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IRISH WATER

LEAD IN DRINKING WATER MITIGATION PLAN – 170 GORT WSZ

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 Gort Water Treatment Plant (WTP) in Co. Galway, to Gort Water Supply Zone (WSZ).

This report comprises information in support of the Screening of the Project in line with the requirements of Article 6(3) of the EU Habitats Directive (Directive 92/43/EEC) on the Conservation of Natural Habitats and of Wild Fauna and Flora (hereafter referred to as the Habitats Directive). The report assesses the potential for significant effects resulting from the additional phosphorus (P) load to environmental receptors, resulting from OP dosing being undertaken to mitigate against consumer exposure to lead in drinking water. It is therefore necessary to consider the sources, pathways and receptors in relation to added P.

1.1 PURPOSE OF THIS REPORT

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

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

1.2 THE PLAN

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

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

[1] Now known as the Department of Housing, Planning and Local Government (DHPLG).

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

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 (µg/l) as per the European Union (Drinking Water) Regulations. From 2003 to 2013, the limit was 25 µg/l, which was a reduction on the previous limit (i.e. pre 2003) of 50 µg/l.

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

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

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

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

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

Orthophosphate (OP) is added in the form of Phosphoric acid - a clear, odourless liquid that is safe for human consumption. Phosphoric acid is already approved for use as a food additive (E338) in dairy, cereals, soft drinks, meat and cheese. The average adult person consumes between 1,000 and 1,500 milligrams (mg) of P every day as part of the normal diet. The OP dose rate for Gort WTP will be 1.0 mg/l P.

1.3 PROJECT BACKGROUND

Phosphorus (P) can influence water quality status through the process of nutrient enrichment and promotion of excessive plant growth (eutrophication). It is therefore necessary to quantify any potential environmental impact and the pathways by which the added (OP) may reach environmental receptors and to evaluate the significance of any such effects on European Sites. To facilitate the assessment of

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.

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

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

Article 6(4) states:

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

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

2.2 GUIDANCE FOR THE APPROPRIATE ASSESSMENT PROCESS

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

European and National Legislation:

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

Guidance / Case Law:

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

Departmental/NPWS Circulars:

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

2.3 STAGES OF THE APPROPRIATE ASSESSMENT PROCESS

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

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

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

Stage 1: Screening for a likely significant effect

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

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

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

Stage 3: Assessment of Alternative Solutions

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

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

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

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

2.4 INFORMATION SOURCES CONSULTED

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

- Information provided by IW as part of the project;
- Environmental Protection Agency – Water Quality www.epa.ie and www.catchments.ie;
- Geological Survey of Ireland – Geology, Soils and Hydrogeology www.gsi.ie;
- Information on the conservation status of birds in Ireland (Colhoun & Cummins 2013);
- National Parks and Wildlife Service – online Natura 2000 network information www.npws.ie;
- National Biodiversity Action Plan 2017 - 2021 (DCHG 2017);
- Article 17 Overview Report Volume 1 (NPWS, 2013a);
- Article 17 Habitat Conservation Assessments Volume 2 (NPWS, 2013b);
- Article 17 Species Conservation Assessment Volume 3 (NPWS, 2013c);
- EPA Qualifying Interests database, (EPA, 2015) and updated EPA Characterisation Qualifying Interests database (EPA/RPS, September 2016);
- River Basin Management Plan for Ireland 2018 - 2021 - www.housing.gov.ie;
- Ordnance Survey of Ireland – Mapping and Aerial photography www.osi.ie;
- National Summary for Article 12 (NPWS, 2013d); and
- Format for a Prioritised Action Framework (PAF) for Natura 2000 (2014) www.npws.ie/sites/default/files/general/PAF-IE-2014.pdf.

2.5 EVALUATION OF THE RECEIVING ENVIRONMENT

Ireland has obligations under EU law to protect and conserve biodiversity. This relates to habitats and species both within and outside designated sites. Nationally, Ireland has developed a National Biodiversity Plan (DCHG, 2017) to address issues and halt the loss of biodiversity, in line with international commitments. The vision for biodiversity is outlined: "*That biodiversity and ecosystems in Ireland are conserved and restored, delivering benefits essential for all sectors of society and that Ireland contributes to efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally*".

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

2.5.1 Identification of European Sites

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

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

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

2.5.2 Conservation Objectives

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

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

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

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

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

For SACs:

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

For SPAs:

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

Favourable Conservation status of a habitat is achieved when:

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

Favourable Conservation status of a species is achieved when:

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

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

2.5.3 Existing Threats and Pressures to EU Protected Habitats and Species

Given the nature of the proposed project, a review has been undertaken of those QIs/SCIs which have been identified as having sensitivity to 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 2013 a, b &c) and on information contained in Ireland's most recent Article 12 submission to the EU on the Status and trends of Birds species (NPWS 2013d). Water dependent species were identified as having the greatest connectivity and thus the highest sensitivity to the proposed dosing activity and the Water Framework Directive SAC water dependency list (NPWS, December 2015), was used as part of the criteria for screening of European Sites.

3. DESCRIPTION OF THE PROJECT

3.1 DESCRIPTION OF THE PROPOSAL

Gort WSZ (1200PUB1022), located in Co. Galway, is supplied by Gort WTP (Figure 1). An average of 1,200 m^3 of potable water per day is distributed to the network from Gort WTP. Based on an assessment of the risk of lead exceedances, the recommended Plumbosolvency Control Plan for Gort WSZ is for universal dosing at Gort WTP. Approximately 42% of the flow is accounted for and this fixed rate (58%) of water mains leakages has been assumed for the WSZ.

The Gort WSZ boundary is served by Gort Wastewater Treatment Plant (WWTP) agglomeration which is licenced in accordance with the requirements of the Waste Water Discharge (Authorisation) Regulations 2007 as amended and the impact of the OP on the emission limit values and the receiving water body downstream of the point of discharge are assessed.

Figure 1 Location of the Gort Water Treatment Plant Site, Co. Galway.

3.1.1 Construction Works

A bunded phosphoric acid storage tank (with capacity for a minimum of 60 days dosing of phosphoric acid at 75% concentration into supply) and a dosing installation unit housed in a kiosk, will be installed on constructed concrete ground slabs, located within the Gort WTP site boundary. The required 60 days storage volume at Gort WTP site corresponds to 0.2 m^3.

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

- Initial site assessment, and site investigation works to determine existing conditions, services and pipe cable duct layouts at the site;

- Installation of OP dosing units may include excavations, construction of new water process and duct chambers, duct and pipe laying and reinstatement works; and will have an area of approximately 30 m^2 (a typical dosing unit is shown in **Figure 2** and **Figure 3**). The exact locations will be confirmed following initial site assessment and investigations. A kiosk will be required to house the OP dosing unit as there is insufficient storage space within the existing buildings. The kiosk will be housed on a concrete base with cast in ducts within the WTP site boundary. A 1.0 m wide concrete apron shall extend around the kiosk;

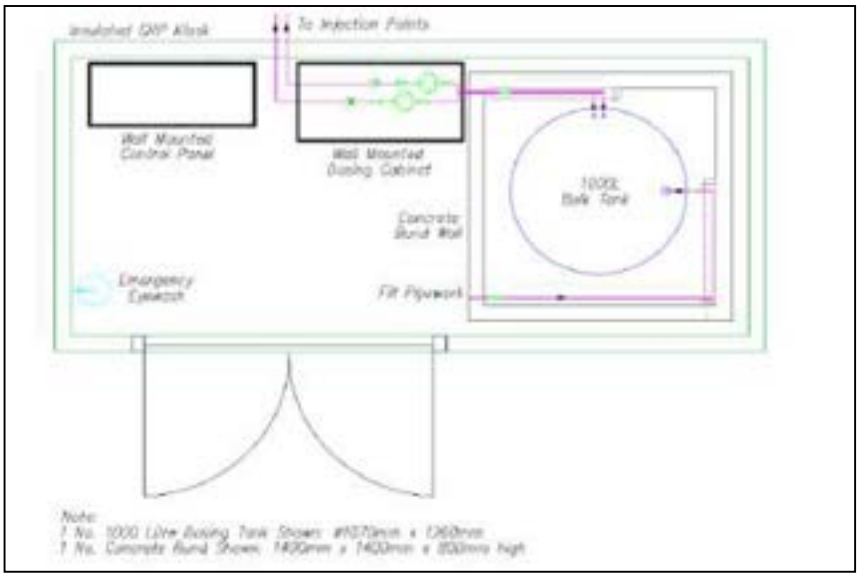

Figure 2 IW schematic of a bulk tank kiosk layout in H_3PO_4 Installation with 500 litres< bulk storage ≤ 6,000 litres.

Figure 3 Typical orthophosphate dosing unit

3.1.2 Operational Works

The scope of the **operational** works includes the dosing of OP to treated water at a rate of 1.0 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 project impacts are assessed on the basis of best scientific knowledge (the EAM); in order to identify whether they are likely to give rise to significant effect on any European sites, in view of their COs;

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

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

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

3.2.2 Environmental Assessment Methodology

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

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

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

A flow chart of the methodology applied in the EAM is provided in **Figure 5** and illustrates the importance of the European Sites in the process. In all instances where nutrient sensitive qualifying features within the Natura 2000 network are hydrologically linked with the WSZ, a Screening to inform AA will be required in the first instance. For each WSZ where OP treatment is proposed the conceptual model allows the quantification of loads in a mass balance approach to identify potentially significant pathways, as part of the risk assessment process.

A summary report outlining the EAM is available in **Appendix C**, which further outlines P dynamics and the consideration of P trends and capacity in receiving waters and the potential for any impact on OP indicative water quality status from an increase in OP loading arising from the proposed OP dosing.

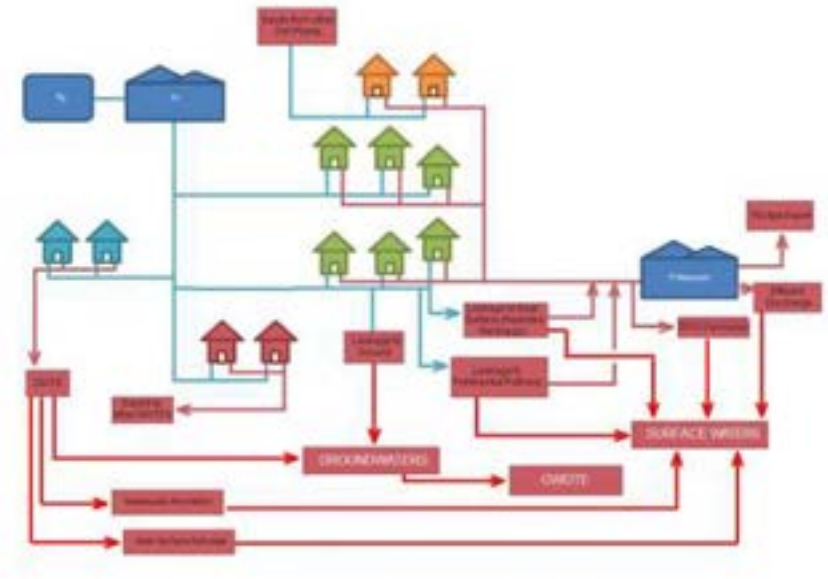

Figure 4 Conceptual Model of P Transfer

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

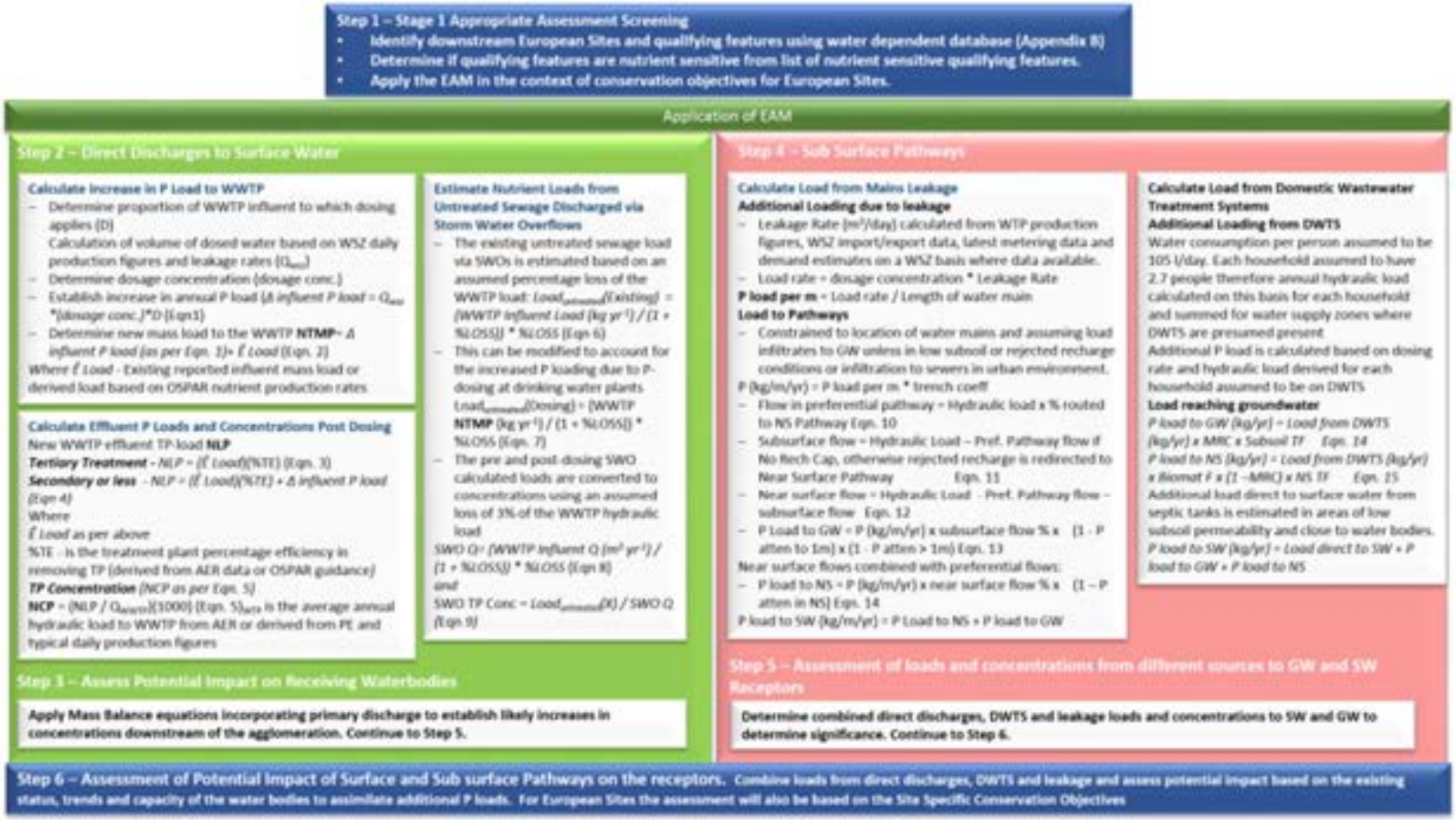

Figure 5 Stepwise Approach to the Environmental Assessment Methodology

4. PROJECT CONNECTIVITY TO EUROPEAN SITES

4.1 OVERVIEW OF THE PROJECT ZONE OF INFLUENCE

4.1.1 Construction Phase

Gort WTP site boundary is located approximately 3km northwest of the closest European Sites, Coole-Garryland Complex SAC (000252) and Coole-Garryland SPA (004107) (**Figure 6**). The closest watercourse to the works is the Clooninahaha Stream, which is located approximately 760m southeast of the WTP site boundary. The Clooninahaha Stream flows into the Cannahowna River 4.3km downstream of this point. The Cannahowna River forms part of the Coole-Garryland Complex SAC/SPA approximately 12 km downstream of this point. The existing WTP site is made up entirely of hard standing surface and has no habitat or species for which the SAC is designated within its footprint. All proposed works are within the footprint of the WTP site. The construction works are limited to the placement of a concrete plinth no more than 30 m^2 on an existing hardstanding surface thus requiring minimal excavation. The extent of excavation for pipework is further limited in scale.

There will be direct and indirect impacts within the construction works Zone of Influence, however given the location and taking account of the scale of the construction of the OP Dosing Unit for the proposed scheme, these direct and indirect construction impacts and the reservoir will not have a significant effect on any European Site, and are henceforth screened out. It is therefore considered 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. Construction impacts are therefore not discussed further in this report.

