens and Killeen (2014). Groundwater inflow to substratum contributes to water-cycling. Low flows appear to be impacting mussels in the Clady. The effects of the ESB HEP scheme and peatland degradation require investigation. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clady system
Host fish	Number	Maintain sufficient juvenile salmonids to host glochidial larvae	Salmonid fish are host to the larval stage of the freshwater pearl mussel and, thus, are essential to the completion of the life cycle. 0+ and 1+ fish are typically used, because of habitat overlaps and the development of immunity with age in fish. Fish presence is considered sufficient, as higher fish density and biomass is indicative of enriched conditions in mussel rivers. Geist et al. (2006) found that higher densities of host fish coincided with eutrophication, poor substrate quality for pearl mussels and a lack of pearl mussel recruitment, while significantly lower densities and biomass of host fish were associated with high numbers of juvenile mussels. Fish movements must be such that 0+ fish remain in the mussel habitat until their 1+ summer. No fish stocking should occur within the mussel habitat, nor any works that may change the salmonid balance or residency time. In May 2009, glochidia were found on salmon, but not on trout in the Clady (Johnston et al., 2009; NPWS, 2010)

Fringing habitat	Hectares	Maintain the area and condition of fringing habitats necessary to support the population	Riparian habitats, including those along lake fringes, particularly natural/semi-natural woodlands and wetlands, even where they do not form part of a natural floodplain, are an integral part of the structure and functioning of river systems. Fringing habitats assist in the settlement of fine suspended material, protect banks from erosion, contribute to nutrient cycling and to the aquatic food web (e.g. allochthonous matter such as leaf fall), and provide habitat (refuge and resources) for certain life-stages of fish, birds and aquatic invertebrates. Shade may also be important in suppressing algal and macrophyte growth in enriched rivers and moderating temperatures. Equally, fringing habitats are dependent on rivers/lakes, particularly their water levels, and support wetland communities and species of conservation concern. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clady system
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**MAP 1:
FAWNBOY BOG / LOUGH NACUNG SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION**

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

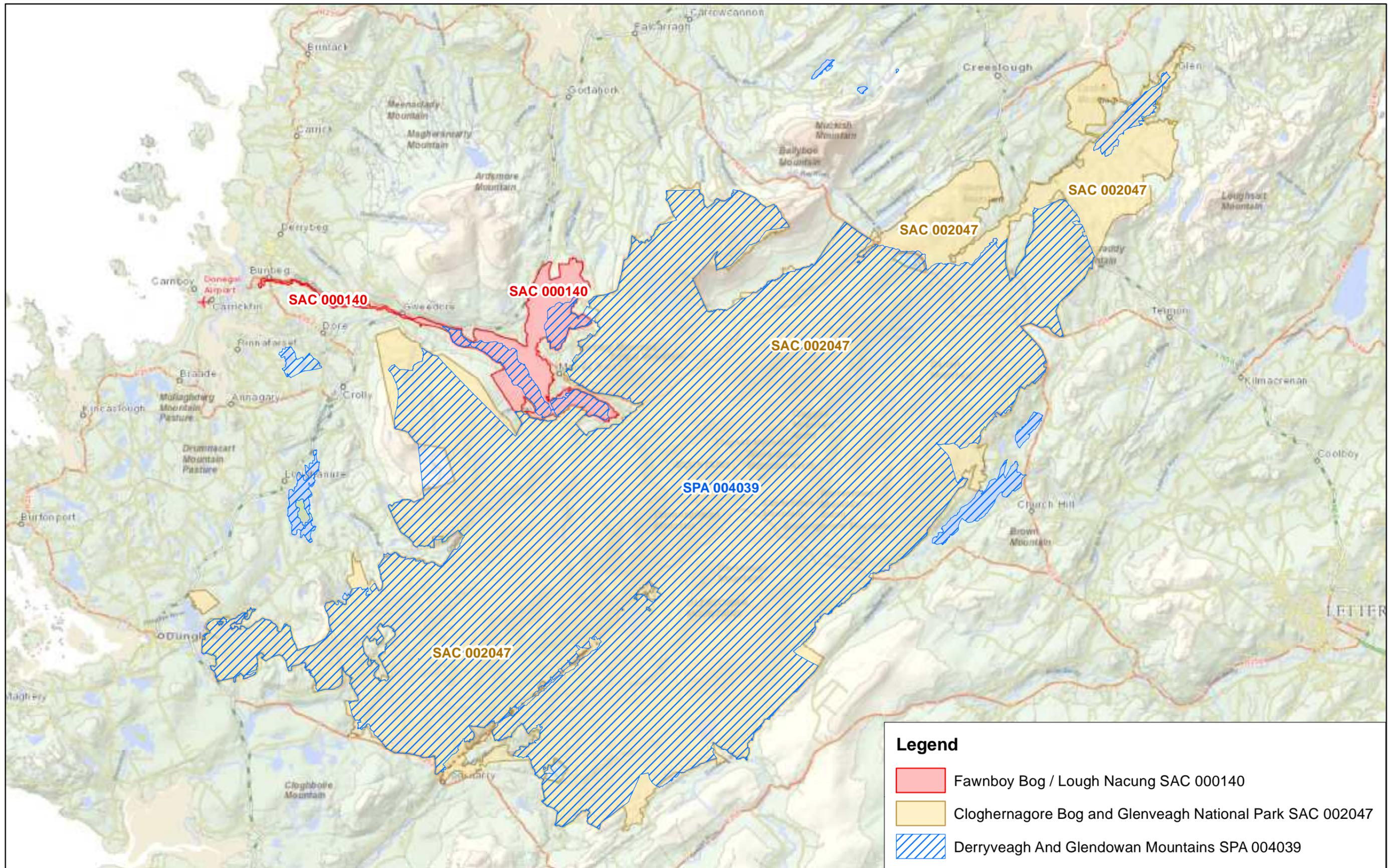
**SITE CODE:
SAC 000140; version 3. CO. DONEGAL.**

0 0.35 0.7 1.05 1.4 1.75 km

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision.
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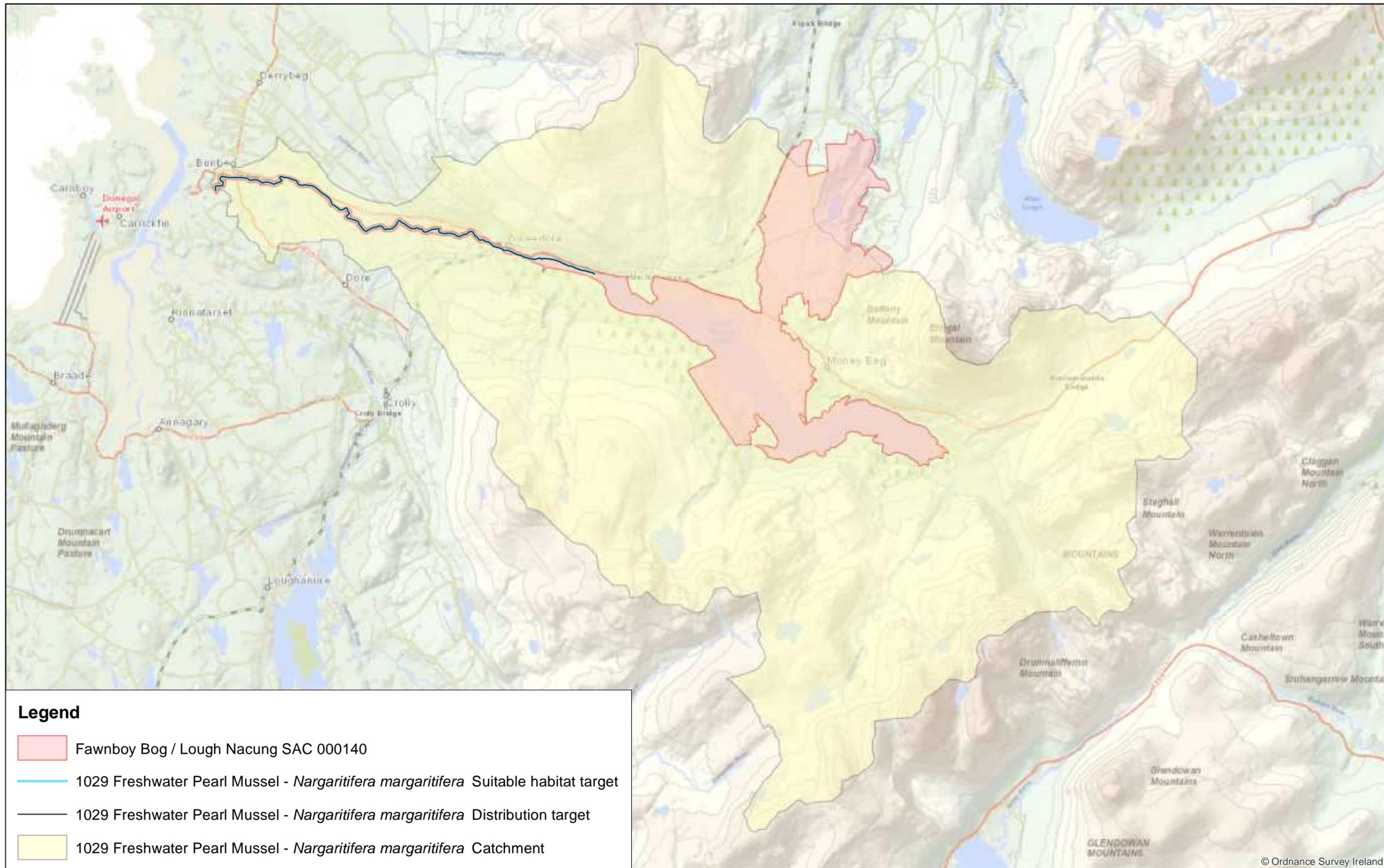
Níl sna teorainneacha ar na léarscáileanna ach nod garshuíomhach ginearálta. Féadfar athbheithniú a déanamh ar theorainneacha na gceantar comharthaíthe. Suirbhéarachta Ordonáis na hÉireann Ceadúnas Uimh EN 0059216. © Suirbhéarachta Ordonáis na hÉireann Rialtas na hÉireann

**Map Version 1
Date: July 2016**



Legend

- Fawnboy Bog / Lough Nacung SAC 000140
- Cloghernagore Bog and Glenveagh National Park SAC 002047
- Derryveagh And Glendowan Mountains SPA 004039



Legend

- Fawnboy Bog / Lough Nacung SAC 000140
- 1029 Freshwater Pearl Mussel - *Nargaritifera margaritifera* Suitable habitat target
- 1029 Freshwater Pearl Mussel - *Nargaritifera margaritifera* Distribution target
- 1029 Freshwater Pearl Mussel - *Nargaritifera margaritifera* Catchment

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**MAP 3:
FAWNBOY BOG / LOUGH NACUNG SAC
CONSERVATION OBJECTIVES
FRESHWATER PEARL MUSSEL**

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

**SITE CODE:
SAC 000140 ; version 3. CO. DONEGAL.**



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 garshuimhach ginearálta. Féadfar athbheirneithe a déanamh ar theorainneacha na gceantar comharthaíthe. Suirbhéarachta Ordonáis na hÉireann Ceadúnas Uimh EN 0059216. © Suirbhéarachta Ordonáis na hÉireann Rialtas na hÉireann

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**Map Version 1
Date: July 2016**

National Parks and Wildlife Service

Conservation Objectives Series

Ballyness Bay SAC 001090



*An Roinn
Ealaíon, Oidhreachta agus Gaeltachta*

*Department of
Arts, Heritage and the Gaeltacht*



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Gaeltacht.**

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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

001090	Ballyness Bay SAC
1013	Snail <i>Vertigo geyeri</i>
1130	Estuaries
1140	Mudflats and sandflats not covered by seawater at low tide
2110	Embryonic shifting dunes
2120	Shifting dunes along the shoreline with <i>Cladonia</i> (white dunes)
2130	Fixed coastal dunes with herbaceous vegetation (grey dunes)E
2190	Humid dune slacks

Please note that this SAC overlaps with Falcarragh to Meenlaragh SPA (004149) and adjoins Horn Head and Rinclevan SAC (000147). 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

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

NPWS Documents

Year :	2006
Title :	A survey of intertidal mudflats and sandflats in Ireland
Author :	Aquafact
Series :	Unpublished report to NPWS
<hr/>	
Year :	2009
Title :	Coastal Monitoring Project 2004-2006
Author :	Ryle, T.; Murray, A.; Connolly, K.; Swann, M.
Series :	Unpublished report to NPWS
<hr/>	
Year :	2011
Title :	Monitoring and condition assessment of populations of <i>Vertigo geyeri</i> , <i>Vertigo angustior</i> and <i>Vertigo moulinsiana</i> in Ireland
Author :	Moorkens, E.A.; Killeen, I.J.
Series :	Irish Wildlife Manual No. 55
<hr/>	
Year :	2013
Title :	Monitoring survey of Annex I sand dune habitats in Ireland
Author :	Delaney, A.; Devaney, F.M.; Martin, J.R.; Barron, S.J.
Series :	Irish Wildlife Manual No. 75
<hr/>	
Year :	2014
Title :	Ballyness Bay SAC (site code: 1090) Conservation objectives supporting document- coastal habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document
<hr/>	
Year :	2014
Title :	Ballyness Bay SAC (site code: 1090) Conservation objectives supporting document- marine habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	2012
Title :	Intertidal benthic survey of Ballyness Bay SAC
Author :	MERC
Series :	Unpublished report to the Marine Institute and NPWS
<hr/>	
Year :	2012
Title :	Subtidal benthic survey of Ballyness Bay SAC
Author :	MERC
Series :	Unpublished report to the Marine Institute and NPWS

Spatial data sources

Year :	Interpolated 2014
Title :	Intertidal surveys 2006, 2011; subtidal 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 :	1130, 1140, marine community types (maps 3, 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 :	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 :	2110, 2120, 2130, 2190 (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 :	2110, 2120, 2130, 2190 (map 6)
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 :	1013 (map 6)

1130 Estuaries

To maintain the favourable conservation condition of Estuaries in Ballyness 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 15ha by mapping extent using OSi data and expert judgement
Community distribution	Hectares	Conserve the following community types in a natural condition: Coarse sediment to sandy mud with oligochaetes and polychaetes community complex; Mobile sand community complex. See map 5	Based on intertidal surveys undertaken in 2006 (Aquafact, 2006) and 2011 MERC (2012) and a subtidal survey undertaken in 2011 (MERC, 2012). See marine habitats supporting document for further information

Conservation Objectives for : Ballyness Bay SAC [001090]

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 Ballyness 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 4	Habitat area was estimated as 690ha using OSi data
Community distribution	Hectares	Conserve the following community types in a natural condition: Coarse sediment to sandy mud with oligochaetes and polychaetes community complex; Mobile sand community complex. See map 5	Based on intertidal surveys undertaken in 2006 (Aquafact, 2006) and 2011 MERC (2012). See marine habitats supporting document for further information

Conservation Objectives for : Ballyness Bay SAC [001090]

2110 Embryonic shifting dunes

To maintain the favourable conservation condition of Embryonic shifting dunes in Ballyness Bay 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. Dooley - 4.81ha, Ballyness - 2.26ha. See map 6	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009) and Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Habitat is very difficult to measure in view of its dynamic nature. It was recorded at two sub-sites, giving a total estimated area of 7.07ha. Accretion was noted from the western end of Ballyness. Embryo dune habitat is restricted to the northern tip of the spit at Dooley. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline or change, 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. At Dooley, the extension of the pier and carpark through reclamation from the sea is likely to modify sea currents and appears to be impacting on western side of spit where the dune face is steep (Ryle et al. 2009). 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). At Dooley and Ballyness there are transitions from sand dunes to saltmarsh habitats. See coastal habitats supporting document for further details
Vegetation composition: plant health of foredune grasses	Percentage cover	More than 95% of sand couch grass (<i>Elytrigia juncea</i>) and/or lyme grass (<i>Leymus arenarius</i>) 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 (<i>Elytrigia juncea</i>) and/or lyme grass (<i>Leymus arenarius</i>)	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 (<i>Hippophae rhamnoides</i>) should be absent or effectively controlled. See coastal habitats supporting document for further details

Conservation Objectives for : Ballyness Bay SAC [001090]

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 Ballyness Bay 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: Dooney- 8.98ha; Ballyness - 14.15ha. See map 6	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009) and Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Habitat was mapped at two sub-sites to give a total estimated area of 23.13ha. Habitat is very difficult to measure in view of its dynamic nature. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 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 (<i>Ammophila arenaria</i>) reproduces vegetatively and requires constant accretion of fresh sand to maintain active growth encouraging further accretion. At Dooney, the extension of the pier and carpark through reclamation from the sea is likely to modify sea currents and appears to be impacting on western side of spit where the dune face is steep (Ryle et al. 2009). 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). At Dooney and Ballyness there are transitions from sand dunes to saltmarsh habitats. See coastal habitats supporting document for further details
Vegetation composition: plant health of dune grasses	Percentage cover	More than 95% of marram grass (<i>Ammophila arenaria</i>) and/or lyme-grass (<i>Leymus arenarius</i>) 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 dominated by marram grass (<i>Ammophila arenaria</i>) and/or lyme-grass (<i>Leymus arenarius</i>)	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 (<i>Hippophae rhamnoides</i>) should be absent or effectively controlled. See coastal habitats supporting document for further details

Conservation Objectives for : Ballyness Bay SAC [001090]

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 Ballyness Bay 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: Dooley - 97.04ha; Ballyness - 90.95ha. See map 6	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009) and Sand Dunes Monitoring Project (SMP) (Delaney et al., 2013). Habitat mapped at two sub-sites to give a total estimated area of 187.99ha. 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 dune habitat is extensive at both Dooley and Ballyness. 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 Dooley, the extension of the pier and carpark through reclamation from the sea is likely to modify sea currents and appears to be impacting on western side of spit where the dune face is steep (Ryle et al. 2009). 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). At Dooley and Ballyness there are transitions from sand dunes to saltmarsh habitats. 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). At Ballyness, the high fixed dunes on the seaward side are fenced to exclude grazers resulting in rank vegetation; elsewhere, fixed dune habitat is grazed by cattle, sheep and rabbits. The majority of the Dooley site is rank and undergrazed. 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	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 (<i>Hippophae rhamnoides</i>) 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

Conservation Objectives for : Ballyness Bay SAC [001090]

2190 Humid dune slacks

To maintain the favourable conservation condition of Humid dune slacks in Ballyness Bay SAC, which is defined by the following list of attributes and targets:

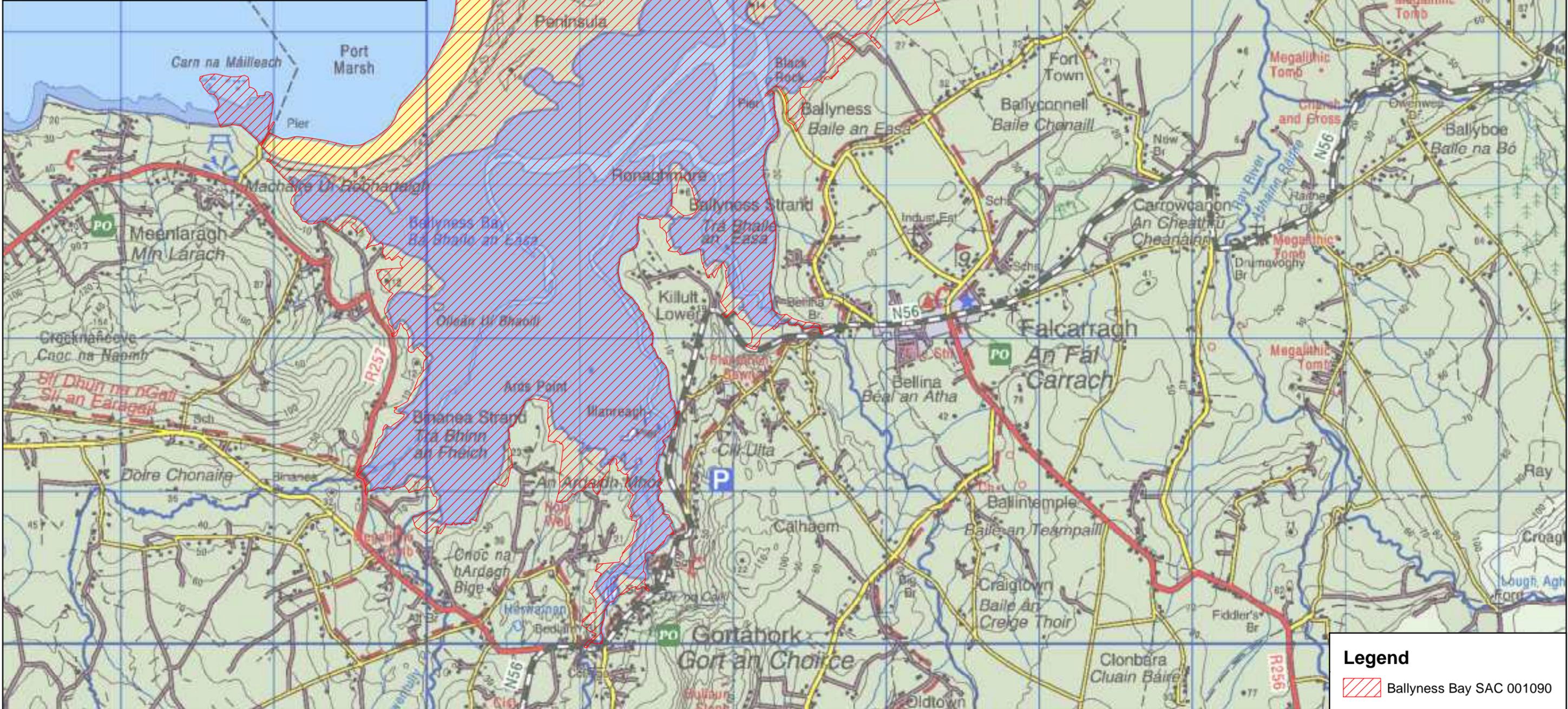
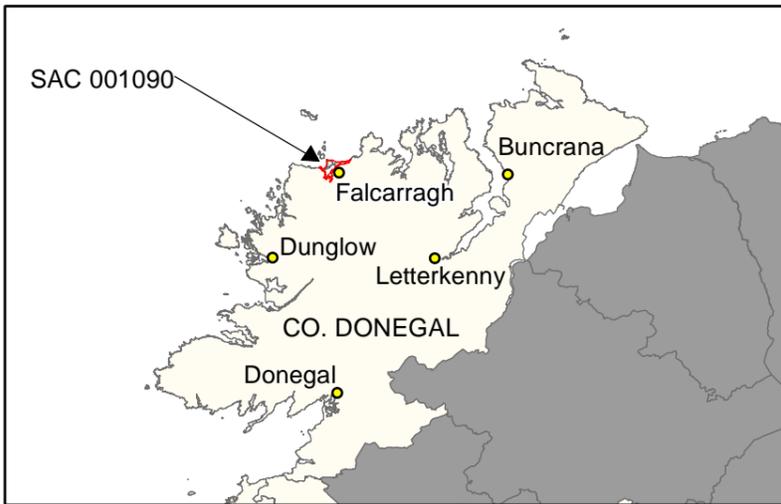
Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes including erosion and succession. For sub-site mapped: Ballyness - 13.87ha. See map 6	Based on data from the Coastal Monitoring Project (CMP) (Ryle et al., 2009) and Sand Dunes Monitoring Project (SDM) (Delaney et al., 2013). Habitat was mapped at one sub-site, giving a total estimated area of 13.87ha. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 6 for known distribution	Based on data from Ryle et al. (2009) and Delaney et al. (2013). Dune slacks were only recorded at Ballyness. See coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Physical barriers can lead to fossilisation or over-stabilisation of dunes, as well as beach starvation, resulting in increased rates of erosion. See coastal habitats supporting document for further details
Physical structure: hydrological and flooding regime	Water table levels; groundwater fluctuations (metres)	Maintain natural hydrological regime	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). 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). At Ballyness, there are transitions from sand dunes into saltmarsh habitats. See coastal habitats supporting document for further details
Vegetation structure: bare ground	Percentage cover	Bare ground should not exceed 5% of dune slack habitat, with the exception of pioneer slacks which can have up to 20% bare ground	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). At Ballyness, the dune slacks are grazed by cattle, sheep and rabbits, though no damage was noted to the habitat. See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	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 sample of monitoring stops	Maintain range of sub-communities with typical species listed in Delaney et al. (2013)	Based on data from from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). See coastal habitats supporting document for further details
Vegetation composition: cover of <i>Salix repens</i>	Percentage cover	Maintain less than 40% cover of creeping willow (<i>Salix repens</i>)	Based on data from Ryle et al. (2009) and Delaney et al. (2013). Cover of creeping willow (<i>Salix repens</i>) needs to be maintained through an appropriate grazing regime, which prevents the development of a coarse, rank vegetation cover. At Ballyness, the slack supports <i>Salix repens</i> throughout, but it is not dominant. 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 (<i>Hippophae rhamnoides</i>) 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

Conservation Objectives for : Ballyness Bay SAC [001090]

1013 ; YnYffgK \cf Snail *Vertigo geyeri*

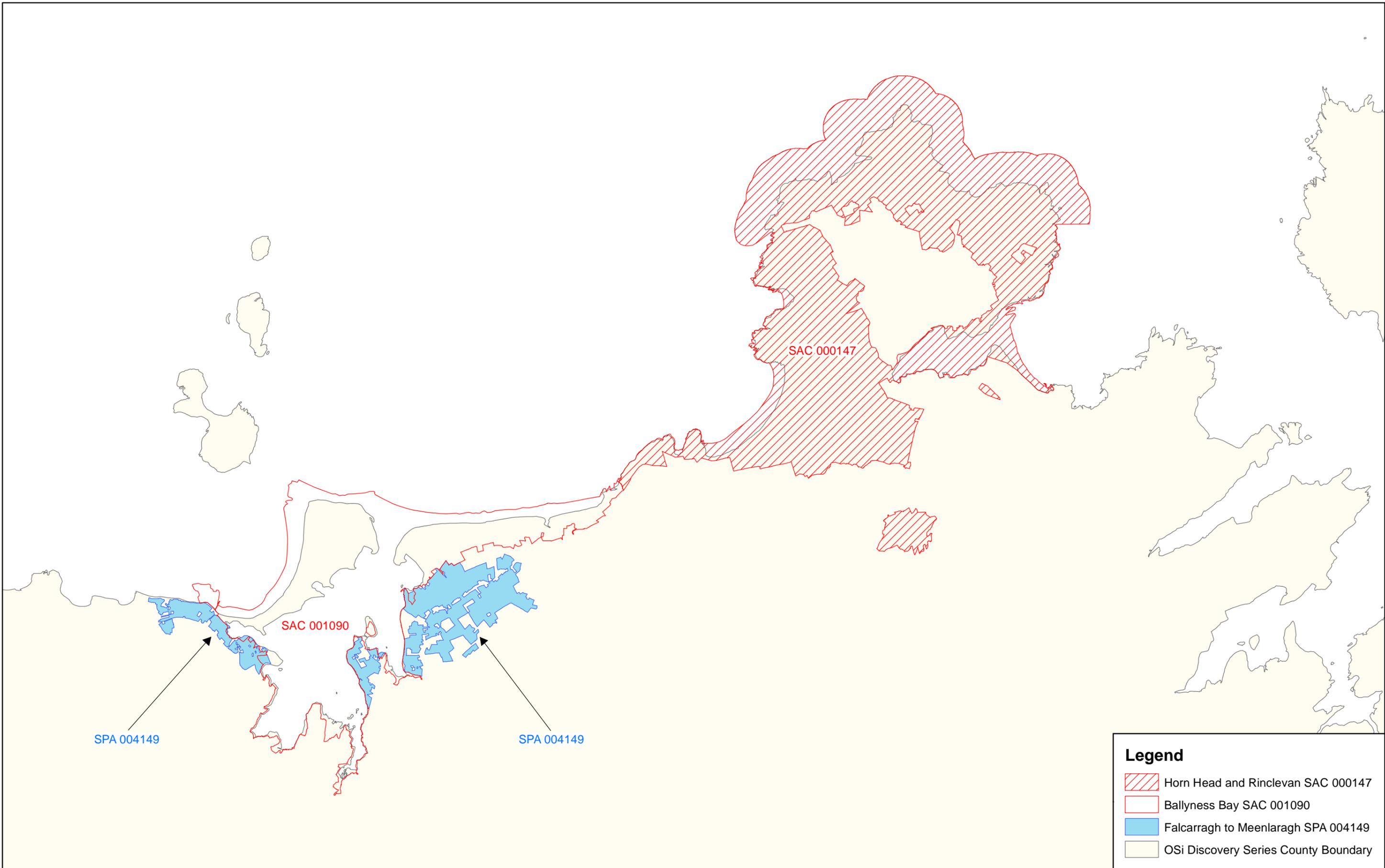
To maintain the favourable conservation condition of Geyer's Whorl Snail in Ballyness Bay SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: occupied sites	Number	No decline. There is one known site for this species in this SAC within the 1km square B9233. See map 6	From Moorkens and Killeen (2011) (site code VgCAM10)
Presence on transect	Occurrence	Adult or sub-adult snails are present in at least two of the four samples taken from optimal or sub-optimal habitat on the transect	Transect established 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 on transect	Number per sample	At least two samples on the transect should have more than 20 individuals	From Moorkens and Killeen (2011)
Transect habitat quality	Metres	17m of habitat along the first 45m of the transect is classed as optimal and at least 34m is classed as optimal or sub-optimal habitat	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 saturated (optimal wetness) for at least 24m of the first 45m of the transect	From Moorkens and Killeen (2011)
Habitat extent	Hectares	0.4-0.5ha of the site optimal and sub-optimal habitat mosaic. Optimal habitat is defined as flushed fen grassland with sward lawns 10-30cm tall, containing species such as yellow sedge (<i>Carex viridula</i>), marsh horsetail (<i>Equisetum palustre</i>), jointed rush (<i>Juncus articulatus</i>), bogbean (<i>Menyanthes trifoliata</i>) and the mosses <i>Drepanocladus revolvens</i> and <i>Campylium stellatum</i> . During sampling the water table should be between 0 and 5cm of the soil surface, but not above ground level. Sub-optimal grassland is defined as having same vegetation composition as optimal habitat but including meadowsweet (<i>Filipendula ulmaria</i>) and water horsetail (<i>Equisetum fluviatile</i>), and either vegetation height is less than 5cm or greater than 30cm; or the water table is below 5cm or ground is flooded at the time of sampling	From Moorkens and Killeen (2011)



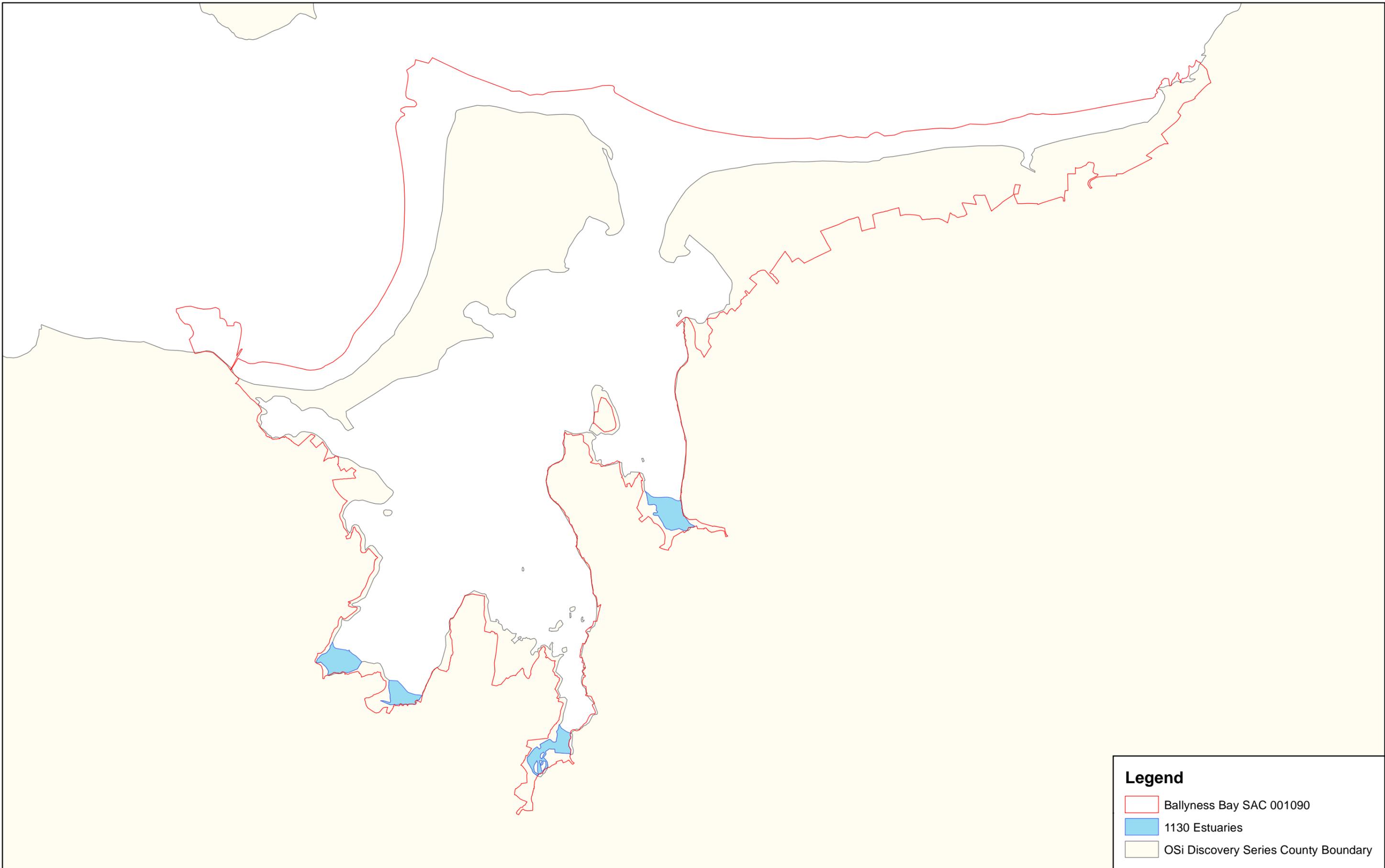
Legend

 Ballyness Bay SAC 001090



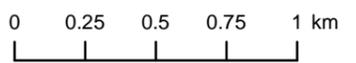
Legend

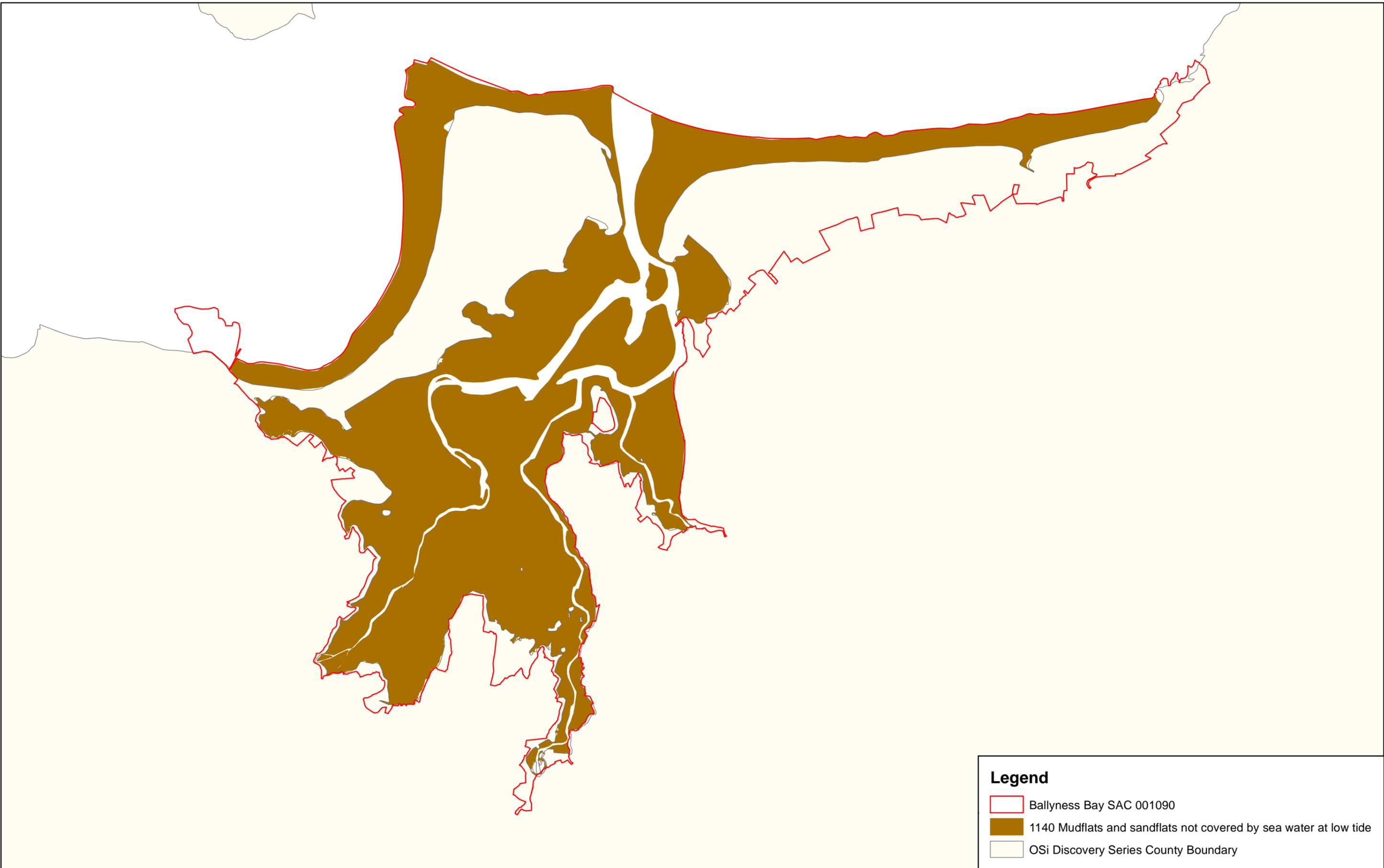
-  Horn Head and Rinclevan SAC 000147
-  Ballyness Bay SAC 001090
-  Falcarragh to Meenlaragh SPA 004149
-  OSi Discovery Series County Boundary