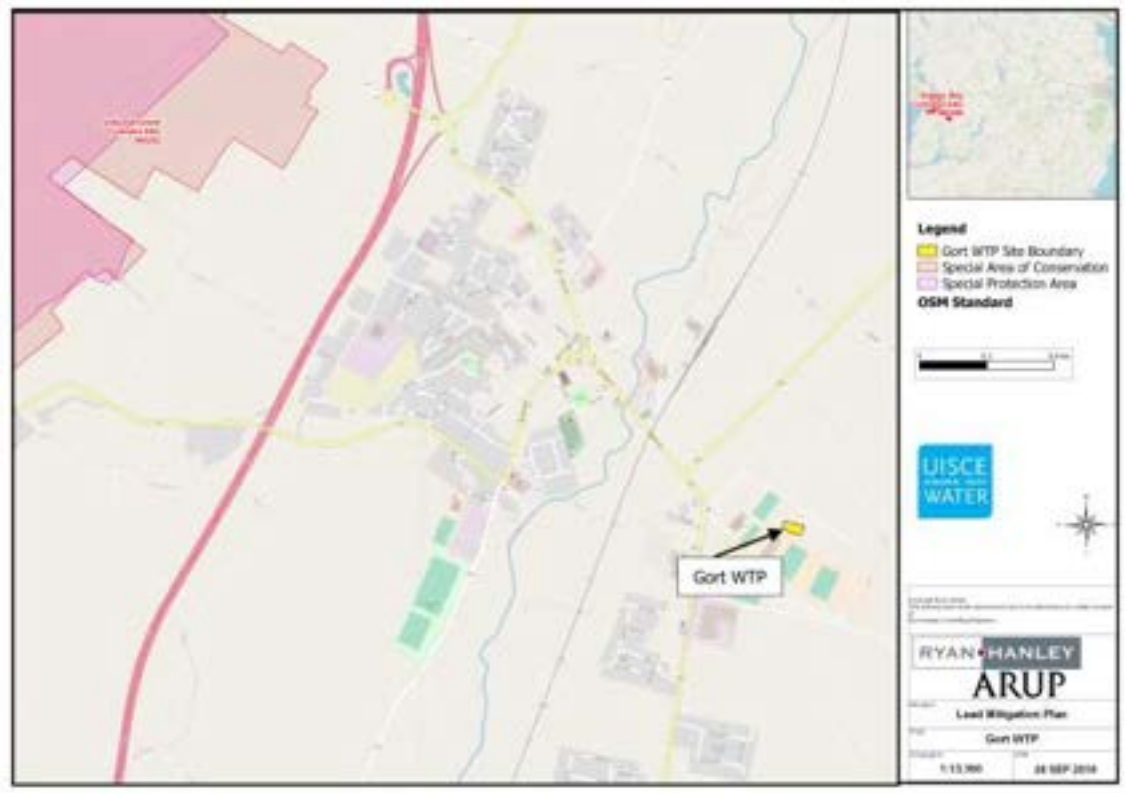

Figure 6 Location of the Gort WTP with respect to European Sites

4.1.2 Operational Phase

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

The EAM process identified 3 river waterbodies, 2 transitional waterbodies and 1 coastal waterbody potentially impacted following OP dosing of drinking water. This AA Screening identifies the connectivity between EAM identified surface waterbodies and downstream receiving waterbodies and European Sites:

- Boleyneendorrish_030 (IE_WE_29B040800) river waterbody flows into Kilchreest_010 (IE_WE_29K022100) river waterbody which drains into Kinvarra Bay (IE_WE_460_0300) transitional waterbody and Inner Galway Bay South (IE_WE_160_0000) coastal waterbody.

- Cannahowna_010 (IE_WE_29C010200) river waterbody flows into Kilchreest_010 IE_WE_29K022100) river waterbody which drains into Kinvarra Bay (IE_WE_460_0300) transitional waterbody and Inner Galway Bay South (IE_WE_160_0000) coastal waterbody.

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

- **GWDTE-Caherglassaun Turlough (SAC000238) (IE_WE_G_0091)**

- **Kilchreest Turloughs,** which is not a WFD defined groundwater body, but has been identified as a sensitive waterbody owing to the SAC designations and so has been assessed separately.

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

Site Name	SAC/ SPA Code	Water Dependent Species/ Habitats	Nutrient Sensitive	Potential Hydrological/ Hydrogeological Connectivity
Caherglassaun Turlough SAC	000238	Yes	Yes	Yes
Castletaylor Complex SAC	000242	Yes	Yes	No
Coole-Garryland Complex SAC	000252	Yes	Yes	Yes
Galway Bay Complex SAC	000268	Yes	Yes	Yes
Kiltartan Cave (Coole) SAC	000286	Yes	Yes	Yes
Lough Cutra SAC	000299	No	Yes	No
Peterswell Turlough SAC	000318	Yes	Yes	No
Lough Fingall Complex SAC	000606	Yes	Yes	No
Kiltiernan Turlough SAC	001285	Yes	Yes	No
Termon Lough SAC	001321	Yes	Yes	No
Sonnagh Bog SAC	001913	Yes	Yes	No
East Burren Complex SAC	001926	Yes	Yes	No
Lough Coy SAC	002117	Yes	Yes	No
Gortacarnaun Wood SAC	002180	No	Yes	No
Drummin Wood SAC	002181	No	Yes	No
Ardrahan Grassland SAC	002244	No	Yes	No
Carrowbaun, Newhall and Ballylee Turloughs SAC	002293	Yes	Yes	No
Cahermore Turlough SAC	002294	Yes	Yes	No
Ballinduff Turlough SAC	002295	Yes	Yes	No
Lough Cutra SPA	004056	Yes	Yes	No
Inner Galway Bay SPA	004031	Yes	Yes	Yes
Coole-Garryland SPA	004107	Yes	Yes	Yes
Slieve Aughty Mountains SPA	004168	Yes	Yes	No

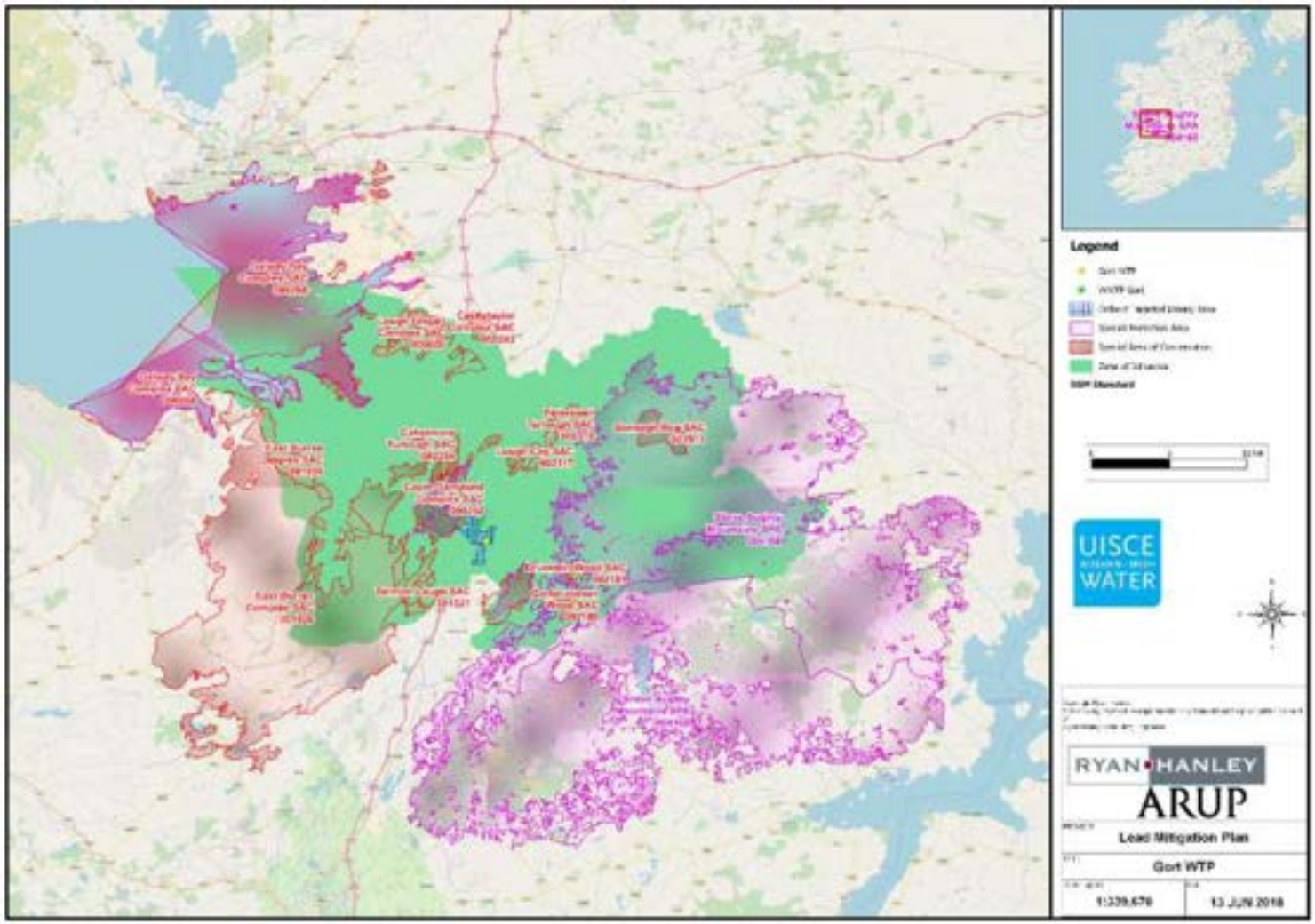

Figure 7 European Sites within the ZoI of the Proposed Project

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, and on this basis, the potential for risk from the proposed Project was identified. This process allowed for certain sites to be screened out at this stage, on the basis that no pathways for effects occur within the WSZ.

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

- Lough Cutra SAC (000299);
- Gortacarnaun Wood SAC (002180);
- Drummin Wood SAC (002181); and
- Ardrahan Grassland SAC (002244)

Sites that screened out owing to absence of hydrological/ hydrological connectivity (i.e. upstream, or up-gradient in the case of groundwater flow paths, of dosing area) were:

- Castletaylor Complex SAC (000242);
- Peterswell Turlough SAC (000318);
- Lough Fingall Complex SAC (000606);
- Kiltiernan Turlough SAC (001285);
- Termon Lough SAC (001321);
- Sonnagh Bog SAC (001913);
- East Burren Complex SAC (001926);
- Lough Coy SAC (002117);
- Carrowbaun, Newhall and Ballylee Turloughs SAC (002293);
- Cahermore Turlough SAC (002294);
- Ballinduff Turlough SAC (002295);
- Lough Cutra SPA (004056); and
- Slieve Aughty Mountains SPA (004168) are upstream from the OP dosing area;

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

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 (*Denotes a priority habitat)	Water Dependent Species/Habitats	Nutrient Sensitive	Potential hydrological/ hydrogeological Connectivity
Caherglassaun Turlough	**SAC 000238**	**21st Feb 2018**	3180	Turloughs*	Yes	Yes	**Yes**
			3270	Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation	Yes	Yes	
			1310	Lesser Horseshoe Bat (*Rhinolophus hipposideros*)	No	Yes	
Coole-Garryland Complex	**SAC 000252**	**21st Feb 2018**	3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation	Yes	Yes	**Yes**
			3180	Turloughs	Yes	Yes	
			3270	Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation	Yes	Yes	
			5130	*Juniperus communis* formations on heaths or calcareous grasslands	No	No	
			6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites)	No	Yes	
			8240	Limestone pavements	No	Yes	
			91J0	*Taxus baccata* woods of the British Isles	No	No	
Galway Bay Complex	**SAC 000268**	**16th Apr 2013**	1140	Mudflats and sandflats not covered by seawater at low tide	Yes	Yes	**Yes**
			1150	Coastal lagoons	Yes	Yes	
			1160	Large shallow inlets and bays	Yes	Yes	
			1170	Reefs	Yes	Yes	
			1220	Perennial vegetation of stony banks	Yes	No	
			1230	Vegetated sea cliffs of the Atlantic and Baltic coasts	Yes	Yes	
			1310	*Salicornia* and other annuals colonising mud and sand	Yes	Yes	
			1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	Yes	Yes	
			1410	Mediterranean salt meadows (*Juncetalia maritimi*)	Yes	Yes	
			3180	Turloughs	Yes	Yes	
			5130	*Juniperus communis* formations on heaths or calcareous grasslands	No	No	

Site Name	SAC/ SPA Code	Conservation Objectives Establishment Date	Feature Code	Qualifying Interests / Special Conservation Interests (*Denotes a priority habitat)	Water Dependent Species/Habitats	Nutrient Sensitive	Potential hydrological/ hydrogeological Connectivity
			6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites)	No	No	
			7210	Calcareous fens	Yes	Yes	
			7230	Alkaline fens	Yes	Yes	
			8240	Limestone pavements	No	Yes	
			1355	Otter (*Lutra lutra*)	Yes	Yes	
			1365	Harbour Seal (*Phoca vitulina*)	Yes	Yes	
Kiltartan Cave (Coole)	**SAC 000286**	**21st Feb 2018**	8310	Caves not open to the public	Yes	Yes	**Yes**
			1303	Lesser Horseshoe Bat (*Rhinolophus hipposideros*)	No	Yes	
Inner Galway Bay SPA	**SPA 004031**	**1st May 2013**	A003	Great Northern Diver (*Gavia immer*)	Yes	Yes	**Yes**
			A017	Cormorant (*Phalacrocorax carbo*)	Yes	Yes	
			A028	Grey Heron (*Ardea cinerea*)	Yes	Yes	
			A046	Light-bellied Brent Goose (*Branta bernicla hrota*)	Yes	Yes	
			A050	Wigeon (*Anas penelope*)	Yes	Yes	
			A052	Teal (*Anas crecca*)	Yes	Yes	
			A056	Shoveler (*Anas clypeata*)	Yes	Yes	
			A069	Red-breasted Merganser (*Mergus serrator*)	Yes	Yes	
			A137	Ringed Plover (*Charadrius hiaticula*)	Yes	Yes	
			A140	Golden Plover (*Pluvialis apricaria*)	Yes	Yes	
			A142	Lapwing (*Vanellus vanellus*)	Yes	Yes	
			A149	Dunlin (*Calidris alpina*)	Yes	Yes	
			A157	Bar-tailed Godwit (*Limosa lapponica*)	Yes	Yes	
			A160	Curlew (*Numenius arquata*)	Yes	Yes	
			A162	Redshank (*Tringa totanus*)	Yes	Yes	
			A169	Turnstone (*Arenaria interpres*)	Yes	Yes	
			A179	Black-headed Gull (*Chroicocephalus ridibundus*)	Yes	Yes	
			A182	Common Gull (*Larus canus*)	Yes	Yes	
			A191	Sandwich Tern (*Sterna sandvicensis*)	Yes	Yes	
			A193	Common Tern (*Sterna hirundo*)	Yes	Yes	
			A999	Wetland and Waterbirds	Yes	Yes	
Coole-Garryland	**SPA 004107**	**21st Feb 2018**	A038	Whooper Swan (*Cygnus cygnus*)	Yes	Yes	**Yes**

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 significant effects to occur:

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

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

- Excessive phosphate within an aquatic ecosystem may lead to eutrophication; with a corresponding reduction in oxygen levels, reduction in species diversity and subsequent impacts on animal life;
- Groundwater dependent habitats include both surface water habitats (e.g. hard oligo-mesotrophic lakes) and Groundwater Dependent Terrestrial Ecosystems (GWDTEs, e.g. alkaline fens). Any change in the water quality of these systems may have subsequent effects for these habitats and species; and therefore will be subject to an evaluation of the significance of any such effect
- The discharge of additional P loads to the environment (through surface and sub surface pathways) may have implication for nutrient sensitive species such as the freshwater pearl mussel, Atlantic salmon and the white-clawed crayfish.
- Phosphorus (P) in wastewater collection systems is the result of drinking water and derived from a number of other sources, including phosphorus imported from areas outside the agglomeration through import of sludges or leachates for treatment at the plant. The disposal and use of P removed in wastewater sludge is regulated (i.e. through nutrient management plans) and should not pose further threat of environmental impact;

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

5.3 ASSESSMENT OF IMPACTS

Article 6 of the Habitats Directive states that:

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

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

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

The EAM has been completed assuming the capacity of a water body is a measure of its ability to absorb extra pressures before its status changes. For example, a river water body at Good Status will have mean phosphate values in the range 0.025 to 0.035 mg/l P. River water bodies with mean phosphate concentrations of 0.0275 mg/l P have 75% capacity left, i.e. high capacity, while river water bodies 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 OP indicative water quality (or the Conservation Objectives of a European Site) where it does not cause the P concentration to increase to a level within 25% of the remaining capacity left within the existing status band, i.e. cause a change in the distance to threshold from far to near. This assessment will be supported by trend analysis as outlined below to ensure the additional OP dosing and statistically significant trends for a water body will not result in deterioration in status by 2021 even where the distance to threshold is currently assessed to be far. Where the water body baseline concentration is "Near" to the threshold before the effect of 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 water bodies is a specific requirement of the WFD and the Groundwater Daughter Directive. Guidance on trends in groundwater assessments (UKTAG 2009, EPA 2010) indicates that trends are environmentally significant if they indicate that the Good Status will not be achieved within two future river basin cycles, i.e. within the next 12 years.

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

Baseline OP monitoring data and associated thresholds are available only for Cannahowna_010 RWB and not for Boleyneendorrish_030 and Kilchreest_010. Where existing monitoring data is not available, a surrogate status is derived from the OP indicative quality of adjacent RWBs. The mid-range of that surrogate status is used as baseline concentration. On the basis of predicted loading, the risk of using surrogate data is excluded because even if high status was ascribed, 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.

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	Ortho-P Status[3] and Trends[4]	Baseline[5] P Conc.[6,7] (mg/l)	75% of Status Threshold (mg/l)	Cumulative Ortho P load to SW and GW[8]	Modelled Conc.[9] (mg/l)	Post-dosing Ortho-P Potential Baseline Conc. (1.0mg/l)	Evaluation
Caherglassaun Turlough SAC 000238	IE_WE_G_0091 GWDTE-Caherglassaun Turlough (SAC000238)	GWB	Good	0.0088	0.0263	14.6	0.0003	0.0091	No deterioration to OP indicative WQ
	Kilchreest_010_ Turloughs	GWB	*Good*	*0.0088*	0.0075	147.8	0.0006	0.0094	No deterioration to OP indicative WQ
	IE_WE_29K022100 Kilchreest_010	RWB	High	*0.0088*	0.0188	147.8	0.0003	0.0091	No deterioration to OP indicative WQ
Coole-Garryland Complex SAC 000252 & Coole-Garryland SPA 004107	IE_WE_G_0091GWDTE-Caherglassaun Turlough (SAC000238)	GWB	Good	0.0088	0.0263	14.6	0.0003	0.0091	No deterioration to OP indicative WQ
	Kilchreest_010_ Turloughs	GWB	*Good*	*0.0088*	0.0075	147.8	0.0006	0.0094	No deterioration to OP indicative WQ
	IE_WE_29K022100 Kilchreest_010	RWB	High	*0.0088*	0.0188	147.8	0.0003	0.0091	No deterioration to OP indicative WQ
Galway Bay Complex SAC 000268 & Inner Galway Bay SPA 004031	IE_WE_160_0000 Inner Galway Bay South	CWB	*Summer High/ Winter High*	*0.0125*	0.0188	147.8	0.0002	0.0127	No deterioration to OP indicative WQ
	IE_WE_29K022100 Kinvarra Bay	TWB	Summer High/ Winter High	0.0130 / 0.0060	0.0188	147.8	0.0003	0.0133/ 0.0063	No deterioration to OP indicative WQ
	IE_WE_29K022100 Kilchreest_010	RWB	High	*0.0088*	0.0188	147.8	0.0003	0.0091	No deterioration to OP indicative WQ
Kiltartan Cave (Coole) SAC 000286	IE_WE_G_0091 GWDTE-Caherglassaun Turlough (SAC000238)	GWB	Good	0.0088	0.0263	14.6	0.0003	0.0091	No deterioration to OP indicative WQ
	IE_WE_29K022100 Kilchreest_010	RWB	High	*0.0088*	0.0188	147.8	0.0003	0.0091	No deterioration to OP indicative WQ

[3] Surrogate Status indicated in italic;
[4] Distance to threshold in parentheses.
[5] Baseline year is 2021.
[6] Surrogate concentration is given in italic mg/l
[7] Ortho P in RWBs, TWBs, CWBs and GWBs; TP in LWBs.
[8] Cumulative Ortho P load to SW and GW from upstream and downstream dosing areas, Leakage, DWWTS and agglomerations (kg/yr).
[9] 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.

5.3.1 Assessment of direct impact from WWTPs and Storm Water Overflows

The conceptual model developed for P transfer identifies a number of pathways by which OP can reach receptors. In the case of these pathways, factors contributing to the potential direct impact 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 the existing situation prior to OP dosing is established and compared to the potential loading to the receiving waters post-dosing. In-combination impacts of the operation of the SWO and the continuous discharge from the WWTP were also assessed within the EAM.

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

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

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

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*
Gort Primary Discharge	**OP 0.5 mg/l P- Non-Compliant**	**Existing**	325	0.29	0.23	0.39
		Post Dosing	583	0.51	0.41	0.70
		% Increase	80%	80%	80%	80%
Gort SWOs (4 No.)		**Existing**	202	0.87	0.70	1.18
		Post Dosing	210	0.90	0.72	1.23

Gort WWTP Agglomeration

Gort WWTP Agglomeration provides secondary treatment, i.e. no chemical dosing for P removal. Therefore the EAM has assumed that the additional load receives no treatment (Appendix C). The effluent is predicted to increase from 0.29 mg/l P to 0.51 mg/l P (80%) after OP dosing. The SWO concentration will increase from 0.87 mg/l P to 0.90 mg/l P (3%) as a result of the OP dosing. Gort WWTP discharges to the Cannahowna_010 river waterbody which has been assigned a 'High' Indicative OP status and baseline concentration of 0.009 mg/l P. Cannahowna_010 river waterbody is connected to **Coole-Garryland Complex SAC, Coole-Garryland SPA and Caherglassaun Turlough SAC** via the Kilchreest_010 river waterbody (Table 3).

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. The EAM has reported that Gort is the furthest upstream dosing area for this catchment and so other downstream dosing areas, i.e. Tuam

and Kinvara are not incorporated in this EAM. However, the Tuam and Kinvara reports consider the upstream loads from Gort and the cumulative impact of all three have been taken into account in these reports.

River waterbodies

- The Kilchreest_010 (IE_WE_29C010200) river waterbody is hydrologically connected to **Caherglassaun Turlough SAC (000238), Coole-Garryland Complex SAC (000252), Coole-Garryland SPA (004107), Galway Bay Complex SAC (000268), Inner Galway Bay SPA (004031) and Kiltartan Cave (Coole) SAC (000286).**

For the Kilchreest RWBs the majority of the load entering the river comes from primary WWTP discharges and mains leakage. Gort WWTP and SWOs discharge to Cannahowna_010 river waterbody which is not directly connected to a European Site. The Cannahowna_010 RWB enters the Kilchreest_010 RWB which is connected to the aforementioned sites. Kilchreest_010 has been assigned a surrogate OP status of '*Good*' (**Table 3; Appendix C**). The Kilchreest Turlough RWB receives water from the Cannahowna_010 and Boleyneendorrish_030 RWB. The status of these WBs is Good and Moderate respectively. The Cannahowna RWB is substantially larger than the Boleyneedorrish and so the status of this WB has been adopted for the receiving turlough WB. The increase in OP concentrations is 0.0003 mg P/l. The resulting OP concentrations following dosing increase from *0.028* mg/l P to 0.0283 mg/l P (**Table 3; Appendix C**). The predicted dosing concentration is below the 5% of Good/ High boundary (0.00125mg/l P) (as highlighted in **Table 3**) and is within the 75% of upper threshold and therefore there is no risk of deterioration in the OP indicative water quality of this RWB.

In acknowledgement of the larger catchment size of the Kilchreest RWB and the 'front-end' position of the SACs within the Kilchreest RWB, the EAM has further assessed the turloughs associated with the aforementioned European Sites and, delineating a more representative catchment for these turloughs and more accurately assessing the potential impact has created Kilchreest_010_Turloughs WB (Table 3; Appendix C). This waterbody has been assigned a surrogate OP status of 'Good' owing to the proximity and size of the entering waterbody to the Cannahowna_010 RWB ('Good' status) and a baseline concentration of *0.028* mg/l P. This WB is predicted to receive 147.8 mg/P load, which considering the flow, will result in an increase of 0.0006 mg/l P. This increase will cause a rise in the OP concentration to 0.0286 mg/l P. The predicted dosing concentration is below the 5% of Good/ High boundary (0.00125mg/l P) (as highlighted in **Table 3**) and is within the 75% of upper threshold and therefore there is no risk of deterioration in the status of this RWB.

Groundwater bodies

- GWDTE-Caherglassaun Turlough (SAC000238) (IE_WE_G_0091) is hydrologically connected to **Caherglassaun Turlough SAC (000238), Coole-Garryland Complex SAC (000252) and Coole-Garryland SPA (004107) and Kiltartan Cave (Coole) SAC (000286)** (**Table 3**).

The increase in OP concentrations in the GWB as a result of the OP dosing is 0.0003 mg/l P. The baseline concentration will increase from 0.0182 mg/l P to 0.0185 mg/l P following dosing (**Table 3; Appendix C**). The predicted dosing concentration is below the 5% of Good/ Fail boundary (0.00175 mg/l P) (as highlighted in **Table 3**) and within the 75% of upper threshold and therefore there is no risk of deterioration in the WFD OP indicative water quality of this GWB.

Transitional waterbodies

Kilchreest_010 river waterbody drains into:

- Kinvara Bay (IE_WE_29K022100) transitional waterbody which is hydrologically connected to **Galway Bay Complex SAC (000268) and Inner Galway Bay SPA (004031).**

The increase in OP concentrations in the downstream transitional WB as a result of dosing is 0.0006 mg/l P. The resulting OP concentrations following dosing are 0.0056 mg/l P in summer and 0.0106 mg/l P in winter, respectively. This TWB has a predicted dosing concentration below the 5% of Good/ High boundary (0.00125mg/l P) (as highlighted in Table 3) and is within the 75% of upper threshold and therefore there is no risk of deterioration in the OP indicative water quality of this TWB.

Coastal waterbodies

Kinvarra Bay estuary ultimately drains into Inner Galway Bay South coastal waterbody.

- Inner Galway Bay coastal waterbody is hydrologically connected to **Galway Bay Complex SAC (000268) and Inner Galway Bay SPA (004031).**

The increase in OP concentrations in the downstream coastal WB as a result of dosing is 0.00015 mg/l P. The baseline following dosing increase from 0.01250 mg/l P in summer and winter, to 0.01265 mg/l P in summer and winter following dosing. This CWB has a predicted dosing concentration below the 5% of Good/ High boundary (0.00125mg/l P) (as highlighted in Table 3) and is within the 75% of upper threshold and therefore there is no risk of deterioration in the OP indicative water quality of this CWB.

5.3.3 Conclusions

The additional OP dosing as part of this Project does not cause a deterioration in the WFD OP indicative water quality of any river, transitional, coastal waterbody or groundwater body listed in **Table 3.** Concentrations from other dosing areas with regard to cumulative loading on downstream waterbodies has been considered in this assessment. The WFD 'no deterioration' will be evaluated in the context of AA and the SAC/ SPA QI's in **Section 6.** Evaluation of potential for significant effects.

6. EVALUATION OF POTENTIAL FOR SIGNIFICANT EFFECTS

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 interest (habitats and species) identified in **Table 1** that are both water dependent and nutrient sensitive (**Appendix C**). Six European sites remain for evaluation of potential for significant effect on **Caherglassaun Turlough SAC (000238)**, **Coole-Garryland Complex SAC (000252)**, **Galway Bay Complex SAC (000268)**, **Kiltartan Cave (Coole) SAC (000286)**, **Inner Galway Bay SPA (004031)** and **Coole-Garryland SPA (004107)**. 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 CAHERGLASSAUN TURLOUGH SAC 000238

6.1.1 (3180) Turloughs* and (3270) Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation

Caherglassaun Turlough does not, at this time, have an SSCO. Owning to the proximity of this turlough to Lough Corrib Complex SAC, the SSCOs for 3180 turloughs relevant to this Project have been adopted here.

The Site Synopsis (NPWS, 2015[10]) describes Caherglassaun Turlough as a large lake situated in a natural depression comprising a permanent lake at its core, with the rest of the basin functioning as a turlough. The lake fluctuates in a tidal cycle because of its proximity to sea-level. The vegetation resembles that of a saltmarsh community, however the water chemistry does not indicate brackish waters. Caherglassaun is considered to have significant conservation value based on the vegetation present. Turloughs, being groundwater fed, are typically associated with high water quality which is typically demonstrated by naturally low dissolved nutrients, clear water and low algal growth; however, Caherglassaun is reported to be a naturally eutrophic site (Goodwillie, 1992[11]). Pressures and threats to this habitat associated with the current project include nutrient/ P enrichment. The conservation targets are to maintain a soil nutrient status appropriate to the soil type; and to maintain appropriate water quality to support the natural structure and functioning of the habitat (specifically average annual TP concentration of ≤20µg/L TP) (NPWS, 2013[12] and NPWS, 2013[13]).

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 3180 and 3270 habitats in Caherglassaun Turlough (SAC). The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- GWDTE-Caherglassaun Turlough (SAC000238) groundwater body has a 'good' indicative OP indicative water quality, a baseline concentration of 0.0088 mg/l P, a cumulative load of 14.6 kg/yr, a potential concentration following dosing of 0.0091 mg/l P and an unchanged WFD OP indicative water quality, i.e. 'good'.

- Kilchreest_010_Turloughs waterbody has been assigned a surrogate 'Good' indicative OP water quality which was derived from the main Kilchreest waterbody, a surrogate baseline

[10] NPWS, 2015. Site Synopsis Caherglassaun Turlough SAC. National Parks and Wildlife Services.
[11] Goodwillie, 1992. Turloughs over 10ha: Vegetation survey and Evaluation. National Parks and Wildlife Services.
[12] NPWS (2013) Galway Bay Complex SAC [000268]. Conservation objectives supporting document – marine habitats and species Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
[13] NPWS (2013) Galway Bay Complex SAC [000268]. Conservation objectives supporting document – turlough habitats and species Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

concentration of *0.0088* mg/l P, a cumulative load of 147.8 kg/yr, a potential concentration following dosing of 0.0094 mg/l P and an unchanged WFD OP indicative water quality, i.e. '*Good*'.

The EAM assessment results which evaluate the additional OP loading from dosing at Gort WTP have demonstrated that there will be no change in the WFD OP indicative water quality of groundwater bodies and surface waterbodies connected to Caherglassaun Turlough (SAC). There is sufficient capacity within the status threshold, and no alteration to water quality, meaning there will be no alteration to the nutrient condition supporting 'Turloughs' and 3270 habitat in Caherglassaun Turlough SAC. The baseline OP indicative water quality is above the 0.020 mg/l P required for this habitat; however, the concentrations contributed by this project are below the 5% high/good boundary (0.00125 mg/l P), therefore potential for significant effects on this habitat arising from loading contributions from this project can be excluded.

Furthermore, dosing will not prevent the restoration of the favourable conservation condition of 'Turlough habitat' and 3270 habitat in Caherglassaun Turlough SAC/ no deterioration of their favourable conservation condition is identified.

6.2 COOLE-GARRYLAND COMPLEX SAC 000252

6.2.1 (3150) Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation, (3180) Turloughs, (3270) Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation

Coole-Garryland Complex SAC does not, at this time, have an SSCO. Owning to the proximity of this turlough to Lough Corrib Complex SAC, the SSCOs for 3180 turloughs relevant to this Project have been adopted here.

The Site Synopsis (NPWS, 2016[14]) describes the site as containing a series of turloughs fed by springs and a partly submerged river. Coole Garryland complex is considered to have significant conservation value, containing nationally rare plant communities and a complex of habitats that provide for otter, pine marten and one of the most important and unique assemblages of insects in the country. Diffuse groundwater pollution with P input is considered as having 'medium importance' pressure ranking for 3180 habitat and 'low importance' for 3270 habitat (NPWS, 2013). Turloughs, being groundwater fed, are typically associated with high water quality, which is typically demonstrated by naturally low dissolved nutrients, clear water and low algal growth; however, turloughs in this Complex are reported to be naturally eutrophic (Goodwillie, 1992[15]). The conservation targets are to maintain a soil nutrient status appropriate to the soil type; and to maintain appropriate water quality to support the natural structure and functioning of the habitat (specifically average annual TP concentration of ≤20µg/L TP) (NPWS, 2013[16] and NPWS, 2013[17]).

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 3150, 3180 and 3270 habitats in Coole-Garryland Complex (SAC). The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

[14] NPWS, 2015. Site Synopsis Coole-Garryland Complex SAC. National Parks and Wildlife Services.
[15] Goodwillie, 1992. Turloughs over 10ha: Vegetation survey and Evaluation. National Parks and Wildlife Services.
[16] NPWS (2013) Galway Bay Complex SAC [000268]. Conservation objectives supporting document – marine habitats and species Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
[17] NPWS (2013) Galway Bay Complex SAC [000268]. Conservation objectives supporting document – turlough habitats and species Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

- GWDTE-Caherglassaun Turlough (SAC000238) groundwater body has a 'good' indicative OP indicative water quality, a baseline concentration of 0.0088 mg/l P, a cumulative load of 14.6 kg/yr, a potential concentration following dosing of 0.0091 mg/l P and an unchanged WFD OP indicative water quality, i.e. 'good'.

- Kilchreest_010_Turloughs waterbody has been assigned a surrogate 'Good' indicative OP water quality which was derived from the main Kilchreest waterbody, a surrogate baseline concentration of 0.0088 mg/l P, a cumulative load of 147.8 kg/yr, a potential concentration following dosing of 0.0094 mg/l P and an unchanged WFD OP indicative water quality, i.e. 'Good'.

The EAM assessment results which evaluate the additional OP loading from dosing at Gort WTP have demonstrated that there will be no change in the WFD OP indicative water quality of groundwater bodies and surface waterbodies connected to Coole Garryland Complex (SAC). There is sufficient capacity within the status threshold, and no alteration to water quality, meaning there will be no alteration to the nutrient condition supporting 3150 habitat, 'Turloughs' habitat and 3270 habitat in Coole Garryland Complex. The baseline OP indicative water quality is above the 0.020 mg/l P required for these habitats however, the concentrations contributed by this project are below the 5% high/good boundary (0.00125 mg/l P), therefore potential for significant effects on this habitat because of this project can be excluded.

Furthermore, dosing will not prevent the restoration of the favourable conservation condition of 3150 habitat, 'Turlough habitat' and 3270 habitat in Coole Garryland Complex / no deterioration of their favourable conservation condition is identified.

6.3 GALWAY BAY COMPLEX SAC 000268

6.3.1 (1140) Mudflats and sandflats not covered by seawater at low tide, (1150) Coastal lagoons, (1160) Large shallow inlets and bays, (1170) Reefs

This site contains 12 recorded community types (NPWS, 2013[18]): Intertidal sandy mud community complex (1160 and 1140), Intertidal sand community complex (1160 and 1140), Maërl-dominated community (1160), Zostera-dominated community complex (1160), Fine to medium sand with bivalves community complex (1160), Sandy mud to mixed sediment community complex (1160), Mixed sediment dominated by Mytilidae community complex (1160), Shingle (1160), Mytilus-dominated reef community (1170), Fucoid-dominated community complex (1160 and 1170) Laminaria-dominated community complex (1160 and 1170), Shallow sponge-dominated reef community complex (1160 and 1170). SSCOs (NPWS, 2013[19]) for these habitats are to: maintain the extent and high quality of the *Zostera*- and maërl-dominated communities subject to natural processes; and to conserve the Intertidal sandy mud, Intertidal sand community complex, Fine to medium sand with bivalves, Sandy mud to mixed sediment, Mixed sediment dominated by Mytilidae, Shingle, Fucoid-dominated, *Laminaria*-dominated, and Shallow sponge-dominated community complexes in a natural condition. Increased nutrients could negatively impact these communities by encouraging development of unfavourable sediment conditions.

This SAC encompasses 10 mapped lagoon/ lagoon complexes of varying sizes and salinities and potential additional lagoons which have not yet been mapped (NPWS, 2013). In Ireland, coastal lagoons are considered to be in bad conservation status due to issues such as drainage and water pollution (NPWS, 2008). Only one of the lagoons is in 'favourable' conservation status, eight have a conservation status of 'unfavourable/ inadequate' and one is in 'unfavourable/ bad' conservation status. Impacts of

[18] NPWS (2013) Galway Bay Complex SAC [000268]. Conservation objectives supporting document – marine habitats and species Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

[19] NPWS (2013) Conservation Objectives: Galway Bay Complex SAC 000268. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

eutrophication and pollution from city effluents, urbanisation, industrial/ commercial activities, dumping and silting up. The main attributes and target 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; to maintain/increase the depth of submergent macrophyte colonisation of the lagoon 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, 2013). With regard to negative indicator species, increased P could give rise to eutrophication which would favour phytoplankton blooms at the expense of submerged macrophtyes.