Legend

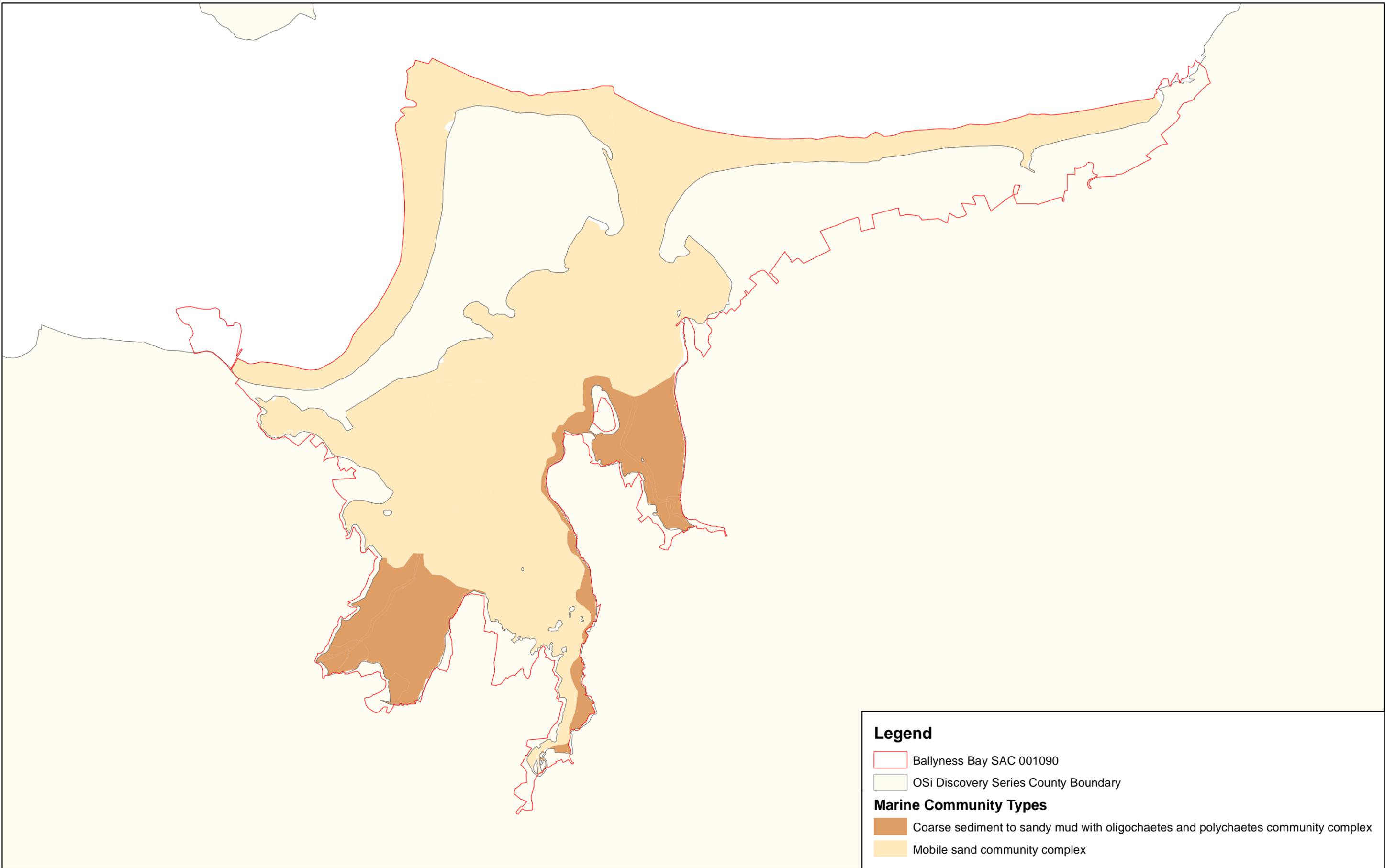
- Ballyness Bay SAC 001090
- 1130 Estuaries
- OSi Discovery Series County Boundary





Legend

- Ballyness Bay SAC 001090
- 1140 Mudflats and sandflats not covered by sea water at low tide
- OSi Discovery Series County Boundary

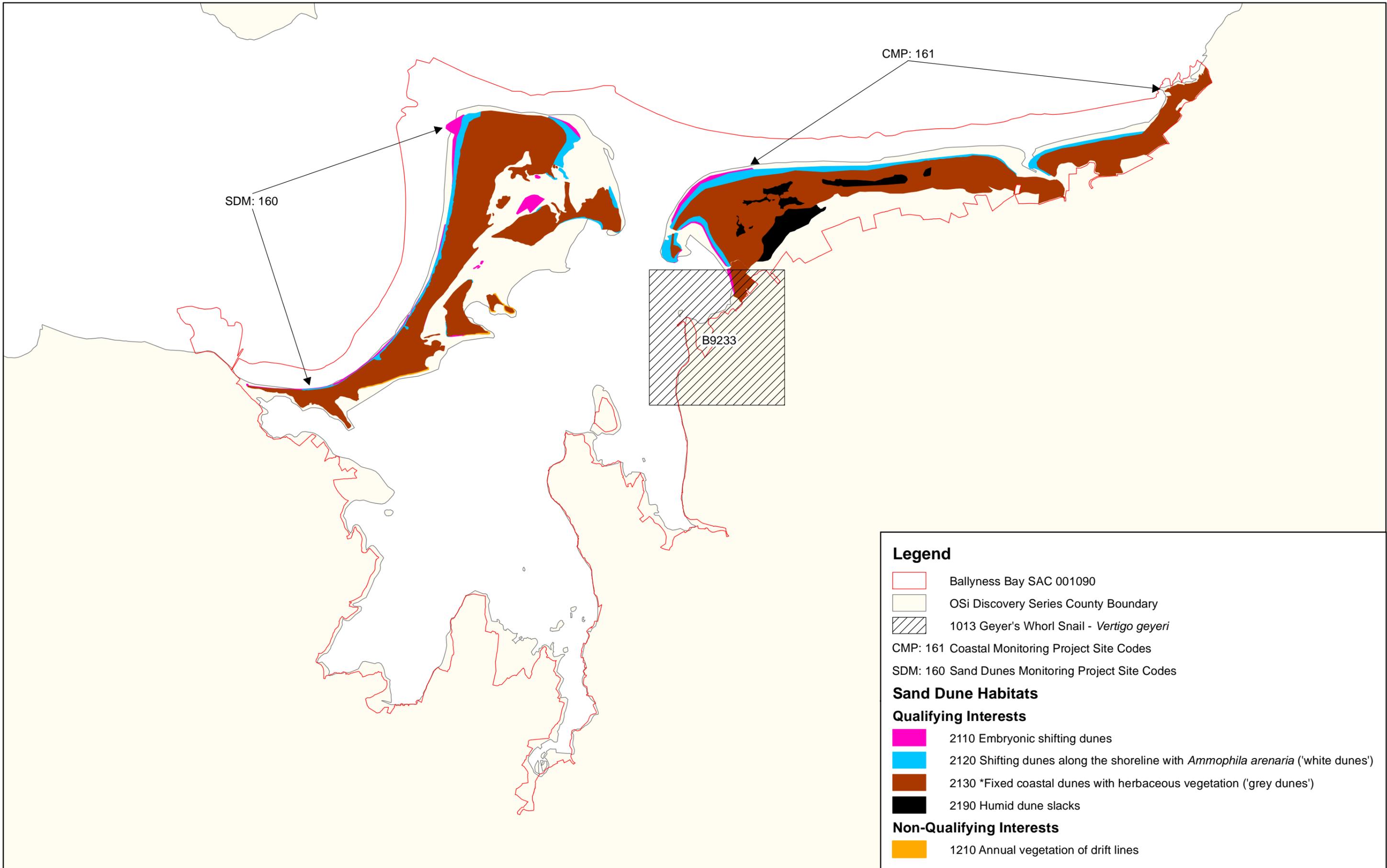


Legend

- Ballyness Bay SAC 001090
- OSi Discovery Series County Boundary

Marine Community Types

- Coarse sediment to sandy mud with oligochaetes and polychaetes community complex
- Mobile sand community complex



Legend

-  Ballyness Bay SAC 001090
-  OSi Discovery Series County Boundary
-  1013 Geyer's Whorl Snail - *Vertigo geyeri*
- CMP: 161 Coastal Monitoring Project Site Codes
- SDM: 160 Sand Dunes 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')
-  2190 Humid dune slacks

Non-Qualifying Interests

-  1210 Annual vegetation of drift lines

National Parks and Wildlife Service

Conservation Objectives Series

Gweedore Bay and Islands SAC 001141



*An Roinn
Ealaíon, Oidhreachta agus Gaeltachta*

*Department of
Arts, Heritage and the Gaeltacht*



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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

001141 Gweedore Bay and Islands SAC	
1150	Coastal lagoonsE
1170	Reefs
1220	Perennial vegetation of stony banks
1355	Otter <i>Lutra lutra</i>
1395	Petalwort <i>Petalophyllum ralfsii</i>
1410	Mediterranean salt meadows (<i>Juncetalia maritimi</i>)
1833	Slender Naiad <i>Najas flexilis</i>
2110	Embryonic shifting dunes
2120	Shifting dunes along the shoreline with <i>Cladonia</i> (white dunes)
2130	Fixed coastal dunes with herbaceous vegetation (grey dunes)E
2140	Decalcified fixed dunes with <i>Calluna</i> E
2150	Atlantic decalcified fixed dunes (<i>Calluno-Ulicetea</i>)E
2170	Dunes with <i>Salicornia</i> ssp. <i>arenaria</i> (<i>Salicion arenariae</i>)
2190	Humid dune slacks
21A0	Machairs (* in Ireland)
3110	Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>)
4030	European dry heaths
4060	Alpine and Boreal heaths
5130	<i>Cladonia</i> formations on heaths or calcareous grasslands

Please note that this SAC overlaps with West Donegal Coast SPA (004150) and West Donegal Islands SPA (004230). It adjoins Rutland Island and Sound SAC (002283). 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 :	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 :	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 :	2007
Title :	Inventory of Irish coastal lagoons (version 2)
Author :	Oliver, G.
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 :	2012
Title :	The Conservation Status of Juniper Formations in Ireland
Author :	Cooper, F.; Stone, R.E.; McEvoy, P.; Wilkins, T.; Reid, N.
Series :	Irish Wildlife Manual No. 63
Year :	2013
Title :	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 :	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 : Gweedore Bay and Islands SAC (site code: 1141) Conservation objectives supporting document- coastal habitats V1
Author : NPWS
Series : Conservation objectives supporting document

Year : 2015
Title : Gweedore Bay and Islands SAC (site code: 1141) Conservation objectives supporting document- coastal lagoons V1
Author : NPWS
Series : Conservation objectives supporting document

Year : 2015
Title : Gweedore Bay and Islands SAC (site code: 1141) Conservation objectives supporting document- marine habitat V1
Author : NPWS
Series : Conservation objectives supporting document

Year : 2015
Title : Gweedore Bay and Islands SAC (site code: 1141) Conservation objectives supporting document- *Najas flexilis* 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 : 1988
Title : The Irish red data book 1. Vascular plants
Author : Curtis, T.G.F; McGough, H.N.
Series : Wildlife Service, Dublin

Year : 1991
Title : The spatial organization of otters (*Lutra lutra*) in Shetland
Author : Kruuk, H.; Moorhouse, A.
Series : J. Zool, 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 : 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 : 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 : 2011
Title : Reef investigations in Gweedore Bay and Islands cSAC (site code:IE001141)
Author : Aquafact
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 : Monitoring and assessment of Irish lagoons for the purposes of the EU Water Framework Directive, 2009-2011. Parts 1 and 2
Author : Roden, C.M; Oliver, G.A.
Series : Unpublished report to the Environmental Protection Agency

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 :	Revision 2011
Title :	Inventory of Irish Coastal Lagoons. Version 3
GIS Operations :	Clipped to SAC boundary
Used For :	1150 (map 3)
Year :	Interpolated 2014
Title :	Subtidal survey 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 :	1170, marine community types (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 :	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 :	1410 (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 :	1220, 2110, 2120, 2130, 2140, 2150, 2170, 2190, 21A0 (map 7)
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 :	2110, 2120, 2130, 2140, 2150, 2170, 2190, 21A0 (map 7)
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 7)
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 8)
Year :	2012
Title :	The conservation status of juniper formations in Ireland
GIS Operations :	Juniper formations polygons clipped to SAC boundary
Used For :	5130 (map 9)

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 and Coastal Lagoon 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 10)
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 and Coastal Lagoon 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 10)
Year :	Revision 2011
Title :	Inventory of Irish Coastal Lagoons. Version 3
GIS Operations :	Creation of 80m buffer on the aquatic side of lagoon data; creation of 10m buffer on the terrestrial side of lagoon data. These datasets are combined with the derived OSi data and EPA WFD Waterbodies data for the 1355 CO. Overlapping regions are investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1355 (map 10)
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 11)
Year :	2013
Title :	<i>Najas flexilis</i> data
GIS Operations :	Lake habitat for species clipped to SAC boundary
Used For :	1833 (map 12)

Conservation Objectives for : Gweedore Bay and Islands SAC [001141]

1150 Coastal lagoons

To restore the favourable conservation condition of Coastal lagoons in Gweedore Bay and Islands 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 10.0ha for mapped lagoons. See map 3	Areas calculated from spatial data derived from Oliver (2007). Site codes IL082 (Kincas Lough) and IL083 (Moorlagh). See lagoons supporting document for further details. NB there may be additional, unsurveyed lagoons within the SAC
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 3 for mapped lagoons	Sites IL082 and IL083 in Oliver, 2007. See lagoons supporting document for further details. NB there may be additional, unsurveyed lagoons within the SAC
Salinity regime	Practical salinity units (psu)	Median annual salinity and temporal variation within natural ranges	Kincas Lough and Moorlagh are recorded as euhaline to oligohaline lagoons. See lagoons supporting document for further details
Hydrological regime	Metres	Annual water level fluctuations and minima within natural ranges	Maximum depth of Kincas Lough is recorded as 5m and Moorlagh is less than 1m. See lagoons supporting document for further details
Barrier: connectivity between lagoon and sea	Permeability	Appropriate hydrological connections between lagoons and sea, including where necessary, appropriate management	Kincas Lough and Moorlagh are described as rock/peat lagoons. See lagoons supporting document for further details
Water quality: Chlorophyll <i>a</i>	µg/L	Annual median chlorophyll <i>a</i> within natural ranges and less than 5µg/L	Target based on Roden and Oliver (2013). See lagoons supporting document for further details
Water quality: Molybdate Reactive Phosphorus (MRP)	mg/L	Annual median MRP within natural ranges and less than 0.1mg/L	Target based on Roden and Oliver (2013). See lagoons supporting document for further details
Water quality: Dissolved Inorganic Nitrogen (DIN)	mg/L	Annual median DIN within natural ranges and less than 0.15mg/L	Target based on Roden and Oliver (2013). See lagoons supporting document for further details
Depth of macrophyte colonisation	Metres	Macrophyte colonisation to at least 2m depth	Where a lagoon is less than 2m deep, it is expected that macrophyte colonisation would extend to the full depth. See lagoons supporting document for further details
Typical plant species	Number and m ²	Maintain number and extent of listed lagoonal specialists, subject to natural variation	Species listed in Oliver, 2007. See lagoons supporting document for further details
Typical animal species	Number	Maintain listed lagoon specialists, subject to natural variation	Species listed in Oliver, 2007. See lagoons supporting document for further details
Negative indicator species	Number and % cover	Negative indicator species absent or under control	Low salinity, shallow water and elevated nutrient levels increase the threat of unnatural encroachment by reedbeds. See lagoons supporting document for further details

Conservation Objectives for : Gweedore Bay and Islands SAC [001141]

1170 Reefs

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

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 4 for mapped area	Habitat area estimated as 369ha from a 2010 subtidal reef survey (Aquafact, 2011) and intertidal observations made in 2012
Distribution	Occurrence	The distribution of reefs remains stable, subject to natural processes. See map 4 for mapped distribution	Based on information from a 2010 subtidal reef survey (Aquafact, 2011) and intertidal observations made in 2012
Community structure	Biological composition	Conserve the following community types in a natural condition: Reef community complex; <i>Laminaria</i> -dominated community complex. See map 5	Reef mapping based on information from a 2010 subtidal reef survey (Aquafact, 2011) and intertidal observations made in 2012. 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 Gweedore Bay and Islands 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. It was recorded as being present, but extent was not mapped, from two sub-sites during the National Shingle Beach Survey (NSBS) (Moore and Wilson, 1999): Coastline from Port ui Chuirean to Bunaninver, and Port bun an Inbhir. A small area of this habitat was also recorded on Gola Island by the Coastal Monitoring Project (CMP) (Ryle et al., 2009). 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 7 for surveyed locations	Distribution unknown at present, although the habitat has been recorded at Port ui Chuirean to Bunaninver and Port bun an Inbhir by Moore and Wilson (1999) and at Gola Island by Ryle et al. (2009). Donegal is noted for its raised beaches and habitat is 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	Moore and Wilson (1999) noted the presence of rock armour at the coastline from Port Ui Chuirean to Bunaninver sub-site, which may be compromising the supply and natural circulation of sediment. 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). Lichens are present at both subsites visited by the NSBS, 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 sample 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). Both sub-sites support good quality vegetated shingle 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 Moore and Wilson (1999) and 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. No negative indicator species were recorded at the sub-sites by the NSBS or CMP. See coastal habitats supporting document for further details