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 1140, 1150, 1160 and 1170 habitats in Galway Bay Complex (SAC). The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Kilchreest_010 river waterbody has been assigned a surrogate '*High*' indicative OP indicative water quality, a surrogate baseline concentration of *0.0088* mg/l P, a cumulative load of 147.8 kg/yr, a modelled loading of 0.0003 mg/l P resulting in a potential concentration following dosing of 0.0091 mg/l P and an unchanged WFD OP indicative water quality, i.e. '*High*'.

- Kinvarra Bay transitional waterbody has been assigned, a surrogate 'High' indicative OP indicative water quality, a baseline concentration of 0.0130 mg/l P in summer and 0.0060 mg/l P in winter, a cumulative load of 147.8 kg/yr, a potential concentration following dosing of 0.0133 mg/l P in summer and 0.0063 mg/l P in winter, and an unchanged WFD OP indicative water quality, i.e. 'High'.

- Inner Galway Bay South coastal waterbody has a '*High*' indicative OP indicative water quality, a baseline concentration of *0.0125* mg/l P, a cumulative load of 147.8 kg/yr, a potential concentration following dosing of 0.0127 mg/l P for both summer and winter and an unchanged WFD OP indicative water quality, i.e. '*High*'.

The EAM assessment results which evaluate the additional OP loading from dosing at Gort WTP have demonstrated that there will be no change in the WFD OP indicative water quality of surface waterbodies connected to Galway Bay Complex (SAC), there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to the nutrient conditions that support Mudflats and sandflats (1140), Coastal lagoons (1150), Large shallow inlets and bays (1160) and Reef (1170) habitat in Galway Bay Complex SAC. Therefore potential for significant effects on these habitats can be excluded.

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

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

Soft coastal cliffs reaching heights in excess of 10m occur at Rusheen, due west of Galway city and located on the north shore of Galway Bay. These cliffs support coastal grassland with very sparse vegetation cover and are considered highly representative of the rarer soft type of sea cliffs in Ireland. Groundwater connectivity between Rusheen and the Gort OP dosing area is not evident and therefore not assessed further.

6.3.3 (1310) Salicornia and other annuals colonising mud and sand, (1330) Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*), (1410) Mediterranean salt meadows (*Juncetalia maritimi*)

Mediterranean salt meadows (1410), *Salicornia* and other annuals (1310) and Atlantic salt meadows (1330) are saltmarsh habitats which can be found in close association with each other. 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. Salicornia and other annuals colonising mud and sand is a pioneer saltmarsh community that can occur on muddy sediment seaward of established saltmarsh, or form patches within other saltmarsh communities where the elevation is suitable and there is regular tidal inundation. Ten sub-sites have been surveyed within Galway Bay Complex SAC. While other sites are known to exist within the area the ten surveyed sites are believed to represent ~45% of the total saltmarsh area within Galway Bay Complex SAC. The overall objective for '*Salicornia* and other annuals' in Galway Bay Complex SAC is to 'maintain the favourable conservation condition', however for 'Atlantic' and 'Mediterranean' salt meadows, the conservation status is to restore the favourable conservation condition. The SSCOs do not specify nutrient specific targets (NPWS, 2013[15]) however, the coastal supporting document specifies that the above communities be maintained in a 'natural condition' (NPWS, 2013[18]). Increased nutrients could negatively impact these communities by encouraging development of unfavourable sediment 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 1310, 1330 and 1410 habitats in Galway Bay Complex (SAC). The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Kilchreest_010 river waterbody has been assigned a surrogate '*High*' indicative OP indicative water quality, a surrogate baseline concentration of *0.0088* mg/l P, a cumulative load of 147.8 kg/yr, a modelled loading of 0.0003 mg/l P resulting in a potential concentration following dosing of 0.0091 mg/l P and an unchanged WFD OP indicative water quality, i.e. '*High*'.

- Kinvarra Bay transitional waterbody has been assigned, a surrogate 'High' indicative OP indicative water quality, a baseline concentration of 0.0130 mg/l P in summer and 0.0060 mg/l P in winter, a cumulative load of 147.8 kg/yr, a potential concentration following dosing of 0.0133 mg/l P in summer and 0.0063 mg/l P in winter, and an unchanged WFD OP indicative water quality, i.e. 'High'.

- Inner Galway Bay South coastal waterbody has a '*High*' indicative OP indicative water quality, a baseline concentration of *0.0125* mg/l P, a cumulative load of 147.8 kg/yr, a potential concentration following dosing of 0.0127 mg/l P for both summer and winter and an unchanged WFD OP indicative water quality, i.e. '*High*'.

The EAM assessment results which evaluate the additional OP loading from dosing at Gort WTP have demonstrated that there will be no change in the WFD OP indicative water quality of surface waterbodies connected to Galway Bay Complex SAC, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to the nutrient conditions that support 1310, 1330 and 1410 habitats in Galway Bay Complex SAC. Therefore potential for significant effects on these habitats can be excluded.

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

6.3.4 (3180) Turloughs

Turlough habitat area in Galway Bay Complex SAC is considered stable/ increasing based on the measured area of four known turloughs (Lough Rask, Ballyvelaghan Lough, Ballinderreen Lough, Ballinacourty Lough). It is likely more turloughs exist at the site but have not yet been mapped. Turloughs, being groundwater fed, are typically associated with high water quality. This is demonstrated by naturally low dissolved nutrients, clear water and low algal growth. The objectives set out in the SSCOs relevant to the current project are to maintain the favourable conservation condition of turloughs (NPWS, 2013). Pressures and threats to this habitat associated with the current project include nutrient/ P

enrichment. The conservation targets are to maintain a soil nutrient status appropriate to the soil type; and to maintain appropriate water quality to support the natural structure and functioning of the habitat (specifically average annual TP concentration of ≤10µg/L TP, or ≤20µg/L TP). It is recognised that these TP targets may not be appropriate for Lough Rask owing to the saline influence.

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 turloughs in Galway Bay Complex (SAC). The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Kilchreest_010 river waterbody has been assigned a surrogate '*High*' indicative OP indicative water quality, a surrogate baseline concentration of *0.0088* mg/l P, a cumulative load of 147.8 kg/yr, a modelled loading of 0.0003 mg/l P resulting in a potential concentration following dosing of 0.0091 mg/l P and an unchanged WFD OP indicative water quality, i.e. '*High*'.

- Kinvarra Bay transitional waterbody has been assigned, a surrogate 'High' indicative OP indicative water quality, a baseline concentration of 0.0130 mg/l P in summer and 0.0060 mg/l P in winter, a cumulative load of 147.8 kg/yr, a potential concentration following dosing of 0.0133 mg/l P in summer and 0.0063 mg/l P in winter, and an unchanged WFD OP indicative water quality, i.e. 'High'.

- Inner Galway Bay South coastal waterbody has a '*High*' indicative OP indicative water quality, a baseline concentration of *0.0125* mg/l P, a cumulative load of 147.8 kg/yr, a potential concentration following dosing of 0.0127 mg/l P for both summer and winter and an unchanged WFD OP indicative water quality, i.e. '*High*'.

The EAM assessment results which evaluate the additional OP loading from dosing at Gort WTP have demonstrated that there will be no change in the WFD OP indicative water quality of surface waterbodies connected to Galway Bay Complex (SAC), there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to the nutrient conditions that support turlough habitat in Galway Bay Complex 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 this habitat / no deterioration of its favourable conservation condition is identified.

6.3.5 (7210) Calcareous fens, (7230) Alkaline fens

Calcareous fens are thought to typically occur in occur in lowland topogenous basins associated with limestone groundwater bodies with a karstic or poorly productive flow regime. The habitat can also occur in other calcareous wetland types such as upland and lowland base-rich flushes, along the fringes of calcareous lakes and within turloughs. Alkaline fens are typically base-rich basin or flush fen systems with extensive areas of species-rich small sedge communities of the alliance *Caricion davallianae*. The full extent of fen habitat in Galway Bay Complex SAC is currently unknown. Fen vegetation occurs in wetland areas to the east of Oranmore and in Ballindereen Lough. SSCOs for this habitat are to maintain the favourable conservation condition and specific attributes and targets relating to the current project include 'maintain appropriate water quality to support the natural structure and functioning of the habitat. Fens are considered to be poor in nitrogen and phosphorus and phosphorus is generally the limiting nutrient.

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 fen habitat in Galway Bay Complex (SAC). The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Kilchreest_010 river waterbody has been assigned a surrogate '*High*' indicative OP indicative water quality, a surrogate baseline concentration of *0.0088* mg/l P, a cumulative load of 147.8 kg/yr, a modelled loading of 0.0003 mg/l P resulting in a potential concentration following dosing of 0.0091 mg/l P and an unchanged WFD OP indicative water quality, i.e. '*High*'.

- Kinvarra Bay transitional waterbody has been assigned, a surrogate 'High' indicative OP indicative water quality, a baseline concentration of 0.0130 mg/l P in summer and 0.0060 mg/l P in winter, a cumulative load of 147.8 kg/yr, a potential concentration following dosing of 0.0133 mg/l P in summer and 0.0063 mg/l P in winter, and an unchanged WFD OP indicative water quality, i.e. 'High'.

- Inner Galway Bay South coastal waterbody has a '*High*' indicative OP indicative water quality, a baseline concentration of *0.0125* mg/l P, a cumulative load of 147.8 kg/yr, a potential concentration following dosing of 0.0127 mg/l P for both summer and winter and an unchanged WFD OP indicative water quality, i.e. '*High*'.

The EAM assessment results which evaluate the additional OP loading from dosing at Gort WTP have demonstrated that there will be no change in the WFD OP indicative water quality of surface waterbodies connected to Galway Bay Complex (SAC), there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to the nutrient conditions that support calcareous and alkaline fen habitat in Galway Bay Complex SAC. Therefore potential for significant effects on these habitats can be excluded.

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

6.3.6 (1355) Otter (*Lutra lutra*)

A review of the SSCOs found no specific attributes or targets relating to water quality for Otter (NPWS, 2013). However, the NPWS 'Threat Response Plan for the Otter' (NPWS, 2009), which comprises a review of and response to the pressures and threats to otters in Ireland, categorized three principal risks to otters: i) habitat destruction and degradation; ii) water pollution; and, iii) accidental death and/or persecution. The broad diet of the otter varies locally and seasonally; however, it is dominated by wrasse and rockling in coastal waters. The distribution of the otter throughout the SAC is not available directly from field surveys, areas mapped include 80 m of the shoreline based on the presumption that otters tend to forage within this range.

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 otters in Galway Bay Complex (SAC). The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Kilchreest_010 river waterbody has been assigned a surrogate '*High*' indicative OP indicative water quality, a surrogate baseline concentration of *0.0088* mg/l P, a cumulative load of 147.8 kg/yr, a modelled loading of 0.0003 mg/l P resulting in a potential concentration following dosing of 0.0091 mg/l P and an unchanged WFD OP indicative water quality, i.e. '*High*'.

- Kinvarra Bay transitional waterbody has been assigned, a surrogate 'High' indicative OP indicative water quality, a baseline concentration of 0.0130 mg/l P in summer and 0.0060 mg/l P in winter, a cumulative load of 147.8 kg/yr, a potential concentration following dosing of 0.0133 mg/l P in summer and 0.0063 mg/l P in winter, and an unchanged WFD OP indicative water quality, i.e. 'High'.

- Inner Galway Bay South coastal waterbody has a '*High*' indicative OP indicative water quality, a baseline concentration of *0.0125* mg/l P, a cumulative load of 147.8 kg/yr, a potential concentration following dosing of 0.0127 mg/l P for both summer and winter and an unchanged WFD OP indicative water quality, i.e. '*High*'.

The EAM assessment results which evaluate the additional OP loading from dosing at Gort WTP have demonstrated that there will be no change in the WFD OP indicative water quality of surface waterbodies connected to Galway Bay Complex (SAC), there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to the nutrient conditions that support otter habitat in Galway Bay Complex SAC. Therefore potential for significant effects on this species can be excluded.

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

6.3.7 (1365) Harbour Seal (*Phoca vitulina*)

In Galway Bay Complex SAC, harbour seals are present throughout the year during all aspects of its annual life cycle (breeding, moulting and non-breeding foraging and resting phases). All suitable aquatic habitat is considered pertinent to the species range and ecological requirements at the site and is therefore of potential use by harbour seals (NPWS, marine supporting doc). During a national aerial survey in 2003, 317 harbour seals were recorded at the site. Attributes and targets set out by the SSCO which bear specific relevance to this project are: to conserve the breeding sites in a natural condition; to conserve the moult haul-out sites in a natural condition; to conserve the resting haul-out sites in a natural condition; and that human activities should occur at levels that do not affect the harbour seal population at the site (NPWS, 2013 conservation obj.). OP dosing has the potential to alter the natural condition of the sites by increasing the P concentrations.

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 harbour seals in Galway Bay Complex (SAC). The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Kinvarra Bay transitional waterbody has been assigned, a surrogate 'High' indicative OP indicative water quality, a baseline concentration of 0.0130 mg/l P in summer and 0.0060 mg/l P in winter, a cumulative load of 147.8 kg/yr, a potential concentration following dosing of 0.0133 mg/l P in summer and 0.0063 mg/l P in winter, and an unchanged WFD OP indicative water quality, i.e. 'High'.

- Inner Galway Bay South coastal waterbody has a '*High*' indicative OP indicative water quality, a baseline concentration of *0.0125* mg/l P, a cumulative load of 147.8 kg/yr, a potential concentration following dosing of 0.0127 mg/l P for both summer and winter and an unchanged WFD OP indicative water quality, i.e. '*High*'.

The EAM assessment results which evaluate the additional OP loading from dosing at Gort WTP have demonstrated that there will be no change in the WFD OP indicative water quality of surface waterbodies connected to Galway Bay Complex (SAC), there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to the nutrient conditions that support harbour seal habitat in Galway Bay Complex SAC. Therefore potential for significant effects on this species can be excluded.

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

6.4 KILTARTAN CAVE (COOLE) SAC 000286

6.4.1 (8310) Caves not open to the public

Kiltartan Cave (Coole) SAC does not, at this time, have an SSCO. The Site Synopsis (NPWS, 2013[20]) describes the cave as a segment of an abandoned stream course of the Gort River. This habitat is reported as groundwater dependent and nutrient sensitive (Appendix B).

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 caves in Kiltartan Cave (Coole) (SAC). The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- GWDTE-Caherglassaun Turlough (SAC000238) groundwater body has a 'good' indicative OP indicative water quality, a baseline concentration of 0.0088 mg/l P, a cumulative load of 14.6 kg/yr, a potential concentration following dosing of 0.0091 mg/l P and an unchanged WFD OP indicative water quality, i.e. 'good'.
- Kilchreest_010 river waterbody has been assigned a surrogate 'Good' indicative OP indicative water quality, a surrogate baseline concentration of *0.0088* mg/l P, a cumulative load of 147.8 kg/yr, a modelled loading of 0.0003 mg/l P resulting in a potential concentration following dosing of 0.0094 mg/l P and an unchanged WFD OP indicative water quality, i.e. '*Good*'.

The EAM assessment results which evaluate the additional OP loading from dosing at Gort WTP have demonstrated that there will be no change in the WFD OP indicative water quality of groundwater bodies and surface waterbodies connected to Kiltartan Cave (Coole) (SAC), that there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to the nutrient condition supporting 8310 habitat in Kiltartan Cave (Coole) 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 8310 habitat in Kiltartan Cave (Coole) SAC/ no deterioration of its favourable conservation condition is identified.

[20] NPWS, 2013. Site Synopsis Kiltartan Cave (Coole) SAC. National Parks and Wildlife Services.

6.5 INNER GALWAY BAY SPA 004031

6.5.1 (A003) Great Northern Diver (*Gavia immer*), (A017) Cormorant (*Phalacrocorax carbo*), (A028) Grey Heron (*Ardea cinerea*), (A046) Light-bellied Brent Goose (*Branta bernicla hrota*), (A050) Wigeon (*Anas penelope*), (A052) Teal (*Anas crecca*), (A056) Shoveler (*Anas clypeata*), (A069) Red-breasted Merganser (*Mergus serrator*), (A137) Ringed Plover (*Charadrius hiaticula*), (A140) Golden Plover (*Pluvialis apricaria*), (A142) Lapwing (*Vanellus vanellus*), (A149) Dunlin (*Calidris alpina*) (A157) Bar-tailed Godwit (*Limosa lapponica*), (A160) Curlew (*Numenius arquata*), (A162) Redshank (*Tringa totanus*), (A169) Turnstone (*Arenaria interpres*), (A179) Black-headed Gull (*Chroicocephalus ridibundus*), (A182) Common Gull (*Larus canus*), (A191) Sandwich Tern (*Sterna sandvicensis*), (A193) Common Tern (*Sterna hirundo*), (A999) Wetland and Waterbirds

The SSCOs for Inner Galway Bay SPA (NPWS, 2013[21]) list targets for each species (A003) Great Northern Diver (*Gavia immer*), (A017) Cormorant (*Phalacrocorax carbo*), (A028) Grey Heron (*Ardea cinerea*), (A046) Brent Goose (*Branta bernicla hrota*), (A050) Wigeon (*Anas penelope*), (A052) Teal (*Anas crecca*), (A056) Shoveler (*Anas clypeata*), (A069) Red-breasted (Merganser *Mergus serrator*), (A137) Ringed Plover (*Charadrius hiaticula*), (A140) Golden Plover (*Pluvialis apricaria*), (A142) Lapwing (*Vanellus vanellus*), (A149) Dunlin (*Calidris alpina alpine*), (A157) Bar-tailed Godwit (*Limosa lapponica*), (A160) Curlew (*Numenius arquata*), (A162) Redshank (*Tringa tetanus*), (A169) Turnstone (*Arenaria interpres*), (A179) Black-headed Gull (*Chroicocephalus ridibundus*), (A182) Common Gull (*Larus canus*), (A191) Sandwich Tern (*Sterna sandvicensis*), (A193) Common Tern (*Sterna hirundo*), specifically:

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

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

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

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 mentioned bird species in Inner Galway Bay SPA. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- Kilchreest_010 river waterbody has been assigned a surrogate '*High*' indicative OP indicative water quality, a surrogate baseline concentration of *0.0088* mg/l P, a cumulative load of 147.8 kg/yr, a modelled loading of 0.0003 mg/l P resulting in a potential concentration following dosing of 0.0091 mg/l P and an unchanged WFD OP indicative water quality, i.e. '*High*'.
- Kinvarra Bay transitional waterbody has been assigned, a surrogate 'High' indicative OP indicative water quality, a baseline concentration of 0.0130 mg/l P in summer and 0.0060 mg/l P in winter, a cumulative load of 147.8 kg/yr, a potential concentration following dosing of

[21] NPWS (2013) Conservation Objectives: Inner Galway Bay SPA 004031. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

0.0133 mg/l P in summer and 0.0063 mg/l P in winter, and an unchanged WFD OP indicative water quality, i.e. 'High'.

- Inner Galway Bay South coastal waterbody has a '*High*' indicative OP indicative water quality, a baseline concentration of *0.0125* mg/l P, a cumulative load of 147.8 kg/yr, a potential concentration following dosing of 0.0127 mg/l P for both summer and winter and an unchanged WFD OP indicative water quality, i.e. '*High*'.

The EAM assessment results which evaluate the additional OP loading from dosing at Gort WTP have demonstrated that there will be no change in the WFD OP indicative water quality of surface waterbodies connected to Inner Galway Bay SPA, there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to the nutrient conditions that support the species and habitats listed above for Inner Galway Bay SPA. Therefore potential for significant effects on these habitats can be excluded.

Furthermore, dosing will not prevent the maintenance of the favourable conservation condition of these species and associate habitat / no deterioration of their favourable conservation condition is identified.

6.6 COOLE-GARRYLAND SPA 004107

6.6.1 (A038) Whooper Swan (*Cygnus cygnus*)

Coole-Garryland is of major conservation importance as a feeding and roosting site for Whooper swan. The COs (NPWS, 2018[22]) for Coole-Garrryland SPA are to maintain or restore the favourable conservation conditions for the Whooper swan.

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 Whooper swan in Coole-Garryland SPA. The EAM (**Table 3; Appendix C**) has assessed the potential for impact on OP indicative water quality on:

- GWDTE-Caherglassaun Turlough (SAC000238) groundwater body has a 'good' indicative OP indicative water quality, a baseline concentration of 0.0088 mg/l P, a cumulative load of 14.6 kg/yr, a potential concentration following dosing of 0.0091 mg/l P and an unchanged WFD OP indicative water quality, i.e. 'good'.

- Kilchreest_010_Turloughs waterbody has been assigned a surrogate '*Good*' indicative OP water quality which was derived from the main Kilchreest waterbody, a surrogate baseline concentration of *0.0088* mg/l P, a cumulative load of 147.8 kg/yr, a potential concentration following dosing of 0.0094 mg/l P and an unchanged WFD OP indicative water quality, i.e. '*Good*'.

The EAM assessment results which evaluate the additional OP loading from dosing at Gort WTP have demonstrated that there will be no change in the WFD OP indicative water quality of groundwater bodies and surface waterbodies connected to Coole-Garryland SPA, that there is sufficient capacity within the status threshold, and no alteration to water quality meaning there will be no alteration to the bird species and associated habitat in Coole-Garryland SPA. Therefore potential for significant effects on these species and habitat can be excluded.

[22] NPWS (2016) Conservation objectives for Coole-Garryland SPA [004107]. Generic Version 6.0. Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

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

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

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

1. Identify projects/ plans which might act in combination: identify all possible sources of effects from the project or plan under consideration, together with all other sources in the existing environment and any other effects likely to arise from other proposed projects or plans;
2. Impacts identification: identify the types of impacts that are likely to affect aspects of the structure and functions of the site vulnerable to change;
3. Define the boundaries for assessment: define boundaries for examination of cumulative effects; these will be different for different types of impact and may include remote locations;
4. Pathway identification: identify potential cumulative pathways (e.g., via water, air, etc.; accumulations of effects in time or space);
5. Prediction: prediction of magnitude/ extent of identified likely cumulative effects, and
6. Assessment: comment on whether or not the potential cumulative effects are likely to be significant.

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

Based on this search and the Project Teams knowledge of the study area a list of those projects and Plans which may potentially contribute to cumulative or in-combination effects with the proposed project was generated and listed in **Table 4** below.

Table 4: In-Combination Impacts with Other Plans, Programmes and Policies

Plan / Programme/Policy	Key Types of Impacts	Potential for In-combination Effects
Galway County Council Development Plan 2022 – 2028 The objectives of relevance in the Galway County Development Plan include under Chapter 6 Water, Wastewater, Waste Management & Extractive Industry: – to protect, conserve and enhance existing and potential water resources and dependent wildlife/ habitats of the County, in accordance with the EU WFD, RBMPs and relevant EC Regulations (WS-1; WS2; WS11). – to support the preparation of water safety plans for the protection of major public water supply schemes in County Galway; and establish source management and protection zones around drinking water supply areas (WS-5; WS7) – to reduce overall level of water loss in the public water supply (WS8) – to support the implementation of relevant recommendations and measures outlined in the Shannon International & Western RBMPs 2009 – 2015 (WS9) – to invest in infrastructure facilities and to develop supply of water through greater area of the county (WS-4; WS6; WS12 & WS13 WS10; WW2; WW3 & WW8) – to support the preparation & implementation of a Waters Services Plan (WS16) – to ensure all wastewater generated is collected, treated and discharged after treatment in line with EU and national guidance and legislation (WW1) – to promote the provision of safe and secure wastewater infrastructure to ensure that the public is protected and that that permitted development, is within the environmental carrying capacity and does not negatively impact on habitat quality or species diversity (WW6) Elsewhere in the plan Chapters 8 and 9 also consider the protection of water resources in terms of climate change and flooding and conserving biodiversity. **Galway City Council Development Plan 2023 – 2029** Objectives of relevance include the Water Quality Policy (9.6) which sets out: to support the actions of Western RBDMPs to promote and achieve a restoration of good status, reduce chemical pollution and prevent deterioration of surface, coastal and groundwater quality. The Water Services Policy (9.7) objectives include:	▪ N/A	The Galway County Council Development Plan 2022 – 2028 emphasises the objectives of its water and wastewater services which include enhancement and improved quality of the service to its customers. The plan also outlines the importance of compliance with the Shannon International and Western River Basin Management Plans (now replaced by the National Plan 2018-2011[23]), and emphasises compliance with environmental objectives. There is no potential for cumulative effects with these plans.

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

– to work closely with Irish Water in supporting the delivery of the Water Services Strategic Plan; – to provide and maintain a high quality and efficient water supply; – to identify and prioritise water mains for rehabilitation and water conservation; – to provide a sustainable and effective wastewater drainage collection and treatment system and ensure that all new developments have and are provided with satisfactory drainage systems. The Sustainable Urban Drainage Systems (SUDS) Policy (9.8) aims to o enable surface water run-off to be managed as near to its source as possible and achieve wider benefits such as sustainable development, water quality and biodiversity.		
River Basin Management Plan For Ireland 2022 – 2027 The document (Chapter 4) sets out the condition of Irish waters, and a summary of statuses for all monitored waters in the 2013 – 2015 period, including a description of the changes since 2007 – 2009. Nationally, both monitored river waterbodies and lakes at 'high' or 'good' ecological status, appear to have declined by 3% since 2007 – 2009; nevertheless, this figure does not reflect a significant number of improvements and dis-improvements across these waters since 2009. Provisional figures from the EPA suggest that approximately 900 river waterbodies and lakes have either improved or dis-improved. In addition, the previously observed long term trend of decline in the number of high status river sites has continued. Chapter 5 of the RBMP presents results of the catchment characterisation process, which identifies the significant pressures on each water body that is *At Risk* of not meeting the environmental objectives of the WFD. Importantly, the assessment includes a review of trends over time to see if conditions were likely to remain stable, improve or deteriorate by 2021. This work was presented in the RBMP for 81% of water bodies nationally, which had been characterised at the time. 1,517 waterbodies were classed *At Risk* out of a total of 4,775, or 32%. An assessment of significant environmental pressures found that agriculture was the most significant pressure in 729 river and lake water bodies that are *At Risk*. Urban waste water, hydromorphology and forestry were also significant pressures amongst others.	▪ N/A	The objectives of the RBMP are to: ▪ Prevent deterioration; ▪ Restore good status; ▪ Reduce chemical pollution; and ▪ Achieve water related protected areas objectives. The implementation of the RBMP seeks compliance with the environmental objectives set under the plan, which will be documented for each waterbody. This includes compliance with the European Communities (Surface Waters) Regulations S.I. No. 272 of 2009 (as amended). The implementation of this plan will have a positive impact on biodiversity and the Project will not affect the achievement of the RBMP objectives.
Catchment based Flood Risk Assessment and Management (CFRAM) Programme, under the Floods Directive The Office of Public Works (OPW) is responsible for the implementation of the Floods Directive 2007/60/EC which is being carried out through a Catchment based Flood Risk Assessment and Management (CFRAM) Programme. As part of the directive Ireland is required to undertake a Preliminary Flood Risk Assessment, to identify areas of existing or potentially significant future flood risk and to prepare flood hazard and risk maps for these areas. Following this, flood risk management plans are	▪ Habitat loss or destruction; ▪ Habitat fragmentation or degradation; ▪ Alterations to water quality and/or water movement;	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

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.	▪ Disturbance; and ▪ In-combination impacts within the same scheme	other relevant pressures are absent is a significant consideration in terms of achieving the objectives of the WFD. The AA of the plans will need to consider the potential for impacts from hard engineering solutions and how they might affect hydrological connectivity and hydromorphological supporting conditions for protected habitats and species. There is no potential for cumulative effects with the CFRAMS programme as no infrastructure is proposed as part of this project.
Foodwise 2025 Foodwise 2025 strategy identifies significant growth opportunities across all subsectors of the Irish agri-food industry. Growth Projection includes increasing the value added in the agri-food, fisheries and wood products sector by 70% to in excess of €13 billion.	▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition; and ▪ Disturbance to habitats / species	Foodwise 2025 was subject to its own AA[24]. Growth is to be achieved through sustainable intensification to maximise production efficiency whilst minimising the effects on the environment however there is increased risk of nutrient discharge to receiving waters and in turn a potential risk to biodiversity and Europe Sites if not controlled. With the required mitigation in the Food Wise Plan, no significant in-combination effects are predicted. Mitigation measures included cross compliance with 13 Statutory Management Requirements, EIA Agricultural Regulations 2011, GLAS, and AA Screening of licencing and permitting in the forestry and seafood sectors.
Rural Development Programme 2021 – 2025 The agricultural sector is actively enhancing competitiveness whilst trying to achieve more sustainable management of natural resources. The common set of objectives, principles and rules through which the European Union co-ordinates support for European agriculture is outlined in the Rural Development Programme (RDP) 2014-2020 under the Common Agricultural Policy. The focus of the programme is to assist with the sustainable development of rural communities and while improvements are sought in relation to water management. Within the RDP are two targeted agri-environment schemes; Green Low Carbon Agri-Environment Scheme (GLAS) and Targeted Agriculture Modernisation Scheme (TAMS). They provide the role of a	▪ Overgrazing; ▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition; and ▪ Disturbance to habitats / species;	The RDP for 2021 – 2025 has been subject to SEA[25], and AA[26]. 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

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

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

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

supportive measure to improve water quality and thus provide direct benefits in achieving the measures within the RBMP. The achievement of the objectives outlined within GLAS, to improve water quality, mitigate against climate change and promote biodiversity will be of direct positive benefit in achieving the measures within the RBMP and the goals of the Natura Directives. The scheme has an expected participation for 2021-2025 of 50,000 farmers which have to engage in specific training and tasks in order to receive full payment. Farmers within the scheme must have a nutrient management plan which is a strategy for maximising the return from on and off-farm chemical and organic fertilizer resources. This has a direct positive contribution towards protecting waterbodies from pollution through limiting the amount of fertiliser that is placed on the land. The scheme prioritises farms in vulnerable catchments with 'high status' waterbodies and also focuses on educating farmers on best practices to try and improve efficiency along with environmental outcomes. The TAMS scheme is open to all farmers and is focused on supporting productive investment for modernisation. This financial grant for farmers is focused on the pig and poultry sectors, dairy equipment and the storage of slurry and other farmyard manures. Within the TAMS scheme are two further schemes; the Animal Welfare, Safety and Nutrient Storage Scheme and the Low Emission Slurry Spreading Scheme. Both schemes 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.		concluded that there would be no significant in-combination effects on Natura 2000 sites.
National Nitrates Action Programme Ireland is obliged under the Nitrates Directive 91/676/EEC to prepare a National Nitrates Action Programme which is designed to prevent pollution of surface and ground waters from agricultural sources. This will directly contribute to the improvement of water quality and thus the objectives within the RBMP. Ireland's third Nitrates Action Programme came into operation in 2014 and has a timescale up to 2017. The Agricultural Catchments Programme is an ongoing programme that monitors the efficiency of various measures within the nitrate regulations. It is spread across six catchments and encompasses approximately 300 farmers.	▪ Land use change or intensification; ▪ Water pollution; ▪ Nitrogen deposition; and ▪ Disturbance to habitats / species	This programme has been subject to a Screening for Appropriate Assessment and it concluded that the NAP will not have a significant effect on the Natura 2000 network and a Stage 2 AA was not required[27]. It concluded that the NAP was an environmental programme which imposes environmental constraints on all agricultural systems in the state. It therefore benefits Natura 2000 sites and their species. In terms of in-combination effects, it stated that the Food Wise 2025 strategy would have to operate within the constraints of the NAP.
Forest Policy Review: Forests, Products and People – A Renewed Vision (2014) / Forestry Programme 2014 – 2020 (Extended to End 2022)	▪ Habitat loss or destruction;	Ireland's Forestry Programme 2014 – 2020 has undergone AA[28]. A key recommendation is that all proposed forestry projects should be subject to an assessment of their impacts and

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

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

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.	▪ Habitat fragmentation or degradation; ▪ Water quality changes; and ▪ Disturbance to species.	the proximity of Natura 2000 habitats and species should be taken into account when proposals are generated. In-combination effects will therefore be assessed at the project specific scale. Adherence to this recommendation will ensure that there is no potential for cumulative effects with the proposed project.
Water Services Strategic Plan (WSSP, 2015) Irish Water has prepared a Water Services Strategic Plan (WSSP, 2015), under Section 33 of the Water Service No. 2 Act of 2013 to address the delivery of strategic objectives which will contribute towards improved water quality and WFD requirements. The WSSP forms the highest tier of asset management plans (Tier 1) which Irish Water prepare and it sets the overarching framework for subsequent detailed implementation plans (Tier 2) and water services projects (Tier 3). The WSSP sets out the challenges we face as a country in relation to the provision of water services and identifies strategic national priorities. It includes Irish Water's short, medium and long term objectives and identifies strategies to achieve these objectives. As such, the plan provides the context for subsequent detailed implementation plans (Tier 2) which will document the approach to be used for key water service areas such as water resource management, wastewater compliance and sludge management. The WSSP also sets out the strategic objectives against which the Irish Water Capital Investment Programme is developed. The current version of the CAP outlines the proposals for capital expenditure in terms of upgrades and new builds within the Irish Water owned asset and this is a significant piece of the puzzle in terms of the expected improvements from the RBMP.	▪ Habitat loss and disturbance from new / upgraded infrastructure; ▪ Species disturbance; ▪ Changes to water quality or quantity; and ▪ Nutrient enrichment /eutrophication.	The overarching strategy was subject to AA and highlighted the need for additional plan/project environmental assessments to be carried out at the tier 2 and tier 3 level. Therefore, no likely significant in-combination effects are envisaged.
National Wastewater Sludge Management Plan (2016)	▪ Habitat loss and disturbance from	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

The National Wastewater Sludge Management Plan was prepared in 2015, outlining the measures needed to improve the management of wastewater sludge.	new / upgraded infrastructure; ▪ Species disturbance; ▪ Changes to water quality or quantity; and ▪ Nutrient enrichment /eutrophication.	and additional education and research requirements. This plan does not specifically address domestic wastewater loads, only those relating to Irish Water facilities. In relation to the plan as it stands, no in-combination effects are expected with the implementation of proposed mitigation measures.
Lead Mitigation Plan (2016) Included in the WSSP (2015) is the strategy WS1e – Prepare and implement a "Lead in Drinking Water Mitigation Plan" to effectively address the risk of failure to comply with the drinking water quality standard for lead due to lead pipework. This strategy has been realised in the 2016 Lead Mitigation Plan.	▪ Changes to water quality or quantity; and ▪ Nutrient enrichment /eutrophication.	The plan is subject to SEA and AA which have also been published and are available at http://www.water.ie. There are no upstream OP dosing of Gort WTP. Downstream dosing projects include Tuam and Kinvara, and the cumulative effect of dosing downstream areas with Gort WTP has been taken into account in the EAMs for these WTPs.

7. SCREENING CONCLUSION STATEMENT

This Screening for AA has considered the potential for significant effects on European Sites arising from the proposed OP dosing at Gort WTP, for the Gort WSZ, and the wider ZOI. The potential for significant effects are evaluated with regard to the qualifying interests/species of conservation interest and associated conservation objectives.

The potential for direct, indirect and cumulative impacts affecting Caherglassaun Turlough SAC (000238), Coole-Garryland Complex SAC (000252), Galway Bay Complex SAC (000268), Kiltartan Cave (Coole) SAC (000286), Inner Galway Bay SPA (004031) and Coole-Garryland SPA (004107) 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 connected to the proposed project via hydrological or hydrogeological pathways, in order to provide a scientific basis for the evaluations. The Screening for AA has determined that there is no potential for significant direct, indirect or cumulative impacts which would have the potential to affect the qualifying interests/special conservation interests of the European sites within the study area.