Conservation Objectives for : Gweedore Bay and Islands SAC [001141]

1410 Mediterranean salt meadows (*Juncetalia maritimi*)

To maintain the favourable conservation condition of Mediterranean salt meadows (*Juncetalia maritimi*) in Gweedore Bay and Islands 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-site mapped: Keadew - 0.09ha. See map 6	Based on data from the Saltmarsh Monitoring Project (SMP) (McCorry and Ryle, 2009). One sub-site that supports Mediterranean Salt Meadows was mapped (0.09ha) and additional areas of potential MSM habitat (9.66ha) were identified from an examination of aerial photographs, giving a total estimated area of 9.75ha. NB further unsurveyed areas maybe present within the SAC. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 7 for mapped distribution	Based on data from McCorry and Ryle (2009). 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	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 saltmarsh habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from McCorry and Ryle (2009). At Keadew, embryonic dunes, fixed dunes and blanket bog were recorded on the upper boundary of the saltmarsh. 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). The overall grazing intensity of the saltmarsh at Keadew is low. 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). Trails from pedestrian and vehicular traffic criss-cross the saltmarsh habitat particularly at the western end of the sub-site. 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 characteristic species listed in SMP (McCorry and Ryle, 2009)	See coastal habitats supporting document for further details
Vegetation structure: negative indicator species - <i>Spartina anglica</i>	Hectares	Common cordgrass (<i>Spartina anglica</i>) has not been recorded in this SAC and its establishment should be prevented	Based on data from McCorry and Ryle (2009). <i>Spartina</i> swards were not recorded in this SAC by SMP. See coastal habitats supporting document for further details

2110 Embryonic shifting dunes

To maintain the favourable conservation condition of Embryonic shifting dunes in Gweedore Bay and Islands 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: Keadew - 0.46ha; Cruit Lower - 1.29ha; Kincaslough - 0.14ha; Carnboy - 1.39ha; Derrybeg - 0.69ha. See map 7	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 mapped at five sub-sites to give a total estimated area of 3.97ha. 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, subject to natural processes. See map 7 for known distribution	Based on data from Ryle et al. (2009) and Delaney et al. (2013). Shifting dunes were recorded at all sub-sites except for Gola Island and Lunniagh. 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). 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. At Derrybeg, rock armour has been placed on the edge of a walkway and pier in the north west of the site. 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 foredune grasses	Percentage cover	More than 95% of sand couch grass (<i>Elytrigia juncea</i>) and/or lyme grass (<i>Leymus arenarius</i>) 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	Maintain the presence of species-poor communities with typical species: sand couch grass (<i>Elytrigia juncea</i>) and/or lyme grass (<i>Leymus arenarius</i>)	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 (<i>Hippophae rhamnoides</i>) 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 Gweedore Bay and Islands 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: Keadew - 0.73ha; Cruit Lower - 1.88ha; Kincaslough - 1.59ha; Carnboy - 2.41ha; Derrybeg - 3.96ha; Gola Island - 0.54ha; Lunniagh - 3.68ha. See map 7	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 mapped at seven sub-sites to give a total estimated area of 14.79ha. Habitat is very difficult to measure in view of its dynamic nature. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 7 for known distribution	Based on data from Ryle et al. (2009) and Delaney et al. (2013). Shifting dunes were recorded at all sub-sites. The shifting dunes at Keadew are undergoing natural erosion. The shifting dunes at Cruit Lower are functioning well with sand accretion noted. At Kincaslough the shifting dunes are eroding at the western side of the sub-site while at the eastern end of the beach they are functioning well. At Carnboy this habitat had been eroded in the past but was rebuilding at time of CMP survey. At Derrybeg the shifting dunes have eroded behind the rock armour. At Lunniagh, dune accretion is occurring on the north side of the river and dunes measure up to 50m wide in places. 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). Dunes are naturally dynamic systems that require continuous supply and circulation of sand. Marram grass (<i>Ammophila arenaria</i>) reproduces vegetatively and requires constant accretion of fresh sand to maintain active growth encouraging further accretion. At Derrybeg, rock armour has been placed on the edge of a walkway and pier in the north west of the site. Sand extraction occurs at Lunniagh. 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 (<i>Ammophila arenaria</i>) and/or lyme-grass (<i>Leymus arenarius</i>) 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 dominated by marram grass (<i>Ammophila arenaria</i>) and/or lyme-grass (<i>Leymus arenarius</i>)	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 (<i>Hippophae rhamnoides</i>) should be absent or effectively controlled. See coastal habitats supporting document for further details
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Conservation Objectives for : Gweedore Bay and Islands SAC [001141]

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 Gweedore Bay and Islands 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: Keadew -14.74ha; Cruit Lower - 30.55ha; Kincaslough - 79.90ha; Carnboy - 56.83ha; Derrybeg - 30.74ha; Gola Island - 3.38ha; Lunniagh - 186.32ha. See map 7	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 mapped at all seven sub-sites to give a total estimated area of 402.46ha. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 7 for known distribution	Based on data from Ryle et al. (2009) 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	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. 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). At Keadew, Derrybeg and Lunniagh, the sand dune habitats occur alongside saltmarsh habitats. 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). Overgrazing was noted at Lunniagh, while fixed dune was undergrazed or lightly grazed in parts at Keadew, Cruit Lower, Carnboy, Derrybeg and Gola Island. 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). An abundance of orchid species was noted at Kincaslough including frog orchid (<i>Coeloglossum viride</i>), common twayblade (<i>Listera ovata</i>), pyramidal orchid (<i>Anacamptis pyramidalis</i>) and fragrant orchid (<i>Gymnadenia conopsea</i>) and are indicators of local distinctiveness. 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 (<i>Hippophae rhamnoides</i>) should be absent or effectively controlled. This species is known to occur at Cruit Lower and bracken (<i>Pteridium aquilinum</i>) at Derrybeg. 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). Burnet rose (<i>Rosa pimpinellifolia</i>) was recorded at Derrybeg. See coastal habitats supporting document for further details
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2140 Decalcified fixed dunes with *Empetrum nigrum*

To maintain the favourable conservation condition of Decalcified fixed dunes with *Empetrum nigrum* in Gweedore Bay and Islands 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-site mapped: Keadew - 0.47ha. See map 7	Current area unknown. 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 at one sub-site, giving a total estimated area of 0.47ha. However, habitat is difficult to map as it occurs in a mosaic with fixed dunes. Likely to be more widespread. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 7 for known distribution	Exact distribution unknown. Based on data from Ryle et al. (2009) and Delaney et al. (2013). This habitat was recorded at two sub-sites: Keadew and Cruit lower, but was only mapped at the Keadew sub-site. 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. 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). At Keadew the coastal heath occurs in close association with fixed dune habitat. 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). At Keadew and Cruit Lower, the dunes are undergrazed. 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	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 (<i>Hippophae rhamnoides</i>) should be absent or effectively controlled. This species is known to occur at Cruit Lower. 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

Conservation Objectives for : Gweedore Bay and Islands SAC [001141]

2150 Atlantic decalcified fixed dunes (Calluno-Ulicetea)

To maintain the favourable conservation condition of Atlantic decalcified fixed dunes (Calluno-Ulicetea) in Gweedore Bay and Islands 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-site mapped: Cruit Lower - 3.57ha. See map 7	Current area unknown. 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 at one sub-site, giving a total estimated area of 3.57ha. Habitat is difficult to map as it occurs in a mosaic with fixed dunes. Likely to be more widespread. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 7 for mapped distribution	Exact distribution unknown. Based on data from Ryle et al., (2009) and Delaney et al. (2013). This habitat was recorded at one sub-site: Cruit Lower. 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. 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). At Cruit Lower, both the fixed dune and machair are ungrazed resulting in a tall sward with low species diversity. 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	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 (<i>Hippophae rhamnoides</i>) should be absent or effectively controlled. This species is known to occur at Cruit Lower. 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 Gweedore Bay and Islands 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: Cruit Lower - 0.94ha; Kincaslough - 0.03ha. See map 7	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 at two sub-sites, giving a total estimated area of 0.97ha. Habitat is difficult to map as it can be confused with humid dune slacks. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 7 for mapped 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	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. See coastal habitats supporting document for further details
Physical structure: hydrological and flooding regime	Water table levels; groundwater fluctuations	Maintain natural hydrological regime	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). 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). At Cruit Lower the fixed dunes are ungrazed. See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in Delaney et al. (2013)	See coastal habitats supporting document for further details
Vegetation composition: cover and height of <i>Salix repens</i>	Percentage cover; centimetres	Maintain more than 10% cover of creeping willow (<i>Salix repens</i>); vegetation height should be in the average range 5 - 20cm	Based on data from Ryle et al. (2009) and Delaney et al. (2013). Cover of creeping willow (<i>Salix repens</i>) should be maintained (e.g. through an appropriate grazing regime) to prevent the development of a coarse, rank vegetation cover. See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover at a representative sample of monitoring stops	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 (<i>Hippophae rhamnoides</i>) should be absent or effectively controlled. This species is known to occur at Cruit Lower. See coastal habitats supporting document for further details

Vegetation composition: scrub/trees	Percentage cover	For trees and scrub other than creeping willow (<i>Salix repens</i>), 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
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2190 Humid dune slacks

To maintain the favourable conservation condition of Humid dune slacks in Gweedore Bay and Islands 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: Keadew - 0.01ha; Cruit Lower - 0.34ha; Carnboy - 0.38ha; Kincaslough - 1.09ha; Derrybeg - 0.19ha; Lunniagh - 5.68ha. See map 7	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 mapped at six sub-sites to give a total estimated area of 7.69ha. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 7 for mapped 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	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. See coastal habitats supporting document for further details
Physical structure: hydrological and flooding regime	Water table levels; groundwater fluctuations	Maintain natural hydrological regime	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). It appears that there has been some drying out of some of the slacks at Cruit Island, which may be due to anthropogenic activities. 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 5% of dune slack habitat, with the exception of pioneer slacks which can have up to 20% bare ground	Based on data from Gaynor (2008), Ryle et al. (2009) and Delaney et al. (2013). At Lunniagh, dune slacks are affected by overgrazing and poaching was noted. See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	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 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). Butterfly orchid (<i>Platanthera</i> spp.) was noted at Kincaslough. Petalwort (<i>Petalophyllum ralfsii</i>), a species on Annex II of the Habitats Directive, is recorded from the dune slacks in this SAC. See the conservation objective for <i>Petalophyllum ralfsii</i> (1395) and the coastal habitats supporting document for further details
Vegetation composition: cover of <i>Salix repens</i>	Percentage cover; centimetres	Maintain less than 40% cover of creeping willow (<i>Salix repens</i>)	Based on data from Ryle et al., (2009) and Delaney et al. (2013). Cover of creeping willow (<i>Salix repens</i>) needs to be controlled (e.g. through an appropriate grazing regime) to prevent the development of a coarse, rank vegetation cover. 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 (<i>Hippophae rhamnoides</i>) should be absent or effectively controlled. This species is known to occur at Cruit Lower. 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). Bunet rose (<i>Rosa pimpinellifolia</i>) was recorded at Derrybeg. See coastal habitats supporting document for further details

Conservation Objectives for : Gweedore Bay and Islands SAC [001141]

21A0 Machairs (* in Ireland)

To restore the favourable conservation condition of Machairs in Gweedore Bay and Islands 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: Keadew - 28.31ha; Cruit Lower - 9.65ha; Derrybeg - 92.13ha; Lunniagh - 39.69ha. See map 7	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 four sub-sites, giving a total estimated area of 169.78ha. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 7	Based on data from Ryle et al. (2009) and Delaney et al. (2013). Machair was recorded at all sub-sites except Gola Island, Carnboy and Kincaslough. 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. See coastal habitats supporting document for further details
Physical structure: hydrological and flooding regime	Water table levels; groundwater fluctuations	Maintain natural hydrological regime	Based on data from Ryle et al. (2009), 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). Overgrazing was noted at Lunniagh, while fixed dune and machair habitats were undergrazed or lightly grazed in parts at Keadew, Cruit Lower and Derrybeg. 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 Ryle et al., (2009) and Delaney et al. (2013). Petalwort (<i>Petalophyllum ralfsii</i>), a species listed on Annex II of the Habitats Directive, was recorded in machair habitat in this SAC. See the conservation objective for <i>Petalophyllum ralfsii</i> (1395) and the 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 (<i>Hippophae rhamnoides</i>) should be absent or effectively controlled. This species is known to occur at Cruit Lower and bracken (<i>Pteridium aquilinum</i>) has been recorded at Derrybeg. 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

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

To maintain the favourable conservation condition of Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) in Gweedore Bay and Islands 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 selection of the SAC for habitat 3110 was based on data for Mullaghderg Loughs. Re-examination of these data and the occurrence of <i>Najas flexilis</i> in Mullaghderg East and West suggest, however, that their vegetation is more closely aligned to habitat 3130. It is possible that habitat 3110 occurs elsewhere within the SAC. It may occur in the small lake in Derrybeg townland (see map 8), but this requires field confirmation. The habitat is highly unlikely to occur in lakes influenced by calcareous sand or by the sea, both of which are prevalent in the SAC. 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. For further information on all attributes see 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	As noted above, it is unlikely that the habitat occurs in the SAC. If the habitat is found, further information on the attribute for distribution can be found in O Connor (in prep.)
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 3110 (NPWS, 2013) and the lake habitats supporting document for the purposes of site-specific conservation objectives and Article 17 reporting (O Connor, in prep.)
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.), however significant further work is necessary to describe the characteristic zonation and other spatial patterns in the other lake habitats
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 of >6 m has been developed for hard water lakes (3140) (see Roden and Murphy, 2013; in prep.). Indicative targets will be developed for the other lake habitats with time
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 the oligotrophic soft water habitat 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. A target has been set for hard water lakes (3140), however targets have yet to be established for the remaining lake habitats. Habitat 3110 is associated with very clear water. The OECD fixed boundary system set transparency targets for oligotrophic lakes of $\geq 6\text{m}$ annual mean Secchi disk depth, and $\geq 3\text{m}$ 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	$\mu\text{g/l P}$; mg/l N	Maintain the concentration of nutrients in the water column to 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 the oligotrophic soft water lake habitat, annual average TP concentration should be $\leq 10\mu\text{g/l TP}$, average annual total ammonia concentration should be $\leq 0.040\text{mg/l N}$ and annual 95th percentile for total ammonia should be $\leq 0.090\text{mg/l N}$. For further information see the European Communities Environmental Objectives (Surface Waters) Regulations 2009
Water quality: phytoplankton biomass	$\mu\text{g/l Chlorophyll } a$	Maintain appropriate water quality to support the habitat, including high chlorophyll <i>a</i> status	Oligotrophic and WFD 'high' status targets apply to the oligotrophic soft water habitat (3110). Where a lake has a chlorophyll <i>a</i> 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 <i>a</i> concentration must be $< 5.8\mu\text{g/l}$. The annual average chlorophyll <i>a</i> concentration should be $< 2.5\mu\text{g/l}$ and the annual peak chlorophyll <i>a</i> concentration should be $< 8.0\mu\text{g/l}$. For further information see 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 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 the oligotrophic soft water habitat 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 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 the oligotrophic soft water lake habitat 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 <i>Sphagnum</i> mosses and <i>Juncus bulbosus</i> (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 oligotrophic soft water lakes (3110), and adopting a precautionary approach based on Arts (2002), minimum pH should not be <5.5. Maximum pH should be <9.0, in line with the surface water standards established for soft waters (where water hardness is ≤100 mg/l CaCO ₃). 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 38 mg/l PtCo (Free, et al., 2000) and 33 mg/l PtCo (Free et al. 2006). It is likely that the water colour in all Irish lake habitats would naturally be <50 mg/l PtCo. Water colour can be very low (<20 mg/l PtCo or even <10 mg/l PtCo) in oligotrophic soft water lakes (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 factors such as shading and competition
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	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. 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

Conservation Objectives for : Gweedore Bay and Islands SAC [001141]

4030 European dry heaths

To maintain the favourable conservation condition of European dry heaths in Gweedore Bay and Islands 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 known to be distributed throughout the SAC, usually occurring in mosaic with other habitats such as exposed rock, other heath types and fixed dune habitats (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 and is a good example of a maritime variant in the western part of its Irish and European range (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 (<i>Erica cinerea</i>), cross-leaved heath (<i>Erica tetralix</i>) and ling (<i>Calluna vulgaris</i>) 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 <i>Campylopus</i> and <i>Polytrichum</i> moss species	Percentage cover at a representative number of monitoring stops
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 structure: dwarf shrub species	Percentage cover at a representative number of monitoring stops	Cover of bog myrtle (<i>Myrica gale</i>), creeping willow (<i>Salix repens</i>) and Western gorse (<i>Ulex gallii</i>) 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 (<i>Pteridium aquilinum</i>) 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 (<i>Juncus effusus</i>) 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 (<i>Calluna vulgaris</i>) cover less than 50%	Percentage cover at a representative number of monitoring stops

Vegetation structure: growth phases of ling	Percentage cover in local vicinity	Outside boundaries of sensitive areas, all growth phases of ling (<i>Calluna vulgaris</i>) 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)
Vegetation structure: burning	Occurrence in local vicinity	No signs of burning within sensitive areas	Attribute and target based on Perrin et al. (2014) where sensitive areas are also 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%	Attribute and target based on Perrin et al. (2014)

Conservation Objectives for : Gweedore Bay and Islands SAC [001141]

4060 Alpine and Boreal heaths

To maintain the favourable conservation condition of Alpine and Boreal heaths in Gweedore Bay and Islands 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 occurs in mosaic with other habitats such as exposed rock, other heath types and fixed dune habitats (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 at a representative number of monitoring stops	Number of bryophyte or non-crustose lichen species present at each monitoring stop is least three	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%	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. Bearberry (<i>Actostaphylos uva-ursi</i>), Crowberry (<i>Empetrum nigrum</i>), bell heather (<i>Erica cinerea</i>) and ling (<i>Calluna vulgaris</i>) 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%	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%	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%	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	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 (<i>Empetrum nigrum</i>) showing signs of browsing	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	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%	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