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

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

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

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Appendix A

European Sites - Conservation Objectives

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National Parks and Wildlife Service

Conservation Objectives Series

Caherglassaun Turlough SAC 000238

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Introduction

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

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

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

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

Favourable conservation status of a habitat is achieved when:

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

The favourable conservation status of a species is achieved when:

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

Notes/Guidelines:

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

Qualifying Interests

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

000238	Caherglassaun Turlough SAC
1303	Lesser Horseshoe Bat *Rhinolophus hipposideros*
3180	Turloughs*
3270	Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation

Supporting documents, relevant reports & publications

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

NPWS Documents

Year :	1992
Title :	Turloughs over 10ha - Vegetation survey and evaluation
Author :	Goodwillie, R.N.
Series :	Unpublished report to NPWS
Year :	2006
Title :	A survey of rare and scarce vascular plants in County Galway
Author :	Conaghan, J.; Roden, C.; Fuller, J.
Series :	Unpublished report to NPWS
Year :	2015
Title :	Turlough hydrology, ecology and conservation (Part 1)
Author :	Waldren, S. (ed.)
Series :	Unpublished report to NPWS
Year :	2015
Title :	Turlough hydrology, ecology and conservation (Part 2)
Author :	Waldren, S. (ed.)
Series :	Unpublished report to NPWS
Year :	2016
Title :	Ireland Red List No. 10: Vascular Plants
Author :	Wyse Jackson, M.; FitzPatrick, Ú.; Cole, E.; Jebb, M.; McFerran, D.; Sheehy Skeffington, M.; Wright, M.
Series :	Ireland Red Lists series, NPWS
Year :	2017
Title :	Conservation objectives supporting document: Turloughs* and Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation
Author :	O Connor, Á.
Series :	Conservation objectives supporting document
Year :	2018
Title :	Conservation objectives supporting document – lesser horseshoe bat (*Rhinolophus hipposideros*)
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	1932
Title :	The flora of the turloughs: a preliminary note
Author :	Praeger, R.L.
Series :	Proceedings of the Royal Irish Academy, 41B: 37-45
Year :	1979
Title :	A note on the Mollusca of three turloughs
Author :	Donaldson, F.; Donaldson, F.L.; McMillan, N.F.
Series :	Irish Naturalists' Journal, 19(11): 400-401

Year :	1983
Title :	Flora of Connemara and the Burren
Author :	Webb, D.A.; Scannell, M.J.P.
Series :	Royal Dublin Society, Dublin and Cambridge University Press, Cambridge
Year :	1985
Title :	Phytosociological and ecological studies on turloughs in the west of Ireland
Author :	MacGowran, B.
Series :	Unpublished Ph.D. Thesis, National University of Ireland, Galway
Year :	1986
Title :	A study of the geology, hydrology and geomorphology of turloughs
Author :	Coxon, C.
Series :	Unpublished Ph.D. Thesis, Trinity College Dublin
Year :	1997
Title :	An Investigation of the Flooding Problems in the Gort–Ardrahan Area of South Galway. Ecology Baseline Study. Vols I and II.
Author :	Southern Water Global and Jennings O'Donovan and Partners (eds)
Series :	The Office of Public Works, Dublin
Year :	2007
Title :	Protecting and managing underground sites for bats
Author :	Mitchell-Jones, A.J.; Bihari, Z.; Masing, M.; Rodrigues, L.
Series :	EUROBATS Publication Series No. 2
Year :	2008
Title :	The lesser horseshoe bat conservation handbook
Author :	Schofield, H.W.
Series :	The Vincent Wildlife Trust
Year :	2009
Title :	Importance of night roosts for bat conservation: roosting behaviour of the lesser horseshoe bat *Rhinolophus hipposideros*
Author :	Knight, T.; Jones, G.
Series :	Endangered Species Research, 8: 79-86
Year :	2010
Title :	Modelling a network of turloughs
Author :	Gill, L.W.
Series :	Unpublished Ph.D. Thesis, Trinity College Dublin
Year :	2011
Title :	The hydrology and hydroecology of turloughs
Author :	Naughton, O.
Series :	Unpublished Ph.D. Thesis, Trinity College Dublin
Year :	2012
Title :	Groundwater flooding in Irish karst: The hydrological characterisation of ephemeral lakes (turloughs)
Author :	Naughton, O.; Johnston, P.M.; Gill, L.W.
Series :	Journal of Hydrology, 470-471: 82-97
Year :	2013
Title :	Modeling a network of turloughs in lowland karst
Author :	Gill, L.W.; Naughton, O.; Johnston, P.M.
Series :	Water Resources Research, 49: 3487-3503

Year :	2017
Title :	Groundwater flood hazards and mechanisms in lowland karst terrains
Author :	Naughton, O.; McCormack, T.; Gill, L.; Johnston, P.
Series :	Geological Society, London, Special Publications, 466

Spatial data sources

Year :	2015
Title :	Turlough hydrology, ecology and conservation
GIS Operations :	Dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	3180 (map 2)
Year :	2018
Title :	NPWS lesser horseshoe bat database
GIS Operations :	Roost identified, clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1303 (map 3)
Year :	2007
Title :	Forest Inventory and Planning System (FIPS)
GIS Operations :	Dataset clipped to 2.5km buffer centred on roost location
Used For :	1303 (map 3)

Conservation Objectives for : Caherglassaun Turlough SAC [000238]

3180 Turloughs

To restore the favourable conservation condition of Turloughs* in Caherglassaun Turlough SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable at c.63.3ha or increasing, subject to natural processes. See map 2	Caherglassaun turlough is one of the better studied of Irish turloughs (Praeger, 1932; MacGowran, 1985; Coxon, 1986; Goodwillie, 1992; Southern Water Global and Jennings O'Donovan and Partners (SWG and JODP), 1997; Gill, 2010; Naughton, 2011; Waldren, 2015). The area target of c.63.3ha for Caherglassaun turlough is based on the approximate area from Waldren (2015). See map 2 for recorded extent. Goodwillie (1992) categorised Caherglassaun turlough as of international ecological importance. Caherglassaun turlough was assessed as in unfavourable-inadequate (poor) condition (Waldren, 2015). See O Connor (2017) for information on all attributes and targets
Habitat distribution	Occurrence	No decline, subject to natural processes	See map 2
Hydrological regime	Various	Maintain appropriate natural hydrological regime necessary to support the natural structure and functioning of the habitat	Hydrological regime is sub-divided into more detailed attributes (groundwater contribution, flood duration, frequency, area and depth, and permanently flooded/wet areas) and targets in O Connor (2017). Caherglassaun turlough is the last in the series of conduit-fed turloughs which includes Blackrock, Lough Coy and Coole/Garryland, and its hydrology is well-studied (Gill, 2010; Naughton, 2011; Naughton et al., 2012; Gill et al., 2013). This system is partly fed by the Owenshree river that drains the acidic bedrock of the Slieve Aughty mountains and, consequently, has a very large zone of groundwater contribution. Its water levels show a small diurnal influence of tides. The turlough basin has a permanent lake with a rocky western shore; a stream enters from the south-west and there are swallow holes in the north-west (Goodwillie, 1992). Record depths of 14.6m were reported for Caherglassaun turlough in 2015/16 by Naughton et al. (2017)
Soil type	Hectares	Maintain variety, area and extent of soil types necessary to support turlough vegetation and other biota	Caherglassaun turlough has extensive areas of poorly-drained mineral soils that are moderately acidic and have low amounts of calcium carbonate and organic matter (Waldren, 2015). Goodwillie (1992) described the soil at Caherglassaun turlough as derived from glacial drift and stony without significant amounts of marl or peat, and noted some finer sediment/silt is associated with the stream and more permanent water
Soil nutrient status: nitrogen and phosphorus	N and P concentration in soil	Maintain/restore nutrient status appropriate to soil types and vegetation communities	Waldren (2015) found relatively low mean total nitrogen (TN) at Caherglassaun turlough of 6,263mg/kg TN and relatively high total phosphorus (TP) of 1,016mg/kg TP
Physical structure: bare ground	Presence	Maintain sufficient wet bare ground, as appropriate	See O Connor (2017) for details on this and all attributes
Chemical processes: calcium carbonate deposition and concentration	Calcium carbonate deposition rate/soil concentration	Maintain appropriate calcium carbonate deposition rate and concentration in soil	Soils had a low calcium carbonate content of 4.37% (Waldren, 2015) at Caherglassaun turlough

Water quality	Various	Restore appropriate water quality to support the natural structure and functioning of the habitat	Water quality is sub-divided into more detailed attributes (nutrients, colour, phytoplankton and epiphyton biomass) and targets in O Connor (2017). Caherglassaun turlough had low alkalinity, high colour and high total phosphorus (mean of 43.2µg/l TP) (Waldren, 2015). Mean chlorophyll *a* was 3.3µg/l and maximum was 33.5µg/l. Targets of ≤20µg/l TP, annual mean chlorophyll *a* <8µg/l and annual maximum chlorophyll *a* <25µg/l may be sufficient to restore Caherglassaun turlough to favourable condition
Active peat formation	Flood duration	Maintain active peat formation, where appropriate	Caherglassaun turlough is dominated by mineral soils with low (13.8%) organic matter content (Waldren, 2015)
Vegetation composition: area of vegetation communities	Hectares	Maintain/restore area of sensitive and high conservation value vegetation communities/units	See MacGowran (1985), Goodwillie (1992), Goodwillie et al. (1997 in SWG and JODP, 1997) and Waldren (2015) for information on vegetation communities at Caherglassaun turlough. Waldren (2015) stated that woodland and scrub communities seem to have increased since the study by Goodwillie (1992). See also, in this volume, the conservation objective for the habitat Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation (habitat code 3270), which is an integral community of Caherglassaun turlough
Vegetation composition: vegetation zonation	Distribution	Maintain/restore vegetation zonation/mosaic characteristic of the site	See MacGowran (1985), Goodwillie (1992), Goodwillie et al. (1997 in SWG and JODP, 1997) and Waldren (2015) for information on vegetation at Caherglassaun turlough
Vegetation structure: sward height	Centimetres	Maintain/restore sward heights appropriate to the vegetation unit, and a variety of sward heights across the turlough	See MacGowran (1985), Goodwillie (1992), Goodwillie et al. (1997 in SWG and JODP, 1997) and Waldren (2015) for information on vegetation at Caherglassaun turlough. Goodwillie (1992) recorded cattle and sheep grazing
Typical species	Presence	Maintain typical species within and across the turlough	Typical species is sub-divided into more detailed attributes (terrestrial, wetland and aquatic plants, invertebrates and birds) and targets in O Connor (2017). At Caherglassaun, the typical species of the habitat Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation (3270) are of note, as is rigid hornwort (*Ceratophyllum demersum*) and the Near Threatened fen violet (*Viola persicifolia*) (Goodwillie, 1992; Goodwillie et al., 1997 in Southern Water Global and Jennings O'Donovan and Partners, 1997; Conaghan et al., 2006; Waldren, 2015; Wyse Jackson et al., 2016). Donaldson et al. (1979) report on the Mollusca of Caherglassaun turlough. Bond (1997 in SWG and JODP, 1997) noted two restricted moth species at Caherglassaun turlough, *Acentria ephemerella* and *Triphosa dubitata*
Fringing habitats: area	Hectares	Maintain marginal fringing habitats that support turlough vegetation, invertebrate, mammal and/or bird populations	See O Connor (2017) for details on this and all attributes
Vegetation structure: turlough woodland	Species diversity and woodland structure	Maintain appropriate turlough woodland diversity and structure	Goodwillie (1992) mapped 4ha of *Rhamnus* wood (vegetation type 3W). Areas of scrub and woodland on limestone pavement with ash (*Fraxinus excelsior*), hazel (*Corylus avellana*), yew (*Taxus baccata*), blackthorn (*Prunus spinosa*), hawthorn (*Crataegus monogyna*), buckthorn (*Rhamnus cathartica*) and spindle (*Euonymus europaeus*) have also been noted (NPWS internal files)

3270 Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation

To maintain the favourable conservation condition of Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation in Caherglassaun Turlough SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable, subject to natural fluctuations	The area of habitat 3270 in Caherglassaun Turlough SAC can vary significantly inter-annually with flooding regime. See Goodwillie (1992), Goodwillie et al. (1997 in Southern Water Global and Jennings O'Donovan and Partners (SWG and JODP), 1997), Conaghan et al. (2006) and Waldren (2015) for information on the occurrence of the habitat at Caherglassaun. Goodwillie (1992) estimated the extent of the *Eleocharis acicularis* community (9B) as 1.9ha and the Wet annuals community (8B) as 0.5ha at Caherglassaun. Waldren (2015) estimated 1.52ha of the *Eleocharis acicularis* community. See O Connor (2017) for information on all attributes and targets
Habitat distribution	Occurrence	No decline, subject to natural processes	See Goodwillie (1992), Goodwillie et al. (1997 in SWG and JODP, 1997), Conaghan et al. (2006) and Waldren (2015) for information on the known distribution of the habitat at Caherglassaun in the SAC
Hydrological regime	Various	Maintain appropriate natural hydrological regime necessary to support the natural structure and functioning of the habitat	Hydrological regime is sub-divided into more detailed attributes (groundwater contribution, flood duration, frequency, area and depth, and permanently flooded/wet areas) and targets in O Connor (2017). The habitat occurs on open muddy ground at the edge of the permanent water at Caherglassaun (Goodwillie, 1992; Conaghan et al., 2006). Late drying/long hydroperiod, the supply of fine mud and the gentle slope on the south-west to south-east shore are key to the area, structure and functioning of the habitat at Caherglassaun. Daily fluctuations caused by the tide may also be influential (Goodwillie, 1992)
Soil type	Hectares	Maintain area and extent of soil types necessary to support the habitat	The habitat occurs on fine sediment/mud associated with the permanent water and, particularly, the inflowing stream at the south-west of Caherglassaun (Goodwillie, 1992; Conaghan et al., 2006)
Soil nutrient status: nitrogen and phosphorus	N and P concentration in soil	Maintain nutrient status appropriate to soil types and vegetation communities/units	Waldren (2015) found relatively low mean total nitrogen (TN) at Caherglassaun turlough of 6,263mg/kg TN and relatively high total phosphorus (TP) of 1,016mg/kg TP; however, no soil samples were taken within habitat 3270
Physical structure: bare ground	Presence	Maintain sufficient wet bare ground, as appropriate	Bare ground results from late drying along the lake shore at Caherglassaun and, likely also, the deposition of fine sediment
Chemical processes: calcium carbonate deposition and concentration	Calcium carbonate deposition rate/soil concentration	Maintain appropriate calcium carbonate deposition rate and concentration in soil	Goodwillie (1992) stated that there are no significant amounts of marl at Caherglassaun and Waldren (2015) stated that the soils had a low calcium carbonate content of 4.37%
Water quality	Various	Maintain/restore appropriate water quality to support the natural structure and functioning of the habitat	Water quality is sub-divided into more detailed attributes (nutrients, colour, phytoplankton and epiphyton biomass) and targets in O Connor (2017). Caherglassaun turlough had low alkalinity, high colour, high total phosphorus (mean of 43.2µg/l TP) and high maximum chlorophyll *a* (33.5µg/l) (Waldren, 2015)

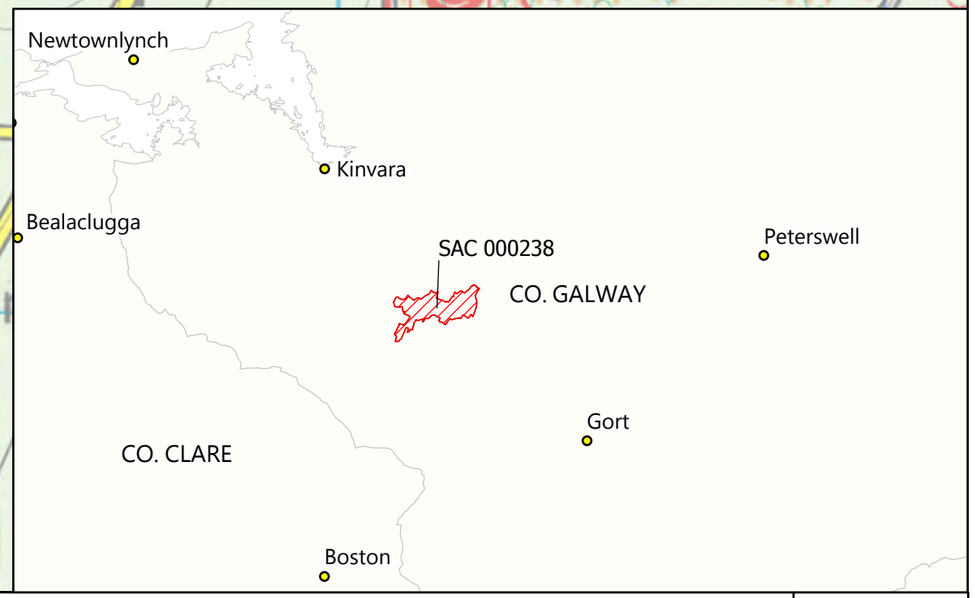
Vegetation composition: area of vegetation communities	Hectares	Maintain area of sensitive and high conservation value vegetation communities/units	See Goodwillie (1992), Goodwillie et al. (1997 in SWG and JODP, 1997), Conaghan et al. (2006) and Waldren (2015) for information on the vegetation communities. Goodwillie (1992) noted "a particularly fine stand of 9B"
Vegetation composition: vegetation zonation	Distribution	Maintain vegetation zonation/mosaic characteristic of the site	See Goodwillie (1992), Goodwillie et al. (1997 in SWG and JODP, 1997), Conaghan et al. (2006) and Waldren (2015) for information on the vegetation
Typical species: plants	Presence	Maintain typical species	Typical plant species and targets are provided in O Connor (2017). Conaghan et al. (2006) surveyed mudwort (*Limosella aquatica*; listed on Flora (Protection) Order, 2015) and northern yellow-cross (*Rorippa islandica*). Other species recorded in the habitat at Caherglassaun include spear-leaved orache (*Atriplex prostrata*), needle spike-rush (*Eleocharis acicularis*), marsh cudweed (*Gnaphalium uliginosum*), shoreweed (*Littorella uniflora*), water-purslane (*Lythrum portula*), water-pepper (*Persicaria hydropiper*), redshank (*P. maculosa*), small water-pepper (*P. minor*) and marsh yellow-cress (*Rorippa palustris*) (Goodwillie, 1992; Goodwillie et al., 1997 in SWG and JODP, 1997; Conaghan et al., 2006). Conaghan et al. (2006) also reported an unconfirmed record for the Vulnerable vernal water-starwort (*Callitriche palustris*) (Wyse Jackson et al., 2016). See also Webb and Scannell (1983)
Fringing habitats: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the natural structure and functions and typical species of the habitat	See O Connor (2017) for further details on this and all attributes