Conservation Objectives for : Gweedore Bay and Islands SAC [001141]

5130 Juniperus communis formations on heaths or calcareous grasslands

To restore the favourable conservation condition of *Juniperus communis* formations on heaths or calcareous grasslands in Gweedore Bay and Islands 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 known to be distributed throughout the SAC, usually occurring in mosaic with other habitats such as exposed rock, other heath types and fixed dune habitats (NPWS internal files). Cooper et al. (2012) surveyed and mapped four sub-sites containing juniper formations that occur completely or partially within the SAC. See map 9. Further areas of the habitat are likely to be present
Habitat distribution	Occurrence	No decline. See map 9 for surveyed locations	See notes for area above
Juniper population size	Number per formation	At least 50 plants per formation	To classify as a juniper formation, at least 50 plants should be present (Cooper et al., 2012)
Vegetation composition: typical species	Number per formation	At least 50% of the listed positive indicator species for the relevant vegetation group present	Cooper et al. (2012) lists positive indicator species for five vegetation groups
Vegetation composition: negative indicator species	Occurrence per formation	Negative indicator species, particularly non-native invasive species, absent or under control	Negative indicator species listed by Cooper et al. (2012)
Vegetation structure: cone-bearing plants	Percentage per formation	At least 10% of plants are bearing cones	Attribute and target based on Cooper et al. (2012)
Vegetation structure: seedling recruitment	Percentage per formation	At least 10% of juniper plants are seedlings	Attribute and target based on Cooper et al. (2012)
Vegetation structure: dead juniper	Percentage per formation	Mean percentage of each juniper plant dead less than 10%	Attribute and target based on Cooper et al. (2012)

1355 Otter *Lutra lutra*

To maintain the favourable conservation condition of Otter in Gweedore Bay and Islands 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 154ha above high water mark (HWM); 40ha along river banks/ around lakes and 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 1,192ha	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 12.1km	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 82ha	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 10	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

Conservation Objectives for : Gweedore Bay and Islands SAC [001141]

1395 Petalwort *Petalophyllum ralfsii*

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

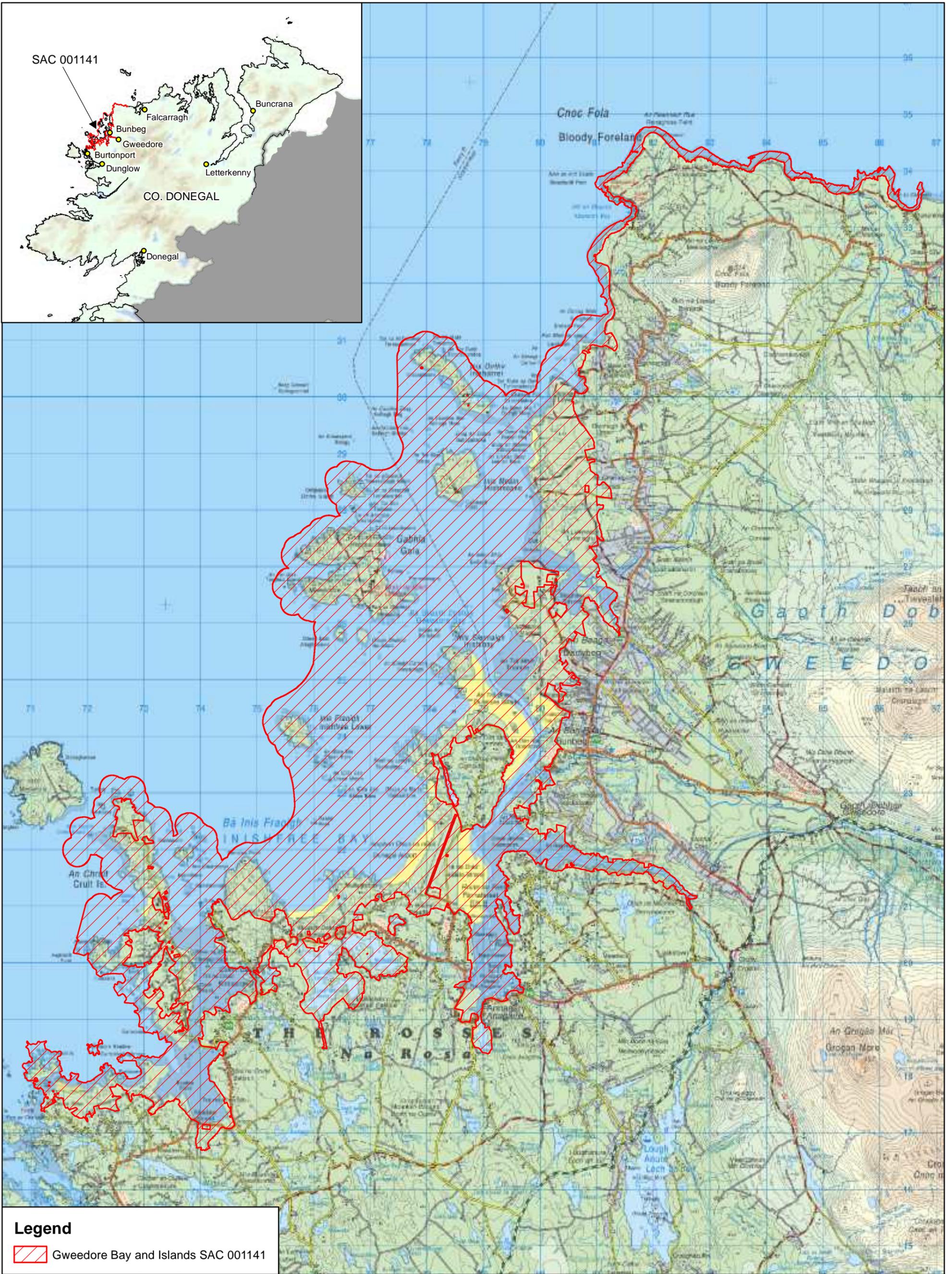
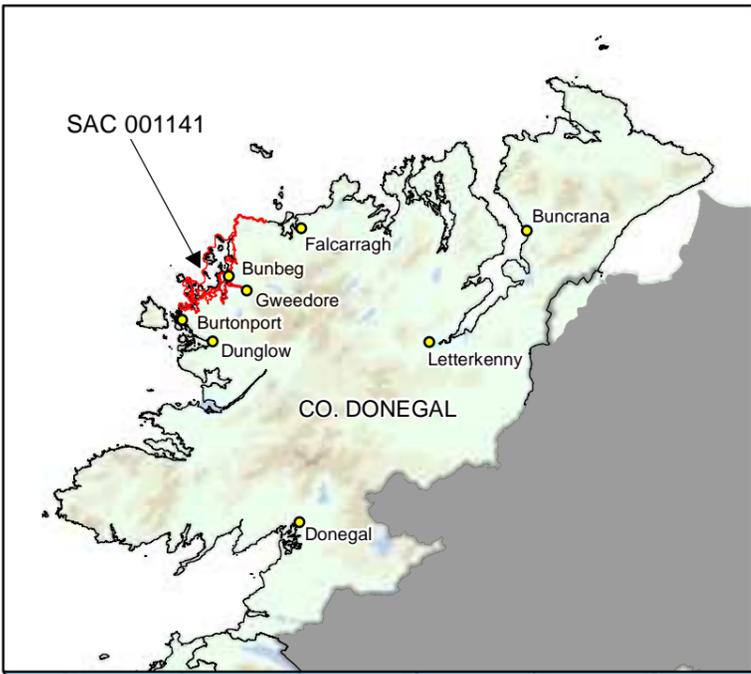
Attribute	Measure	Target	Notes
Distribution of populations	Number and geographical spread of populations	No decline. See map 11 for known locations	There are currently three known populations: (4a) Damph Beg, in slack area and on gravelly sand of small low bank above track into small disused sand-quarry, above edge of dune slack; (4b) Derrybeg, on low NW-facing part of bank just above edge of dune slack and (4c) Keadew Point, at three locations. The population at Damph Beg has not been seen since 2002. Data from NPWS surveys and Campbell (2013)
Population size	Number of individuals	No decline. Population at (4a) Damph Beg: c.10 thalli; (4b) Derrybeg: c.8 thalli; (4c) Keadew Point: c.88 thalli. Total: c.100 thalli	Counts of thalli: for Damph Beg, from mean number of thalli recorded by Holyoak in 1999 and 2002 (24 and 7 thalli) and Lockhart in 2006 (0 thalli) = 10.33; for Derrybeg, from mean number of thalli recorded by Holyoak in 2002 (3 thalli) and Lockhart in 2006 (12 thalli) = 7.5 thalli; for Keadew Point, from mean of number of thalli in two 1 x 1m plots, from three counts between early April 2009 and April 2011 (Campbell, 2013) = 4.2 thalli per m ² in 21m ² = c.88 thalli
Area of suitable habitat	Hectares	No decline. Area of suitable habitat at Damph Beg and Derrybeg currently unknown, but thought to be very small, c.0.5m ² each. Area of suitable habitat at Keadew Point estimated at c.21m ² . Total = c.0.002ha	The extents of suitable habitat at Damph Beg and at Derrybeg has not been measured by GPS, but are known to be very small (c.0.5m ² each). Main area of occupancy at Keadew Point is on a layer of humus-rich sand c.1cm thick overlying pure sand on a rocky outcrop above the shoreline, measured by GPS co-ordinates = 24.3m ² (Campbell, 2013). Only about 80% of this area is actually suitable habitat for <i>Petalophyllum ralfsii</i> (c.19m ²). Two outlying records (1m ² each) from Keadew Point were also reported by Lockhart in 1998 and Holyoak in 2002 giving a total of c.21m ² for Keadew Point
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	<i>Petalophyllum ralfsii</i> 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	<i>Petalophyllum ralfsii</i> grows in compacted, sandy ground, maintained by rabbit (<i>Oryctolagus cuniculus</i>) and sheep grazing and some trampling (by walkers). Recorded at Damph Beg with low moss and patchy low phanaerogams (Holyoak, 2002), not refound there by Lockhart in 2006 who reported that the prospects for survival are reasonable, but small available niche is vulnerable; recorded at Derrybeg on wet humic sand with very low, patchy moss-rich grassland (2.4cm high) (by Holyoak in 2002); at Keadew Point, Campbell (2013) recorded a mean height of vegetation of 6cm, with bryophyte cover c.34-75% and bare ground c.4-25% (based on two 1 x 1m plots from 2009 and 2011)

Conservation Objectives for : Gweedore Bay and Islands SAC [001141]

1833 Slender Naiad *Najas flexilis*

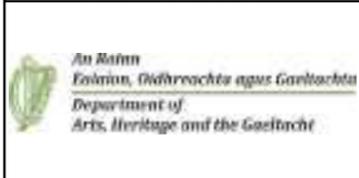
To maintain the favourable conservation condition of Slender Naiad in Gweedore Bay and Islands SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population extent	Hectares and distribution	No change to the spatial extent of <i>Najas flexilis</i> within each lake, subject to natural processes. See map 12 for known locations	See <i>Najas flexilis</i> supporting document for further details
Population depth	Metres	No change to the depth range of <i>Najas flexilis</i> within each lake, subject to natural processes	See <i>Najas flexilis</i> supporting document for further details
Population viability	Plant traits	No decline in plant fitness, subject to natural processes	See <i>Najas flexilis</i> supporting document for further details
Population abundance	Square metres	No change to the cover abundance of <i>Najas flexilis</i> , subject to natural processes	See <i>Najas flexilis</i> supporting document for further details
Species distribution	Occurrence	No decline, subject to natural processes	See <i>Najas flexilis</i> supporting document for further details
Habitat extent	Hectares	No decline, subject to natural processes	See <i>Najas flexilis</i> 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 <i>Najas flexilis</i> supporting document for further details
Lake substratum quality	Various	Maintain appropriate substratum type, extent and chemistry to support the populations of the species	See <i>Najas flexilis</i> supporting document for further details
Water quality	Various	Maintain appropriate water quality to support the populations of the species	See <i>Najas flexilis</i> supporting document for further details
Acidification status	pH units, mg/l	Maintain appropriate water and sediment pH, alkalinity and cation concentrations to support the populations of <i>Najas flexilis</i> , subject to natural processes	See <i>Najas flexilis</i> supporting document for further details
Water colour	mg/L PtCo	Maintain appropriate water colour to support the populations of <i>Najas flexilis</i>	See <i>Najas flexilis</i> supporting document for further details
Associated species	Species composition and abundance	Maintain appropriate associated species and vegetation communities to support the populations of <i>Najas flexilis</i>	See <i>Najas flexilis</i> supporting document for further details
Fringing habitat: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the populations of <i>Najas flexilis</i>	See <i>Najas flexilis</i> supporting document for further details



Legend

 Gweedore Bay and Islands SAC 001141



**MAP 1:
GWEEDORE BAY AND ISLANDS SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION**

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

**SITE CODE:
SAC 001141; version 3.01. CO. DONEGAL**

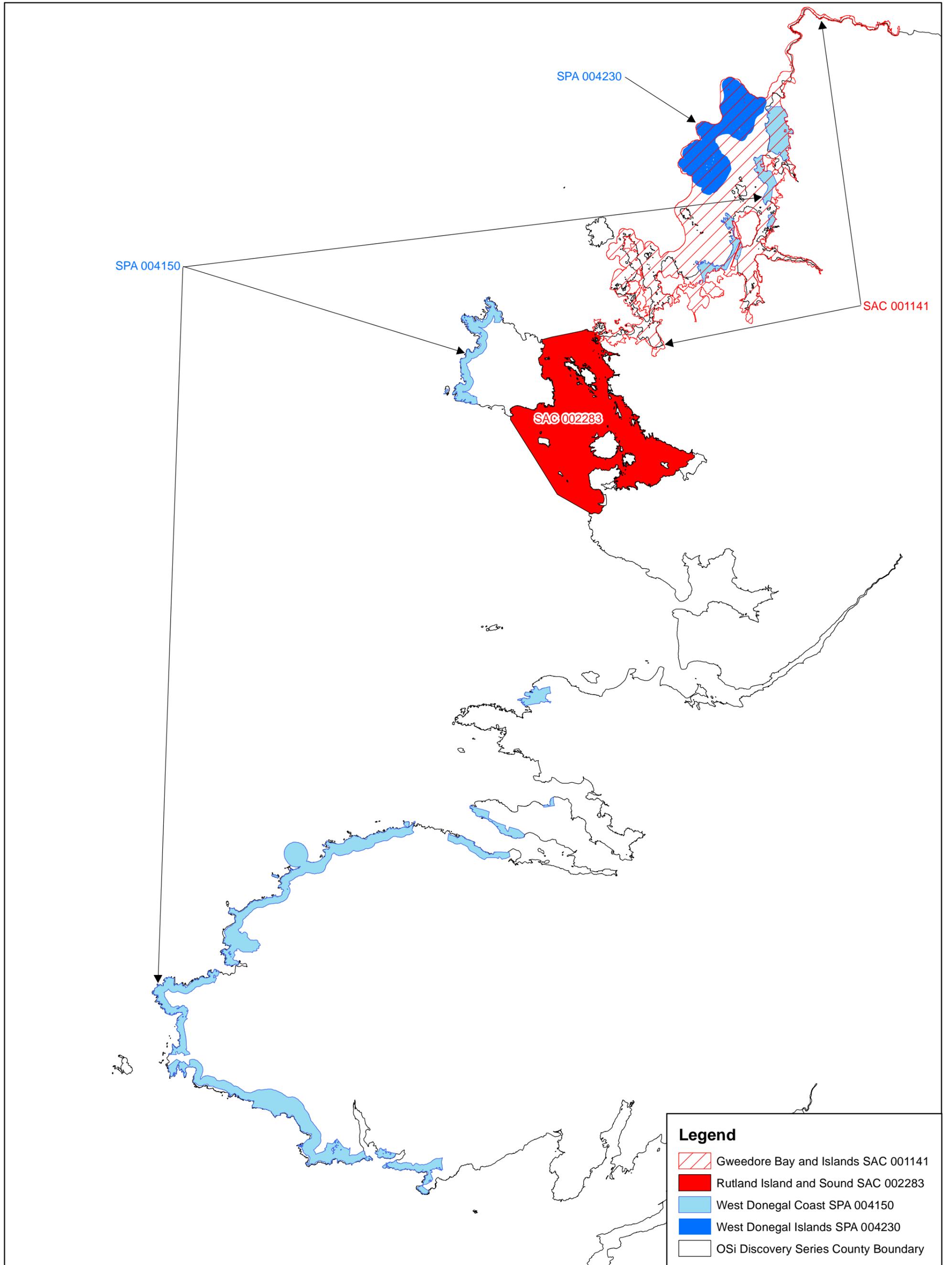
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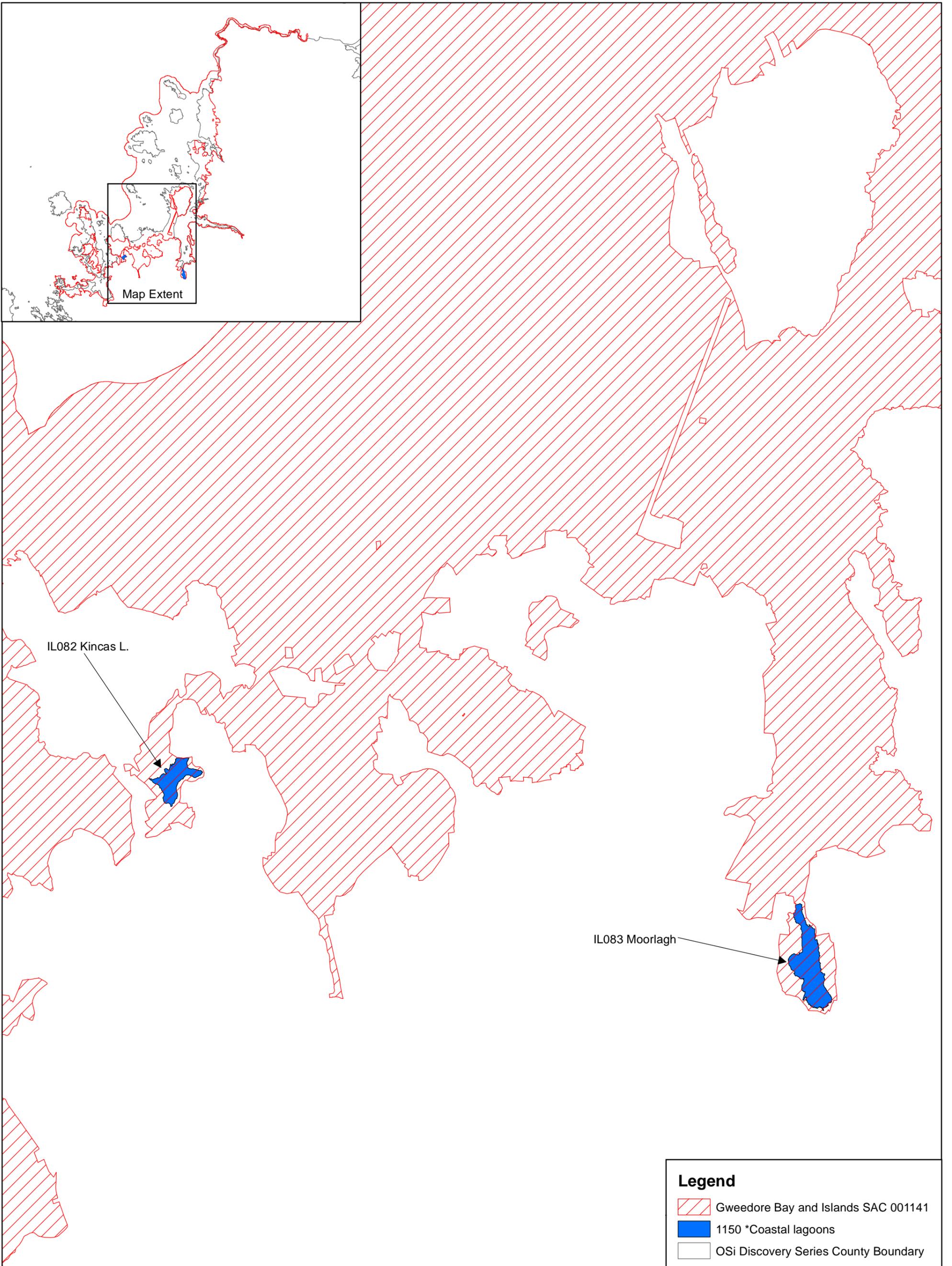
Map Version 1
Date: Jan 2015



Legend

-  Gweedore Bay and Islands SAC 001141
-  Rutland Island and Sound SAC 002283
-  West Donegal Coast SPA 004150
-  West Donegal Islands SPA 004230
-  OSi Discovery Series County Boundary





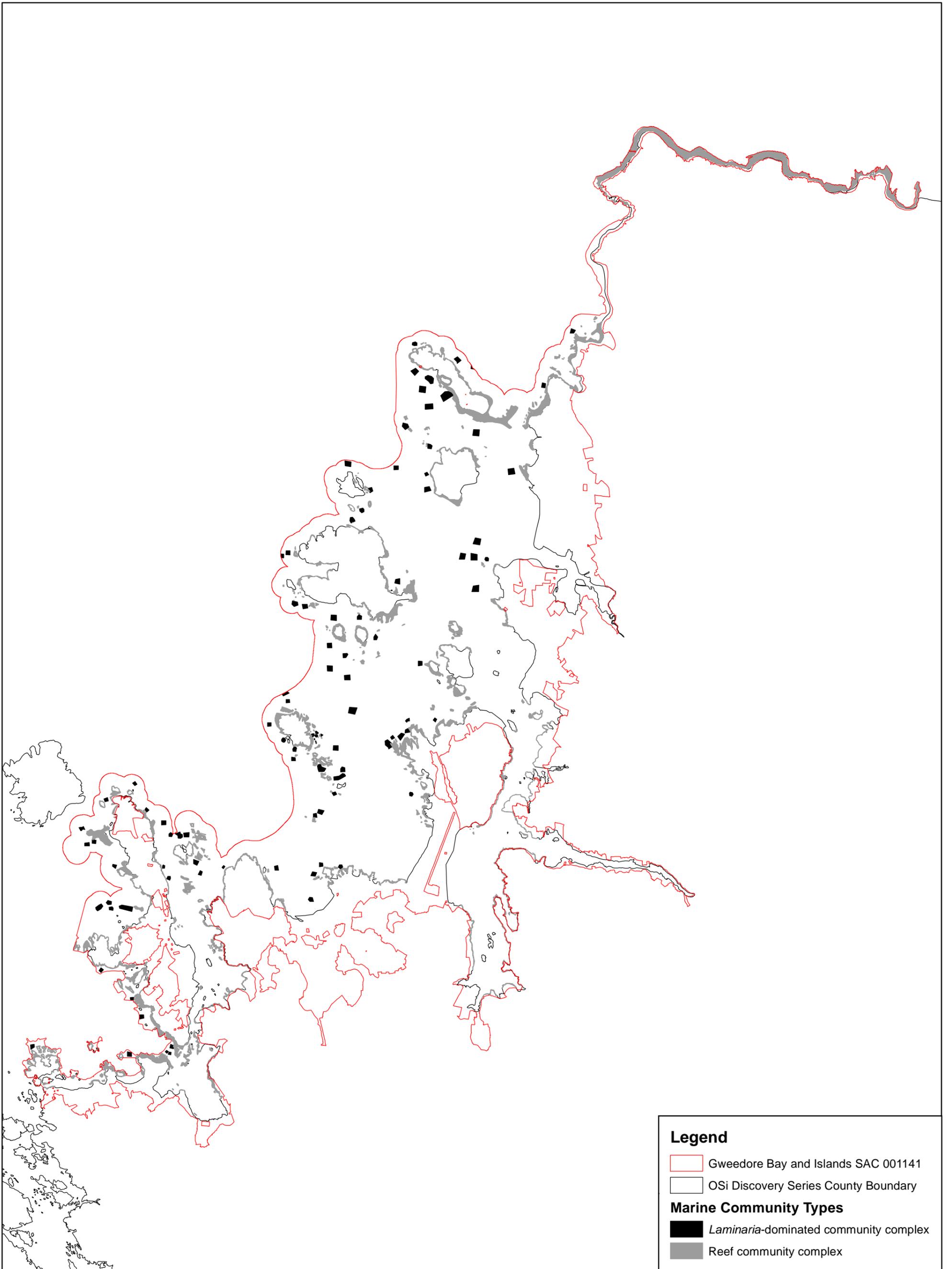
Legend

-  Gweedore Bay and Islands SAC 001141
-  1150 *Coastal lagoons
-  OSi Discovery Series County Boundary



Legend

- Gweedore Bay and Islands SAC 001141
- 1170 Reefs
- OSi Discovery Series County Boundary

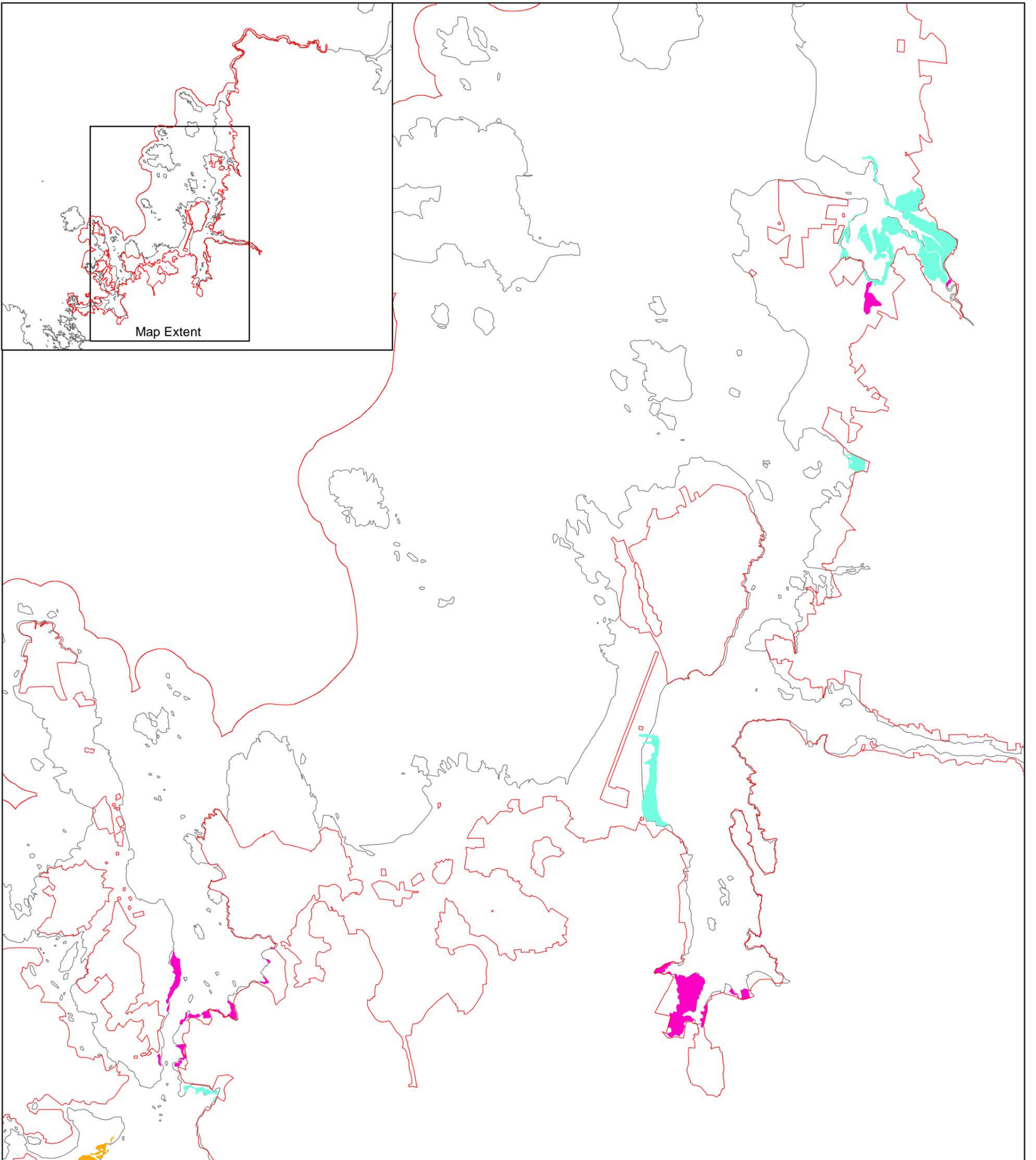


Legend

- Gweedore Bay and Islands SAC 001141
- OSi Discovery Series County Boundary

Marine Community Types

- Laminaria*-dominated community complex
- Reef community complex



Legend

- Gweedore Bay and Islands SAC 001141
- OSi Discovery Series County Boundary

SMP: 0129 Saltmarsh Monitoring Project Site Codes

Saltmarsh Habitats

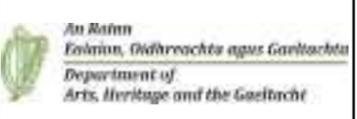
Qualifying Interests

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

Non Qualifying Interests

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

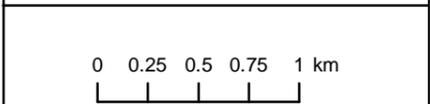
SMP: 0129



**MAP 6:
GWEEDORE BAY AND ISLANDS SAC
CONSERVATION OBJECTIVES
SALTMARSH HABITATS**

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

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↑
Map Version 1
Date: Jan 2015

Legend

- Gweedore Bay and Islands SAC 001141
- OSi Discovery Series County Boundary
- ★ National Shingle Beach Survey sub-sites
- CMP: 153 Coastal Monitoring Project Site Codes
- SDM: 155 Sand Dunes Monitoring Project Site Codes

Sand Dune Habitats

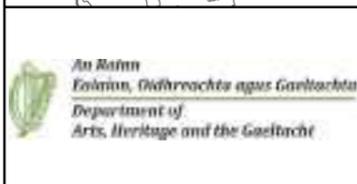
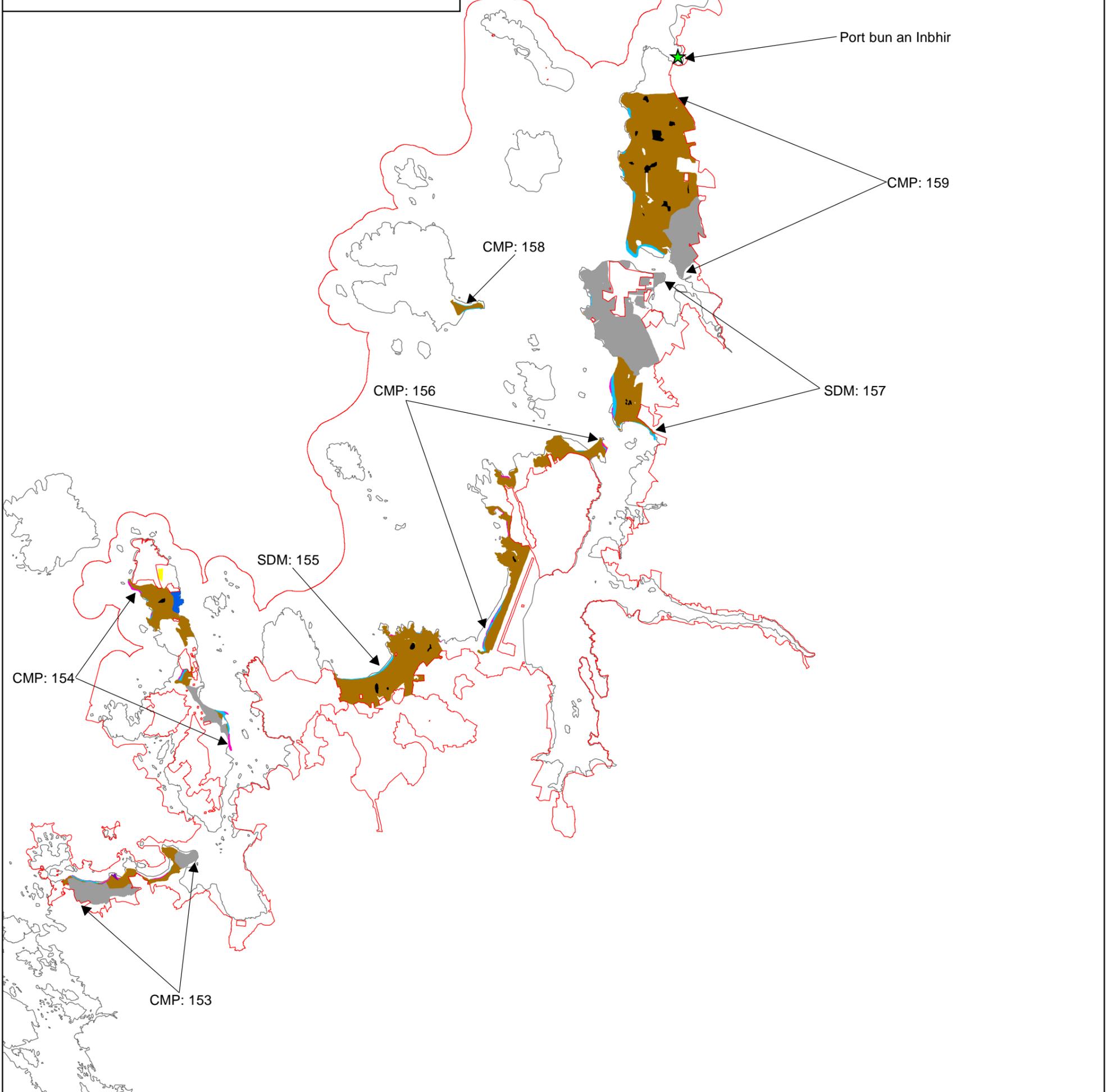
Qualifying Interests

- 1220 Perennial vegetation of stony banks
- 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*
- 2150 *Atlantic decalcified fixed dunes (*Calluno-Ulicetea*)
- 2170 Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*)
- 2190 Humid dune slacks
- 21A0 *Machairs

Non Qualifying Interests

- 1210 Annual vegetation of drift lines

Coastline from Port ui Chuirean to Bunaninver



MAP 7:
GWEEDORE BAY AND ISLANDS SAC
CONSERVATION OBJECTIVES
SAND DUNE HABITATS &
PERENNIAL VEGETATION OF STONY BANKS

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

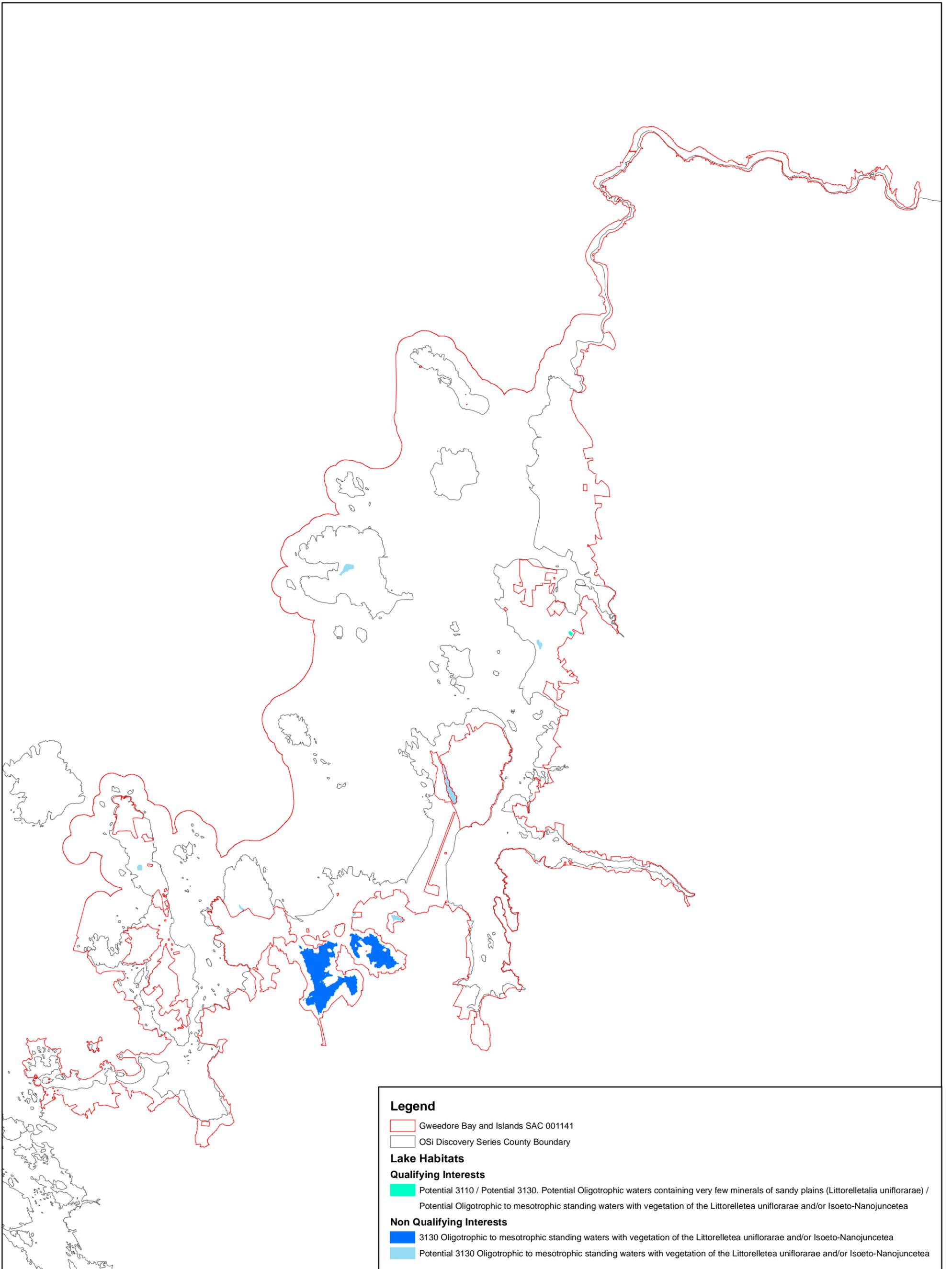
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Map Version 1
Date: Jan 2015