1303 Lesser Horseshoe Bat *Rhinolophus hipposideros*

To maintain the favourable conservation condition of Lesser Horseshoe Bat in Caherglassaun Turlough SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population per roost	Number	Minimum number of 20 bats for the winter roost (roost id. 246 in NPWS database). See map 3	A figure of 100 bats for summer roosts and 50 bats for winter roosts was set as a minimum qualifying standard (MQS) when SACs were being selected for lesser horseshoe bat (*Rhinolophus hipposideros*). Where roosts fall below this figure, the MQS is generally used as the target figure. This site, however, is subject to regular natural flooding which on occasion leads to significant bat mortality. In addition, the site appears to be linked to the nearby Garryland roost. On this basis, a lower target figure (20 bats) is considered justified for the winter roost (roost id. 246 in NPWS database) in Caherglassaun Turlough SAC. See the conservation objectives supporting document for lesser horseshoe bat (NPWS, 2018) for further information on all attributes and targets
Winter roosts	Condition	No decline	Caherglassaun Turlough SAC has been selected for lesser horseshoe bat because of the presence of one internationally important winter roost (roost id. 246 in NPWS database). Damage or disturbance to the roost or to the habitat immediately surrounding it will lead to a decline in its condition (Mitchell-Jones et al., 2007)
Auxiliary roosts	Number and condition	No decline	Lesser horseshoe bat populations will use a variety of roosts during the year besides the main summer maternity and winter hibernation roosts. Such additional roosts within the SAC may be important as night roosts, satellite roosts, etc. Night roosts are also considered an integral part of core foraging areas and require protection (Knight and Jones, 2009). In addition, in response to weather conditions for example, bats may use different seasonal roosts from year to year; this is particularly noticeable in winter. A database of all known lesser horseshoe bat roosts is available on the National Biodiversity Data Centre website. NB further unrecorded roosts may also be present within this SAC
Extent of potential foraging habitat	Hectares	No significant decline within 2.5km of qualifying roost	Lesser horseshoe bats normally forage in woodlands/scrub within 2.5km of their roosts (Schofield, 2008). See map 3 which shows a 2.5km zone around the above roost and identifies potential foraging grounds
Linear features	Kilometres	No significant loss within 2.5km of qualifying roosts. See map 3	This species follows commuting routes from its roost to its foraging grounds. Lesser horseshoe bats will not cross open ground. Consequently, linear features such as hedgerows, treelines and stone walls provide vital connectivity for this species within 2.5km around each roost (Schofield, 2008)
Light pollution	Lux	No significant increase in artificial light intensity adjacent to named roost or along commuting routes within 2.5km of the roost. See map 3	Lesser horseshoe bats are very sensitive to light pollution and will avoid brightly lit areas. Inappropriate lighting around roosts may cause abandonment; lighting along commuting routes may cause preferred foraging areas to be abandoned, thus increasing energetic costs for bats (Schofield, 2008)

Caherglassaun
Cillín
Ballykilladea
Ballybuck North
Holy Well
Castle
Caherglassaun Lough
Crannagh
Megalithic Tombs
Ballynastaig
Barrow
Church
Church
Killinny
Killinny East
Killomoran
Cappanapisha
16
22
29
32
33
38



Legend

Caherglassaun Turlough SAC 000238

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Department of Culture, Heritage and the Gaeltacht

MAP 1:
CAHERGLASSAUN TURLOUGH SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

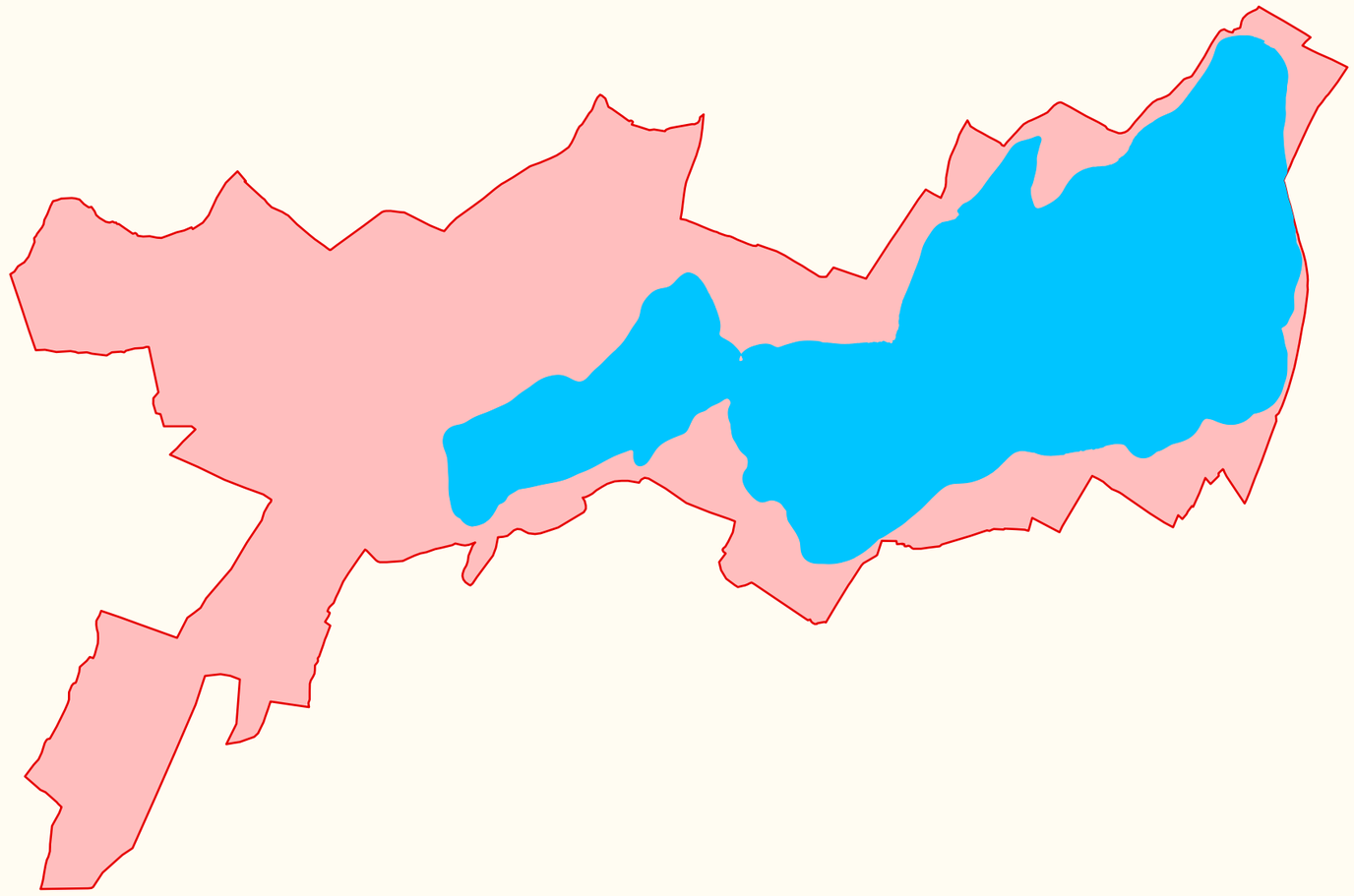
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000238; version 3.0. CO. GALWAY

0 150 300 450 600 Meters

N

Map Version 1
Date: Aug 2018



Legend

- 3180 Turloughs*
- Caherglassaun Turlough SAC 000238
- OSi Discovery Series County Boundaries

An Roinn Cultúir, Oidhreachta agus Gaeltachta
Department of Culture, Heritage and the Gaeltacht

MAP 2:
CAHERGLASSAUN TURLOUGH SAC
CONSERVATION OBJECTIVES
TURLOUGHS

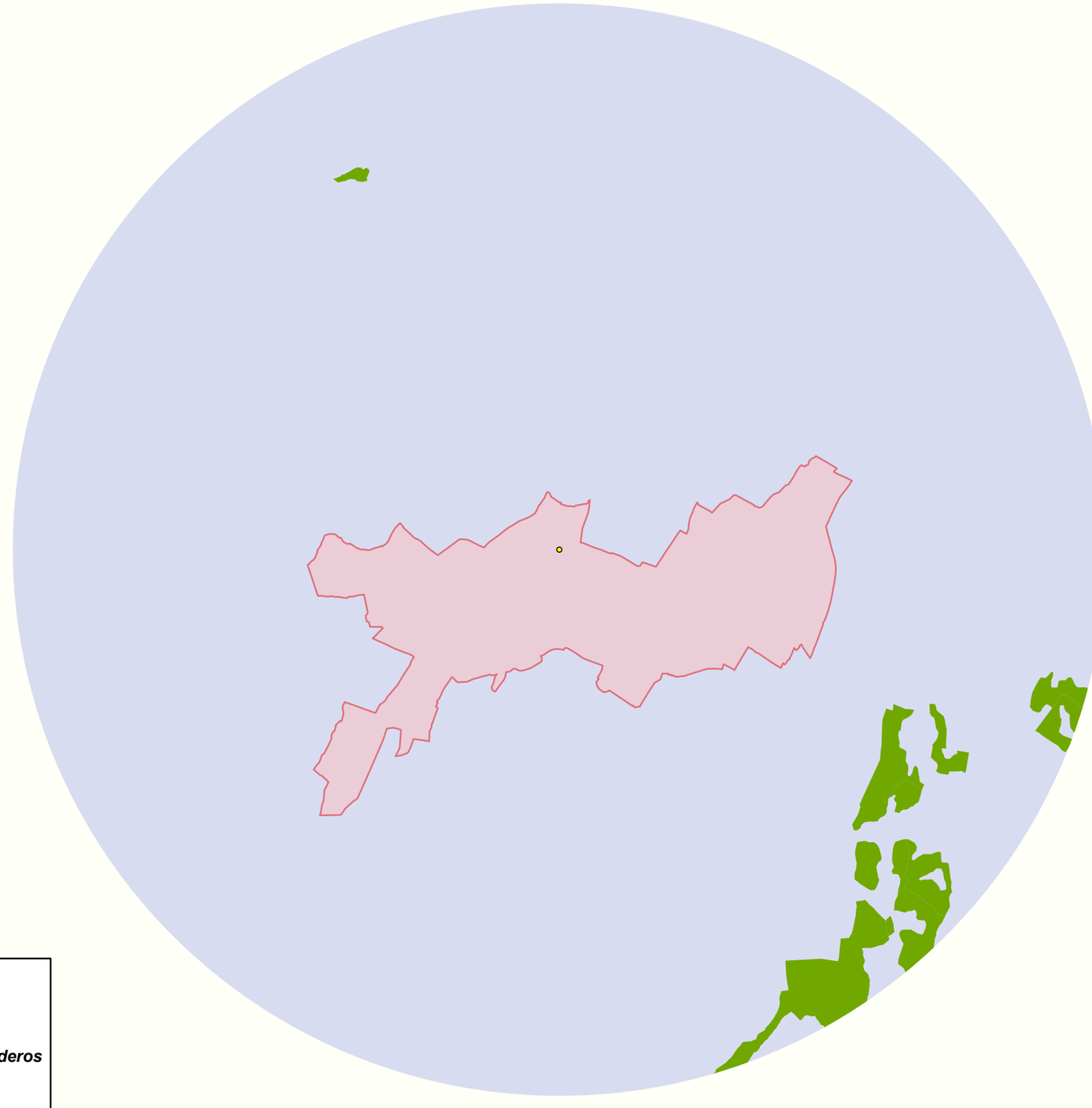
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000238; version 3.0. CO. GALWAY

0 150 300 450 600 Meters

N

Map Version 1
Date: Aug 2018



Legend

- Caherglassaun Turlough SAC 000238
- OSi Discovery Series County Boundary
- **1303 Lesser Horseshoe Bat *Rhinolophus hipposideros***
- Roost Location
- Roost ID 246 Foraging Range
- Potential Foraging Grounds

An Roinn Cultúir, Oidhreachta agus Gaeltachta
Department of Culture, Heritage and the Gaeltacht

MAP 3:
CAHERGLASSAUN TURLOUGH SAC
CONSERVATION OBJECTIVES
LESSER HORSESHOE BAT

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

SITE CODE:
SAC 000238; version 3.0. CO. GALWAY

0 0.25 0.5 0.75 1 Kilometers

N

Map Version 1
Date: Aug 2018

Conservation objectives for Coole-Garryland Complex SAC [000252]

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

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

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

Favourable conservation status of a habitat is achieved when:

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

The favourable conservation status of a species is achieved when:

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

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

Code	Description
3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation
3180	Turloughs*
3270	Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation
5130	*Juniperus communis* formations on heaths or calcareous grasslands
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)
8240	Limestone pavements*
91J0	*Taxus baccata* woods of the British Isles*

* denotes a priority habitat

Citation: *NPWS (2018) Conservation objectives for Coole-Garryland Complex SAC [000252]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Galway Bay Complex SAC 000268

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

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Citation:

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Series Editor: Rebecca Jeffrey
ISSN 2009-4086

Introduction

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

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

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

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

Favourable conservation status of a habitat is achieved when:

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

The favourable conservation status of a species is achieved when:

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

Notes/Guidelines:

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

Qualifying Interests

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

000268	Galway Bay Complex SAC
1140	Mudflats and sandflats not covered by seawater at low tide
1150	Coastal lagoons*
1160	Large shallow inlets and bays
1170	Reefs
1220	Perennial vegetation of stony banks
1310	*Salicornia* and other annuals colonising mud and sand
1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
1355	Otter *Lutra lutra*
1365	Harbour seal *Phoca vitulina*
1410	Mediterranean salt meadows (Juncetalia maritimi)
3180	Turloughs*
5130	*Juniperus communis* formations on heaths or calcareous grasslands
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco Brometalia)(*important orchid sites)
7210	Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae*
7230	Alkaline fens

Please note that this SAC overlaps with Inner Galway Bay SPA (004031) and adjoins Moneen Mountain SAC (000054). 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

Year :	1980
Title :	An assessment of the status of the common seal *Phoca vitulina vitulina* in Ireland
Author :	Summers, C.F.; Warner, P.J.; Nairn, R.G.W.; Curry, M.G.; Flynn, J.
Series :	Biological Conservation 17: 115-123
Year :	1982
Title :	Otter survey of Ireland
Author :	Chapman, P.J.; Chapman, L.L.
Series :	Unpublished Report to Vincent Wildlife Trust
Year :	1983
Title :	An assessment of the breeding populations of common seals (*Phoca vitulina vitulina*) in the Republic of Ireland during 1979
Author :	Warner, P.J.
Series :	Irish Naturalist's Journal 21: 24-26
Year :	1991
Title :	The spatial organization of otters (*Lutra lutra*) in Shetland
Author :	Kruuk, H.; Moorhouse, A.
Series :	J. Zool, 224: 41-57
Year :	1999
Title :	National Shingle Beach Survey of Ireland
Author :	Moore, D.; Wilson, F.
Series :	Unpublished Report to NPWS
Year :	2002
Title :	Distribution of the Harbour Seal (*Phoca vitulina*) in greater Galway Bay
Author :	Doyle,T.
Series :	Unpublished BSc. (hons.) thesis, NUI Galway
Year :	2006
Title :	Otters - ecology, behaviour and conservation
Author :	Kruuk, H.
Series :	Oxford University Press
Year :	2007
Title :	Inventory of Irish coastal lagoons (version 2)
Author :	Oliver, G.
Series :	Unpublished Report to NPWS
Year :	2007
Title :	Saltmarsh Monitoring Project 2006
Author :	McCorry, M.
Series :	Unpublished Report to NPWS
Year :	2009
Title :	Coastal Monitoring Project 2004-2006
Author :	Ryle, T.; Murray, A.; Connolly, C.; Swann, M.
Series :	Unpublished Report to NPWS

Year :	2009
Title :	Saltmarsh Monitoring Project 2007-2008
Author :	McCorry, M.; Ryle, T.
Series :	Unpublished Report to NPWS
Year :	2010
Title :	Monitoring and Assessment of Irish Lagoons for the purpose of the EU Water Framework Directive
Author :	Roden, C.M.; Oliver, G.
Series :	EPA
Year :	2010
Title :	Otter tracking study of Roaringwater Bay
Author :	De Jongh, A.; O'Neill, L.
Series :	Unpublished Draft Report to NPWS
Year :	2010
Title :	Subtidal Benthic Investigations in Galway Bay Complex cSAC (0268) and Inner Galway Bay SPA (4031)
Author :	Aquafact
Series :	Unpublished report for Marine Institute and NPWS
Year :	2010
Title :	Reef Investigations in Galway Bay cSAC (0269)
Author :	Aquafact
Series :	Study for Marine Institute and NPWS
Year :	2012
Title :	Benthic Survey Services Framework. Galway Bay Intertidal Surveys 2009 & 2010
Author :	RPS
Series :	Unpublished report to NPWS & Marine Institute
Year :	1990
Title :	1989 survey of breeding herds of common seal *Phoca vitulina* with reference to previous surveys
Author :	Harrington, R.
Series :	Unpublished report to Wildlife Service
Year :	2004
Title :	Harbour seal population assessment in the Republic of Ireland: August 2003
Author :	Cronin, M.; Duck, C.; O'Cadhla, O.; Nairn, R.; Strong, D.; O'Keeffe, C.
Series :	Irish Wildlife Manual No. 11
Year :	2004
Title :	Summary of National Parks & Wildlife Service surveys for common (harbour) seals (*Phoca vitulina*) and grey seals (*Halichoerus grypus*), 1978 to 2003
Author :	Lyons, D.O.
Series :	Irish Wildlife Manual No.13
Year :	2006
Title :	Otter Survey of Ireland 2004/2005
Author :	Bailey, M.; Rochford, J.
Series :	Irish Wildlife Manual No. 23
Year :	2006
Title :	Surveys of sensitive subtidal benthic communities
Author :	MERC
Series :	Unpublished Report to NPWS