Legend

- Gweedore Bay and Islands SAC 001141
- OSi Discovery Series County Boundary

Lake Habitats

Qualifying Interests

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

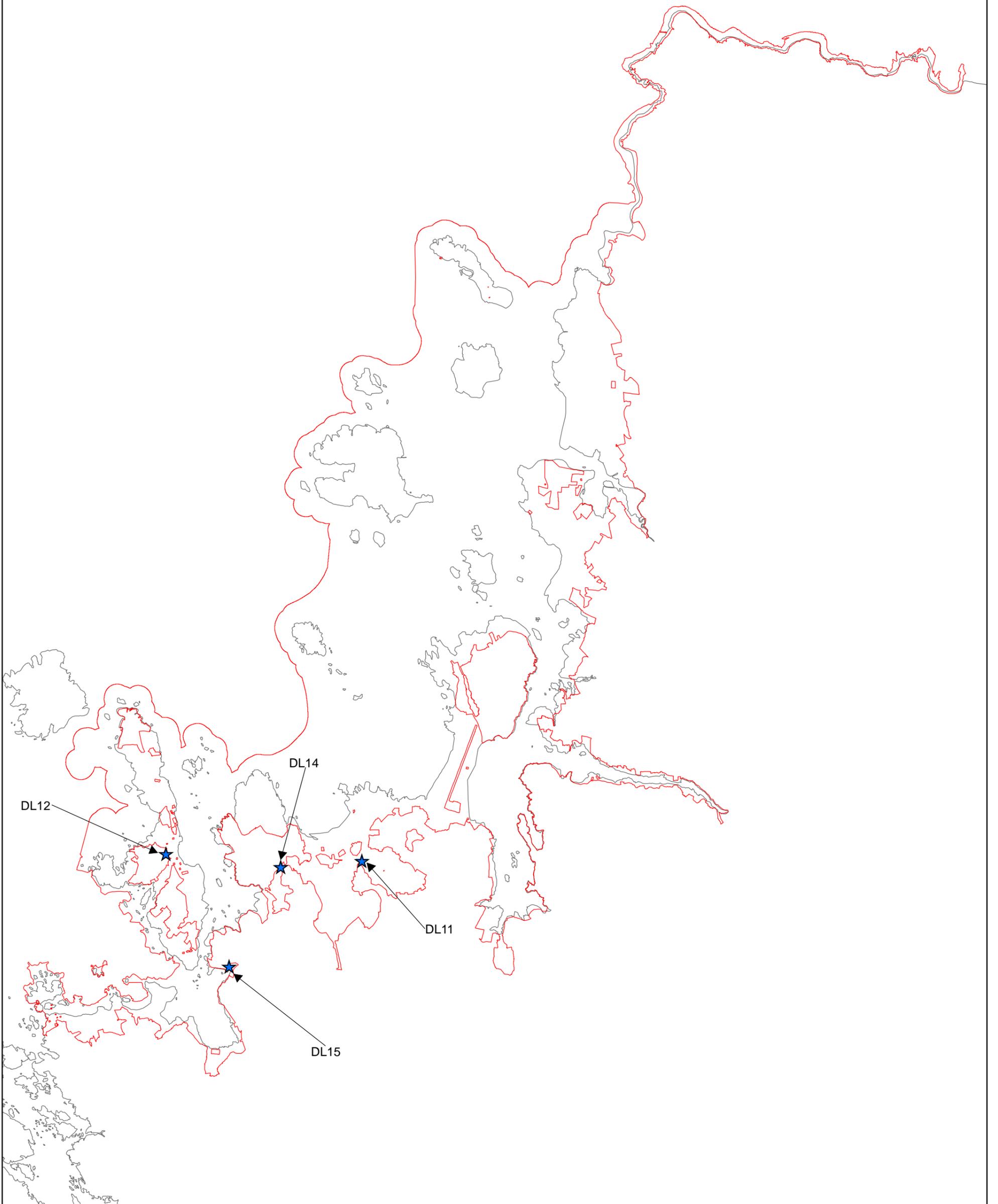
Non Qualifying Interests

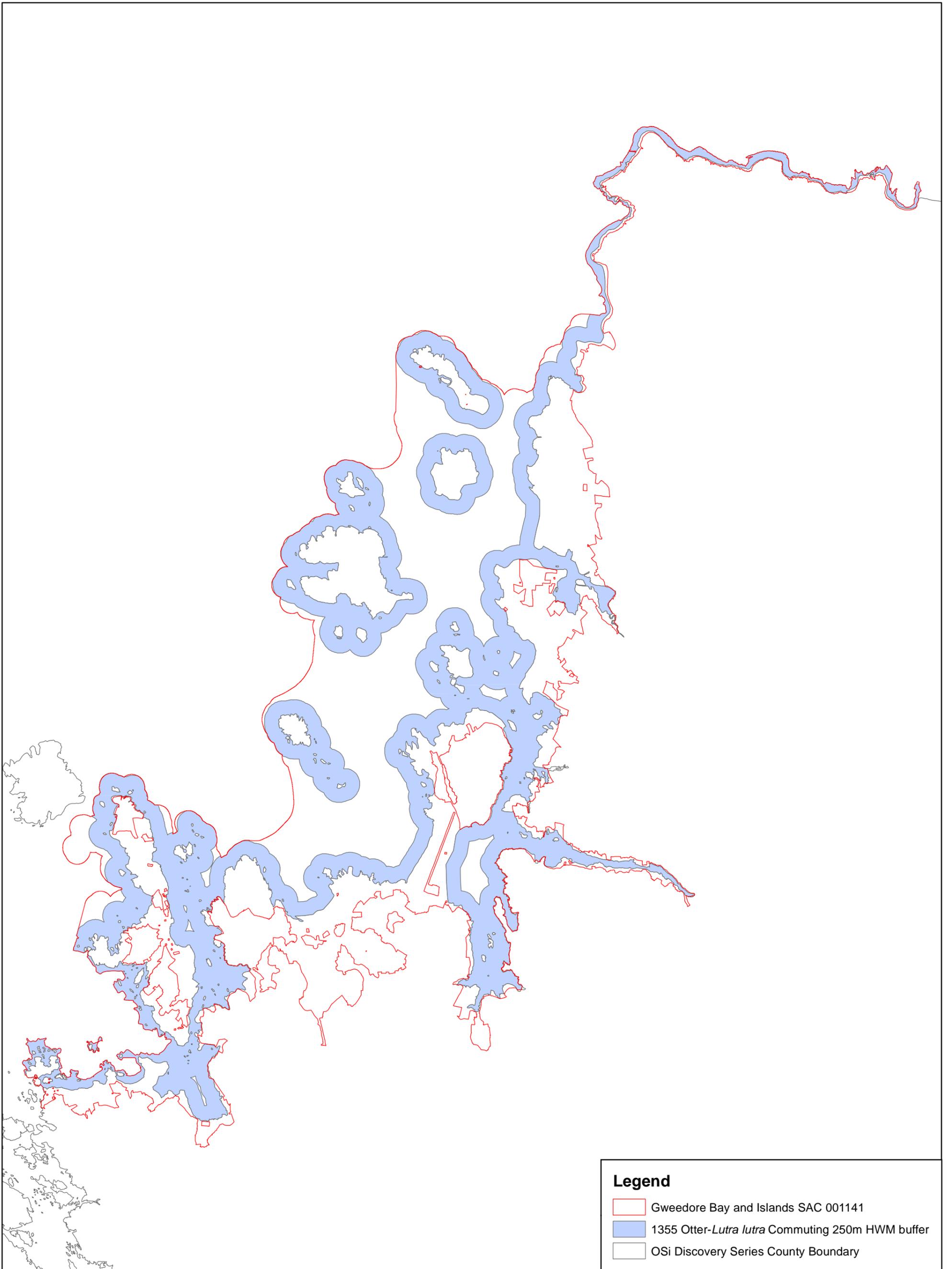
- 3130 Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorarae* and/or *Isoeto-Nanojuncetea*
- Potential 3130 Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorarae* and/or *Isoeto-Nanojuncetea*



Legend

- Gweedore Bay and Islands SAC 001141
- ★ 5130 *Juniperus communis* formations on heaths or calcareous grasslands Survey Sites
- OSi Discovery Series County Boundary





Legend

- Gweedore Bay and Islands SAC 001141
- 1355 Otter-*Lutra lutra* Commuting 250m HWM buffer
- OSi Discovery Series County Boundary



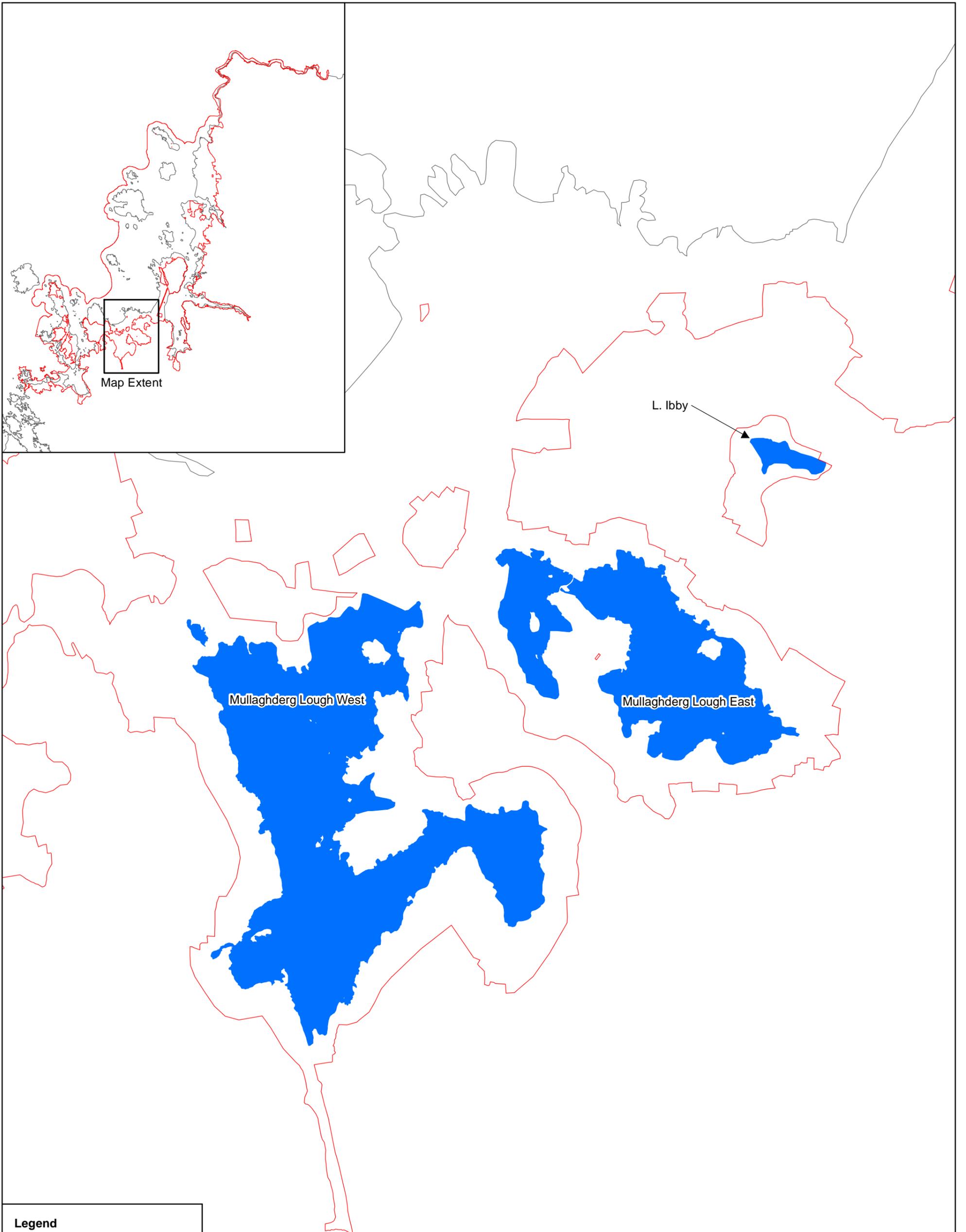
4a Damph Beg; Bunlack machair

4b Derrybeg

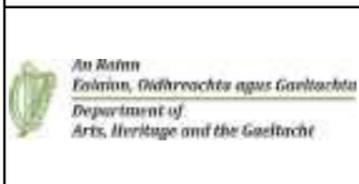
4c Keadew Point

Legend

- Gweedore Bay and Islands SAC 001141
- 1395 Petalwort - *Petalophyllum ralfsii*
- OSi Discovery Series County Boundary



- Legend**
- Gweedore Bay and Islands SAC 001141
 - 1833 Slender Naiad - *Najas flexilis*
 - OSi Discovery Series County Boundary



**MAP 12:
GWEEDORE BAY AND ISLANDS SAC
CONSERVATION OBJECTIVES
SLENDER NAIAD**

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

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**Map Version 1
Date: Jan 2015**



Conservation objectives for Falcarragh to Meenlaragh SPA [004149]

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	<i>Crex crex</i>



Citation: NPWS (2022) Conservation objectives for Falcarragh to Meenlaragh SPA [004149]. Generic Version 9.0. Department of Housing, Local Government and Heritage.

Appendix B

Nutrient Sensitive Qualifying Interests

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

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

Appendix C
EAM Summary Report for 117 Gortahork
WTP

Irish Water
**Lead in Drinking Water
Mitigation Plan - EAM**
Gortahork EAM

Issue 05 | 15 February 2022

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 257367

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RYAN HANLEY

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		Signature			
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			Prepared by	Checked by	Approved by
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		Signature			
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		Signature			
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		Name	Sam Marchant	Alison Orr	Gerry Baker
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2 Abbreviations & Glossary	2
3 Gortahork-Falcarragh Water Supply Zone	3

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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 the Gortahork-Falcarragh 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 16th of 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
- 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 (e.g., 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 Gortahork-Falcarragh Water Supply Zone

Gortahork-Falcarragh Water Supply Zone (WSZ) (0600PUB1059) is located in County Donegal. The Gortahork Water Treatment Plant (WTP) supplies drinking water to the WSZ via a number of reservoirs including the Derryconor Reservoir, the Gortahork Reservoir, the Cashel Reservoir and the Dunmore Reservoir. The Plumbosolvency Control Plan for the WSZ proposes universal dosing of Orthophosphate (OP) to take place at the outlet of Gortahork WTP. Figure 1, at the end of this report, shows the location of the areas proposed to receive Orthophosphate dosed water.

The average flow from the Ardsbeg (Gortahork-Falcarragh) Water Treatment Plant is 2,135 m³/day. Approximately 49% of the flow is accounted for, and this fixed rate for water mains leakage (51%) is assumed across the WSZ. The WSZ boundary covers a large rural area and the Gortahork and Falcarragh urban centres which are served by WWTP agglomerations. There are an estimated 2,049 properties across the WSZ that are serviced by Domestic Wastewater Treatment Systems (DWWTS).

Water Supply Zone	Gortahork-Falcarragh (0600PUB1059)
Step 1 – Appropriate Assessment Screening	<i>To be completed by Ryan Hanley</i>
Model Assumptions	<p>All concentration and loading units for orthophosphate (P₀₄-P) are expressed as mg/l P and kg P/yr.</p> <p>Adopted Orthophosphate Optimum Dosing Concentration is 1.2 mg/l P.</p> <p>Unaccounted for water from the mains is 51%. Seepage from the mains is distributed evenly across the entire length of the WSZ network.</p> <p>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.</p> <p>Conversion factor for Total Phosphorus (TP) to Orthophosphate (OP) for WWTP effluent is 0.5.</p> <p>It is assumed there will be no treatment of additional OP 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 OP 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.</p>

Water Supply Zone	Gortahork-Falcarragh (0600PUB1059)
	<p>Where existing monitoring data is not available a surrogate status is derived from the Orthophosphate indicative quality of the waterbody in the following hierarchy:</p> <ul style="list-style-type: none"> • Upstream waterbodies • Downstream waterbodies • Adjacent waterbodies of similar hydrological settings • Ecological status of the waterbody. <p>The mid-point of that surrogate indicative quality range is used as baseline concentration.</p>
<p>Step 2 & 3 – Impact on Waste Water Treatment Plant (WWTP) Effluent Concentrations and receiving WBs</p>	<p>This section assesses the influent and effluent P loads and resultant OP 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.</p> <p>The treatment level and PE of the WWTPs within the agglomerations are as follows:</p> <ul style="list-style-type: none"> - Gortahork – Primary treatment PE 424 - Falcarragh – No Treatment (Raw) PE 1,109 <p>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.</p>
<p>Step 4 - Subsurface pathways</p>	<p>The loading from mains leakage is 1,089 m³/d (477 kg/yr P). Approximately 362 kg/yr P of the load is attenuated along the flowpaths. The hydraulic loading from the DWWTS is 581 m³/d (254 kg/yr P). Approximately 241 kg/yr P of the load is attenuated along the flowpaths.</p> <p>Flow monitoring gauges are not available for any waterbodies within the assessment area. The river flows for ungauged waterbodies are established from Hydrotool data or, if that is not available, using the using the Area-Standard-period Average Annual Rainfall (SAAR) method.</p> <p>Baseline Orthophosphate monitoring data and associated thresholds are available for three RWBs (Lough Agher Stream, Ray_010 and Tullaghobegly_020) and not available for four RWBs (An_Cheathrú_Cheanainn_010, Glen (Meenaclady)_010, Glenna_010 and Owenawillin_010).</p> <p>Orthophosphate drinking water dosing does not lead to a deterioration in RWB status from subsurface and near surface pathways.</p>

Water Supply Zone	Gortahork-Falcarragh (0600PUB1059)
<p>Step 5 and 6 - Combined Impact from direct and diffuse sources on River Waterbodies (RWB)</p>	<p>This section assesses the combined impact as a result of increased Orthophosphate load from WWTP discharges (Steps 2 & 3), seepage from mains and DWWTS and cumulative impacts from other drinking water dosing areas on River Waterbodies (RWBs). The increase in Orthophosphate concentrations in the RWBs as a result of the P drinking water dosing is shown in Table 2.</p> <p>Figure 2 illustrates the scale of Orthophosphate loading to the receiving waterbodies from mains leakage, DWWTS and direct discharges from WWTP and SWOs and upstream dosing areas. This illustrates that a significant proportion of the loads come from mains seepage through the subsurface, near surface and preferential flow pathways. In An Cheathrú Cheanainn_010 RWB a significant proportion of the load is from upstream dosing area, Creeslough.</p> <p>Figure 3 presents the total loading to the drinking water dosing area from the main sources and illustrates how much of the loading is attenuated in the subsurface, treated in WWTPs and ultimately how much is transported to the receiving RWBs. This illustrated that the mains leakage and DWWTS account for the largest proportion of load and a large proportion of both the mains leakage and DWWTS is attenuated.</p> <p>Direct discharges from WWTPs are combined with diffuse discharges at the following receiving waterbodies and tracked downstream from that point: Falcarragh WWTP – An Cheathrú Cheanainn_010 (SWO only)</p> <p>The remainder of the river water bodies receive diffuse discharge only and the Gortahork discharges into Ballyness Bay.</p> <p>The increase in concentration as a result of the drinking water dosing with Orthophosphate does not cause a deterioration in the status of any RWB.</p>
<p>Step 5 and 6 - Combined Impact through subsurface and surface pathways on Groundwater Waterbodies (GWB)</p>	<p>The increase in Orthophosphate concentrations in the Groundwater Waterbodies (GWBs) as a result of the P drinking water dosing is shown in Table 3.</p> <p>Monitoring data is not available for the only groundwater body in the assessment, Northwest Donegal.</p> <p>The increase in concentration as a result of the drinking water dosing with Orthophosphate does not cause a deterioration in the status of any GWB.</p>
<p>Step 5 and 6 - Combined Impact from direct and diffuse sources on Lakes within the Water Supply Zone</p>	<p>There are no lake waterbodies within the assessment area.</p>

Water Supply Zone	Gortahork-Falcarragh (0600PUB1059)
<p>Step 5 and 6 - Combined Impact from direct and diffuse sources on Transitional and Coastal Waterbodies</p>	<p>The increase in Orthophosphate concentrations in the downstream Transitional Waterbodies and small Coastal (TraC) Waterbodies as a result of drinking water dosing is shown in Table 4.</p> <p>Baseline Orthophosphate monitoring data and associated thresholds are not available for Ballyness Bay but are available for the adjacent Northwestern Atlantic Seaboard (HAs 37 38).</p> <p>Note that the Northwestern Atlantic Seaboard (HAs 37 38) is a large waterbody, however only the area receiving direct discharge from the Gortahork WSZ is considered.</p> <p>The drinking water dosing with Orthophosphate does not deteriorate the status of the TraC waterbodies for both the summer and winter seasons.</p>
<p>Step 5 and 6 Cumulative Assessment of impact from all EAMs within the catchment on:</p> <p>Transitional and Coastal Water Bodies</p> <p>AND</p> <p>Protected Waterbodies</p>	<p><u>Step 5 and 6 Cumulative Assessment of impact from all EAMs within catchment on Transitional and Coastal Waterbodies</u></p> <p>The Gortahork EAM is adjacent to the Creeslough EAM dosing area, see Figure 4. An Cheathru Cheanainn_010 (RWB), which is also included in the Creeslough assessment discharges into Ballyness Bay. However, only a small western part of the RWB discharges into Ballyness Bay and no load from the Creeslough EAM will reach Ballyness Bay.</p> <p>Therefore, a cumulative assessment of the impact of multiple EAMs is not considered within this assessment.</p> <p><u>Step 5 and 6 Cumulative Assessment of impact from EAMs on downstream Protected Waterbodies</u></p> <p>There are no protected waterbodies downstream of the Gortahork EAM not already included in the assessment.</p>
<p>Conclusions</p>	<p>Red, Amber, Green (RAG) STATUS: EAM Result - GREEN</p> <p>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.</p> <p>A map of the RAG status of waterbodies is presented in Figure 4.</p>
<p>Recommendation</p>	<p>No mitigation measures are required.</p>

Table 1: Increased loading/concentration from WWTPs due to dosing of drinking water – Dosing rate = 1.2 mg/l

Agglomeration and Discharge Type	Effluent Treatment level	WWDL ELV AER (2019) Compliance	Primary Discharge Receiving WB		Annual average TP Load (kg/yr P)	OP Concentration (mg/l P) TP – OP Conversion factor varied for sensitivity analysis (40%, 50%, 68%)		
						0.5	0.4	0.68
Gortahork Primary Discharge	Primary	N/A	Ballyness Bay	Pre-Dosing	279	7.20	5.76	9.79
				Post Dosing	308	7.95	6.36	10.82
Falcarragh Primary Discharge	Raw	N/A	Ballyness Bay	Pre-Dosing	810	8.00	6.40	10.88
				Post Dosing	887	8.77	7.01	11.92
Falcarragh SWOs (1 No.)				Pre-Dosing	24	1.14	0.91	1.55
				Post Dosing	26	1.25	1.00	1.70

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

Name	EU_CD	Indicative Quality <i>Surrogate Status in italic</i>	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)
An_Cheathrú_Cheanainn_010	IE_NW_38C180660	<i>High</i>	0.0125	0.0188	41.3	0.0006	0.0131
Glen (Meenaclady)_010	IE_NW_38G050200	<i>High</i>	0.0125	0.0188	35.4	0.0012	0.0137
Glenna_010	IE_NW_38G010200	<i>Moderate</i>	0.0455	0.0508	14.9	0.0004	0.0459
Lough Agher Stream_010	IE_NW_38L020200	<i>High</i>	0.0124	0.0188	1.0	0.00005	0.0125
Owenawillin_010	IE_NW_38O100200	<i>High</i>	0.0125	0.0188	25.6	0.0010	0.0135
Ray_010	IE_NW_38R010200	<i>High</i>	0.0070	0.0188	10.8	0.0002	0.0072
Tullaghobegly_020	IE_NW_38T010400	<i>Moderate</i>	0.0364	0.0508	24.1	0.0004	0.0368

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

Name	EU_CD	Indicative Quality <i>Surrogate Status in italic</i>	Baseline Conc. used in calculation (mg/l P)	75% of status threshold (mg/l P)	Cumulative load (kg/yr P)	Modelled dosing conc. (mg/l P)	Potential Baseline conc. following dosing (mg/l P)
Northwest Donegal	IE_NW_G_049	<i>Good</i>	0.0175	0.0263	25.5	0.0002	0.0177

Table 4: Orthophosphate concentrations in TraC waterbodies following dosing of drinking water

Name	EU_CD	Season	Indicative Quality <i>Surrogate Status in italic</i>	Baseline conc used in calculation (mg/l P)	75% of status threshold (mg/l P)	Cumulative load (kg/yr P)	Modelled dosing conc. (mg/l P)	Potential conc. following dosing (mg/l P)
Ballyness Bay	IE_NW_170_0000	Summer	<i>Moderate</i>	0.0500	0.0550	145.0	0.0006	0.0506
		Winter	<i>Moderate</i>	0.0500	0.0550	145.0	0.0006	0.0506
Northwestern Atlantic Seaboard (HAs 37;38)	IE_NW_100_0000	Summer	High	0.0025	0.0188	145.0	0.0006	0.0031
		Winter	High	0.0100	0.0188	145.0	0.0006	0.0106

Figure 2: RWB Cumulative Loading Assessment

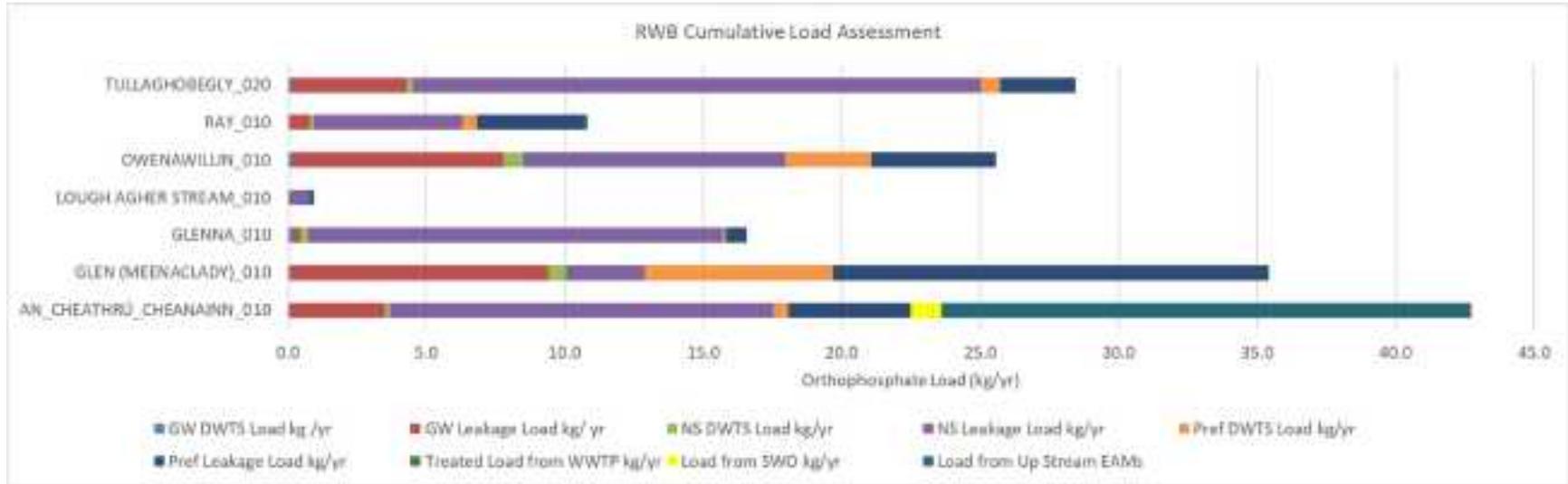


Figure 3: Total dosing area Attenuated, Treated and Transported Loads

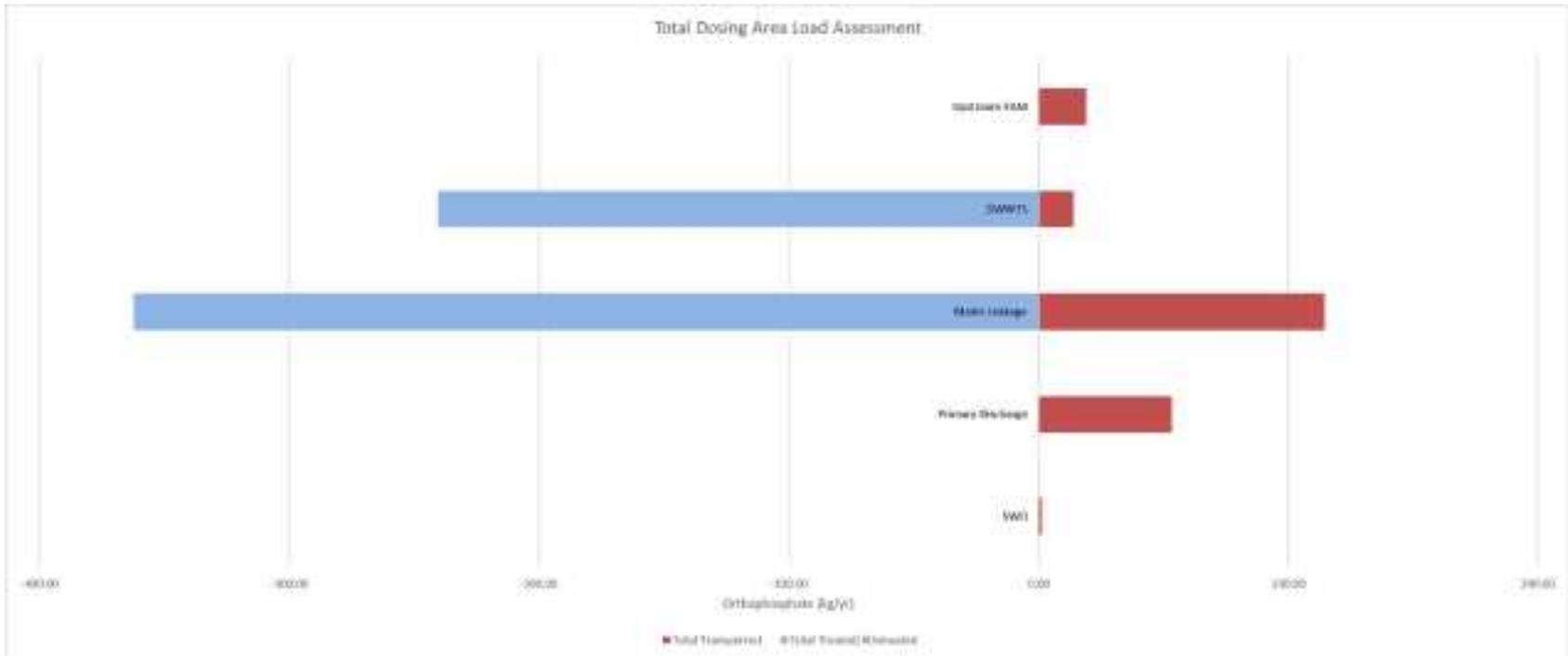


Figure 4: Upstream and downstream EAMs within WFD catchment

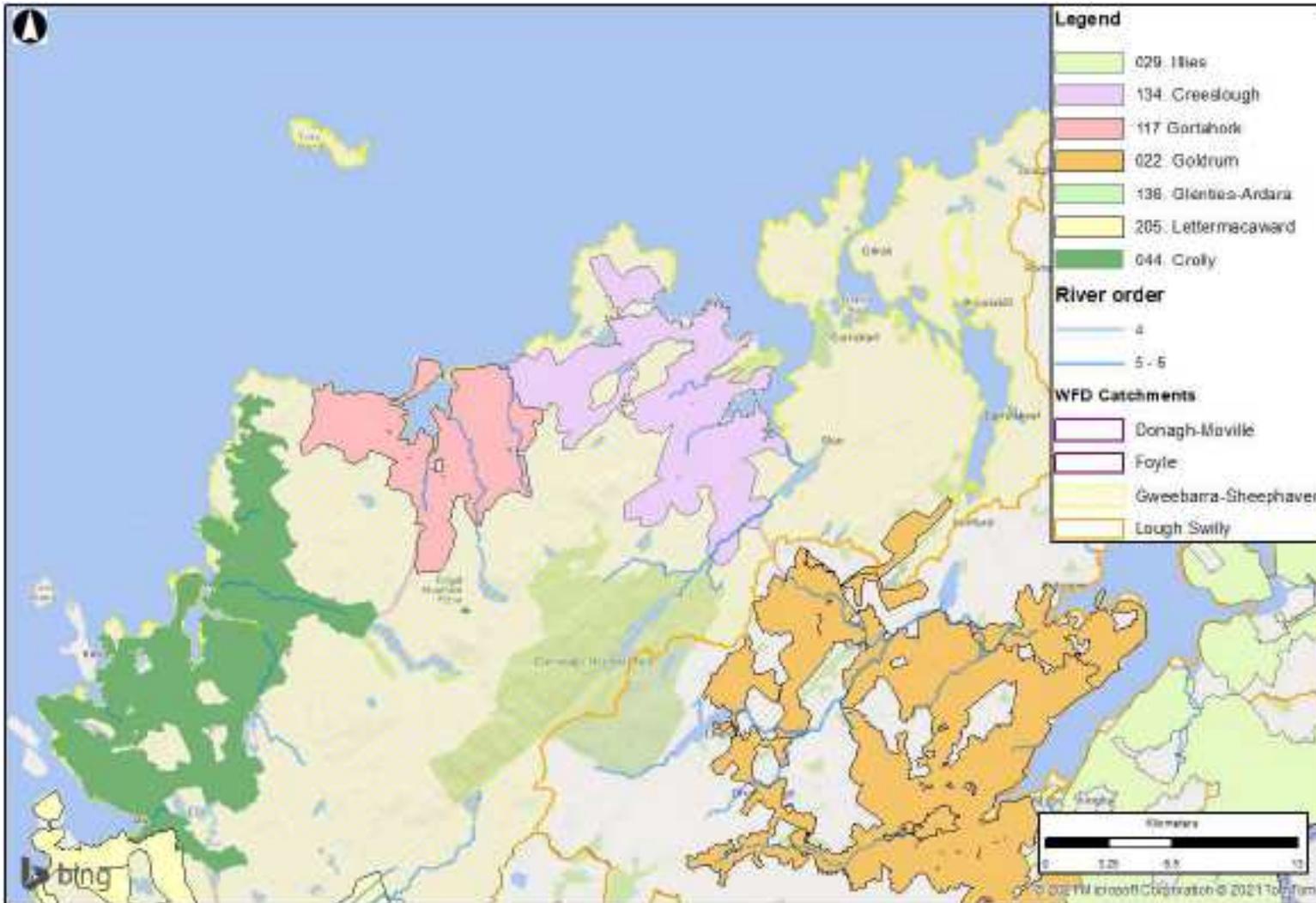


Figure 5: Red, Amber, Green (RAG) Status of waterbodies