Year :	2010
Title :	Harbour seal population monitoring 2009-2012: Report no. 1. Report on a pilot monitoring study carried out in southern and western Ireland, 2009
Author :	NPWS
Series :	Unpublished Report to NPWS
Year :	2011
Title :	Harbour seal pilot monitoring project, 2010
Author :	NPWS
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 :	2012
Title :	Harbour seal pilot monitoring project, 2011
Author :	NPWS
Series :	Unpublished Report to NPWS
Year :	2013
Title :	Galway Bay Complex SAC (site code 268) Conservation objectives supporting document-coastal habitats V1
Author :	NPWS
Series :	Unpublished report to NPWS
Year :	2013
Title :	Galway Bay Complex SAC (Site code 268) Conservation objectives supporting document-lagoons V1
Author :	NPWS
Series :	Unpublished report to NPWS
Year :	2013
Title :	Galway Bay Complex SAC (site code 268) Conservation objectives supporting document-marine habitats and species V1
Author :	NPWS
Series :	Unpublished report to NPWS
Year :	2013
Title :	Galway Bay Complex SAC (site code 268) Conservation objectives supporting document-turloughs V1
Author :	NPWS
Series :	Unpublished report to NPWS

Spatial data sources

Year :	Interpolated 2013
Title :	Intertidal survey (2009) and subtidal subtidal surveys (2006, 2010)
GIS Operations :	Polygon feature classes from marine community types base data sub-divided based on interpolation of marine survey data. Expert opinion used as necessary to resolve any issues arising
Used For :	1140, 1170, Marine community types (maps 3, 6, 7)
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 7)
Year :	2005
Title :	OSi Discovery series vector data
GIS Operations :	High Water Mark (HWM) polyline feature class converted into polygon feature class; clipped to SAC boundary. EPA WFD transitional waterbody data erased from extent. Expert opinion used as necessary to resolve any issues arising
Used For :	1160 (map 5)
Year :	Revision 2012
Title :	National Shingle Beach Survey
GIS Operations :	Clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1220 (map 8)
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 :	1310, 1330, 1410 (map 9)
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 resloved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1355 (no map)
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 11)
Year :	2005
Title :	OSi Discovery series vector data
GIS Operations :	High Water Mark (HWM) polyline feature class converted into polygon feature class; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1365 (map 12)

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 (no map)
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 7)
Year :	2013
Title :	Internal NPWS files
GIS Operations :	Spatial location created from easting and northing Irish Grid coordinates
Used For :	5130 (map 10)
Year :	2013
Title :	Turloughs Database 2013
GIS Operations :	Relevant turloughs identified; clipped to SAC boundary
Used For :	3180 (map 10)
Year :	Revision 2011
Title :	Inventory of Irish Coastal Lagoons. Version 3
GIS Operations :	Clipped to SAC boundary
Used For :	1150 (map 4)
Year :	2013
Title :	NPWS rare and threatened species database
GIS Operations :	Dataset created from spatial references in database records. Expert opinion used as necessary to resolve any issues arising
Used For :	1365 (map 12)

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 Galway Bay Complex SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 3	Habitat area was estimated using OSi data as 744ha
Community distribution	Hectares	Conserve the following community types in a natural condition: Intertidal sandy mud community complex; and Intertidal sand community complex. See map 7	Based on intertidal surveys undertaken in 2009 and 2010 (RPS, 2012). See marine supporting document for further information

1150 Coastal lagoons

To restore the favourable conservation condition of Coastal lagoons in Galway Bay Complex 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 76.7ha. See map 4	Areas calculated from spatial data derived from Oliver, 2007. Site codes IL037, IL038, IL039, IL046, IL047, IL048, IL049, IL050, IL051, IL052. NB there may be more, as yet unmapped, lagoons within this SAC. See lagoon supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 4 for mapped lagoons	Sites IL037, IL038, IL039, IL046, IL047, IL048, IL049, IL050, IL051, IL052 in Oliver, 2007. NB there may be more, as yet unmapped, lagoons within this SAC. See lagoon supporting document for further details
Salinity regime	Practical salinity units (psu)	Median annual salinity and temporal variation within natural ranges	The lagoons in the site vary from oligohaline to euhaline. See lagoon supporting document for further details
Hydrological regime	Metres	Annual water level fluctuations and minima within natural ranges	Most of the lagoons listed for this site are considered to be shallow; however, Aughinish lagoon and Lough Atalia do have deeper (at least 3m) parts. See lagoon supporting document for further details
Barrier: connectivity between lagoon and sea	Permeability	Appropriate hydrological connections between lagoons and sea, including where necessary, appropriate management	The lagoons within this site exhibit a variety of barrier types including cobble/shingle, karst and artificial embankment/causeway. Several are recorded as having sluices. See lagoon supporting document for further details
Water quality: Chlorophyll *a*	µg/L	Annual median chlorophyll *a* within natural ranges and less than 5µg/L	Target based on Roden and Oliver (2010). See lagoon supporting document for further details
Water quality: Molybdate Reactive Phosphorus (MRP)	mg/L	Annual median MRP within natural ranges 0.1mg/L	Target based on Roden and Oliver (2010). See lagoon 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 (2010). See lagoon supporting document for further details
Depth of macrophyte colonisation	Metres	Macrophyte colonisation to at least 2m depth	For shallow lagoons, it is expected that macrophytes should extend to their deepest points. See lagoon 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 lagoon supporting document for further details
Typical animal species	Number	Maintain listed lagoon specialists, subject to natural variation	Species listed in Oliver, 2007. See lagoon 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 accelerated encroachment by reedbeds. See lagoon supporting document for further details

1160 Large shallow inlets and bays

To maintain the favourable conservation condition of Large shallow inlets and bays in Galway Bay Complex SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 5	Habitat area was estimated as 10,825ha using OSi data and the Transitional Water Body area as defined under the Water Framework Directive
Community extent	Hectares	Maintain the extent of the *Zostera*-dominated community complex and the maërl-dominated community, subject to natural processes. See map 7	Based on 2006 diver observation and dropdown camera data (MERC, 2006). See marine supporting document for further details
Community structure: *Zostera* density	Shoots per m²	Conserve the high quality of *Zostera*-dominated communities, subject to natural processes	2006 diver observation and dropdown camera data (MERC, 2006). See marine supporting document for further details
Community structure	Biological composition	Conserve the high quality of the maërl-dominated community, subject to natural processes	2006 diver observation and dropdown camera data (MERC, 2006). See marine supporting document for further details
Community distribution	Hectares	Conserve the following community types in a natural condition: Intertidal sandy mud community complex; Intertidal sand community complex; Fine to medium sand with bivalves community complex; Sandy mud to mixed sediment community complex; Mixed sediment dominated by Mytilidae community complex; Shingle; Fucoid-dominated community complex; *Laminaria*-dominated community complex; and Shallow sponge-dominated community complex. See map 7	Based on intertidal and subtidal surveys undertaken in 2009 and 2010 (Aquafact, 2010a, b; RPS, 2012). See marine supporting document for further information

1170 Reefs

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

Attribute	Measure	Target	Notes
Distribution	Occurrence	The distribution of reefs is stable or increasing, subject to natural processes. See map 6 for mapped distribution	Based on information from 2009 and 2010 intertidal survey data and 2009 subtidal survey data (Aquafact, 2010a, b; RPS, 2012). See marine supporting document for further details
Habitat area	Hectares	The permanent habitat area is stable, subject to natural processes. See map 6	Habitat area estimated as 2773ha using 2009 and 2010 intertidal survey data and 2009 subtidal survey data (Aquafact, 2010a, b; RPS, 2012)
Community extent	Hectares	Maintain the extent of the *Mytilus*-dominated reef community, subject to natural processes. See map 7	Area established from 2009 intertidal survey (RPS, 2012)
Community structure: *Mytilus* density	Individuals per m^2	Conserve the high quality of the *Mytilus*-dominated reef community, subject to natural processes	Based on intertidal survey 2009 (RPS, 2012) and intertidal walkover 2012
Community structure	Biological composition	Conserve the following community types in a natural condition: Fucoid-dominated community complex; *Laminaria*-dominated community complex; and Shallow sponge-dominated community complex See map 7	Reef mapping based on information from 2009 subtidal reef survey (Aquafact, 2010b) and 2009 and 2010 intertidal surveys (RPS, 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 Galway Bay Complex 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 from Rinville Point, Tawin Point and coastline from Blackhead to Carrickada during the National Shingle Beach Survey (Moore and Wilson, 1999), but the extent was not mapped. Two areas of vegetated shingle were recorded during the Coastal Monitoring Project (Ryle et al., 2009): Bishopsquarter - 0.18ha and Barna (Whitestrand) - 0.45ha. 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 8 for mapped locations	Full distribution unmapped at present, although the habitat has been recorded at Rinville Point, Tawin Point and coastline from Blackhead to Carrickada (Moore and Wilson, 1999). It has also been recorded from Barna and Bishopquarter by Ryle et al. (2009). See coastal habitats supporting document for further details
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	The Galway Bay shoreline supports good examples of shingle beaches along the more exposed shores to the south and west of Galway city and to the north-east of Finnavara, County Clare. Shingle features are relatively stable in the longterm (Moore and Wilson, 1999). 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). 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. Typical species include sea sandwort (*Honckenya peploides*), sea beet (*Beta vulgaris* ssp *maritima*), rock samphire (*Crithmum maritimum*), sea mayweed (*Tripleurospermum maritimum*), yellow-horned poppy (*Glaucium flavum*) and sea campion (*Silene uniflora*)	Based on data from Moore and Wilson (1999). See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from Moore and Wilson (1999). Negative indicators include non-native species indicative of changes in nutrient status and species not considered characteristic of the habitat. See coastal habitats supporting document for further details

1310 Salicornia and other annuals colonising mud and sand

To maintain the favourable conservation condition of *Salicornia* and other annuals colonizing mud and sand in Galway Bay Complex 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: Barna House - 0.067ha, Seaweed Point - 0.003ha, Roscam West and South - 0.023ha, Kilcaimin - 0.015, Kileenaran - 0.007ha, Kinvara West - 0.017ha, Scanlan's Island - 0.117ha, Tawin Island - 1.098ha. See map 9	Based on data from Saltmarsh Monitoring Project (SMP) (McCorry and Ryle, 2009). Habitat recorded at eight of the ten sub-sites surveyed and mapped, giving a total estimated area of 1.347ha. N.B. Further unsurveyed areas may be present within this 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 9 for known distribution	Based on data from SMP (McCorry, 2007; McCorry and Ryle, 2009). *Salicornia* is an annual species, so its distribution can vary significantly from year to year. See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/ absence of physical barriers	Maintain/restore, natural circulation of sediments and organic matter, without any physical obstructions	Sediment supply is particularly important for pioneer saltmarsh community, as the distribution of this habitat depends on accretion rates. See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain, or where necessary restore creek and pan structure, subject to natural processes, including erosion and succession	Based on data from SMP (McCorry, 2007; McCorry and Ryle, 2009). Creeks deliver sediment throughout saltmarsh system. Creeks and pan structures well developed at Kileenaran and Tawin Island. See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	This pioneer saltmarsh community requires regular tidal inundation. 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 SMP (McCorry, 2007; McCorry and Ryle, 2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from SMP (McCorry, 2007; McCorry and Ryle, 2009). See coastal habitats supporting document for details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated	Based on data from SMP (McCorry, 2007; McCorry and Ryle, 2009). See coastal habitats supporting document for details
Vegetation composition: typical species and sub-communities	Percentage cover	Maintain the range of species-poor communities with typical species listed in SMP (McCorry and Ryle, 2009)	Based on data from SMP (McCorry, 2007; McCorry and Ryle, 2009). See coastal habitats supporting document for further details
Vegetation structure: negative indicator species - *Spartina anglica*	Hectares	There is currently no common cordgrass (*Spartina anglica*) in this SAC. Prevent establishment of cordgrass	Based on data from SMP (McCorry, 2007; McCorry and Ryle, 2009). See coastal habitats supporting document for further details

1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)

To restore the favourable conservation condition of Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) in Galway Bay Complex 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: Barna House - 2.33ha, Seaweed Point - 1.41ha, Roscam West and South - 3.30ha, Oranmore North - 4.24ha, Kilcaimin - 6.82ha, Tawin Island - 53.85ha, Tyrone House-Dunbulcaun Bay - 9.83ha, Kileenaran - 15.37ha, Kinvara West - 13.33ha, Scanlan's Island - 4.13ha. See map 9	Based on data from Saltmarsh monitoring Project (SMP) (McCorry, 2007; McCorry and Ryle, 2009). Ten sub-sites that supported Atlantic salt meadow were mapped (114.612ha) and additional areas of potential saltmarsh (149.18ha) were identified by an examination of aerial photographs, giving a total estimated area of 263.80ha. 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 9 for known distribution	Based on data from SMP (McCorry, 2007; McCorry and Ryle, 2009). See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/ absence of physical barriers	Maintain/restore natural circulation of sediments and organic matter, without any physical obstructions	See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession	Based on data from SMP (McCorry, 2007; McCorry and Ryle, 2009). The efficiency of sediment circulation throughout a saltmarsh depends on the creek pattern. Creeks and pans are well developed at both Tawin Island and Kileenaran. See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from SMP (McCorry, 2007; McCorry and Ryle, 2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from SMP (McCorry, 2007; McCorry and Ryle, 2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% area outside creeks vegetated	Based on data from SMP (McCorry, 2007; McCorry and Ryle, 2009). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in SMP (McCorry and Ryle, 2009)	Based on data from SMP (McCorry, 2007; McCorry and Ryle, 2009). See coastal habitats supporting document for further details
Vegetation structure: negative indicator species - *Spartina anglica*	Hectares	There is currently no common cordgrass (*Spartina anglica*) in this SAC. Prevent establishment of cordgrass	Based on data from SMP (McCorry, 2007; McCorry and Ryle, 2009). McCorry and Ryle, 2009). See coastal habitats supporting document for further details

1410 Mediterranean salt meadows (Juncetalia maritimi)

To restore the favourable conservation condition of Mediterranean salt meadows (*Juncetalia maritimi*) in Galway Bay Complex 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: Barna House - 0.282ha, Seaweed Point - 0.931ha, Kilcaimin - 0.005ha, Tawin Island - 1.799ha. Tyrone House- Dunbulcan Bay - 8.184ha, Kileenaran - 0.271ha. See map 9	Based on data from the Saltmarsh Monitoring Project (SMP) (McCorry, 2007; McCorry and Ryle, 2009). Six sub-sites that support Mediterranean salt meadow were mapped (11.472ha) and additional areas of potential saltmarsh (8.415ha) were identified from an examination of aerial photographs, giving a total estimated area of 19.887ha. NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 9 for known distribution	See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain/restore natural circulation of sediments and organic matter, without any physical obstructions	See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession	Based on data from the SMP (McCorry, 2007; McCorry and Ryle, 2009). [Site-specific info.]. 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. [Site-specific info.] 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 SMP (McCorry, 2007; McCorry and Ryle, 2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation in the sward	Based on data from SMP (McCorry, 2007; McCorry and Ryle, 2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated	Based on data from SMP (McCorry, 2007; McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in SMP (McCorry and Ryle, 2009)	Based on data from SMP (McCorry, 2007; McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: negative indicator species - *Spartina anglica*	Hectares	There is currently no common cordgrass (*Spartina anglica*) in this SAC. Prevent establishment of cordgrass	Based on data from SMP (McCorry, 2007; McCorry and Ryle, 2009). See coastal habitats supporting document for further details

3180 Turloughs

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

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable at c.59ha or increasing, subject to natural processes. See map 10	Based on measured area of four known turloughs. NB there may be more, as yet unmapped, turloughs within this SAC. See turloughs supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 10	NB there may be more, as yet unmapped, turloughs within this SAC. See turloughs supporting document for further details
Hydrological regime: flood duration, frequency, area, depth; permanently flooded area	Various	Appropriate natural hydrological regimes necessary to support the natural structure and functioning of the habitat	Hydrological regime is sub-divided into more detailed attributes in the turloughs supporting document
Soil type: area	Hectares	Variety, area and extent of soil types necessary to support turlough vegetation and other biota	See turloughs supporting document for further details
Soil nutrient status: nitrogen and phosphorous	N and P concentration in soil	Nutrient status appropriate to soil types	See turloughs supporting document for further details
Physical structure: bare ground	Presence	Sufficient wet bare ground, as appropriate	See turloughs supporting document for further details
Chemical processes: calcium carbonate deposition and concentration	CaCO3 deposition rate/soil concentration	Appropriate CaCO3 deposition rates and concentration in soil	See turloughs supporting document for further details
Water quality: nutrients; colour; phytoplankton; epiphyton	Various	Appropriate water quality to support the natural structure and functioning of the habitat	Water quality is sub-divided into more detailed attributes in the turloughs supporting document
Active peat formation	Flood duration	Active peat formation, where appropriate	See turloughs supporting document for further details
Vegetation composition: area of vegetation communities	Hectares	Maintain area of sensitive and high conservation value vegetation communities/units at each turlough	See turloughs supporting document for further details
Vegetation composition: vegetation zonation	Distribution	Maintain vegetation zonation/mosaic characteristic of each turlough	See turloughs supporting document for further details
Vegetation structure: sward height	Centimetres	Sward heights appropriate to the vegetation unit, and a variety of sward heights across each turlough	See turloughs supporting document for further details
Typical species: terrestrial, wetland and aquatic plants, invertebrates and birds	Presence	Maintain typical species within and across all turloughs	Typical species is sub-divided into more detailed attributes in the turloughs supporting document
Fringing habitats: area	Hectares	Maintain marginal fringing habitats that support turlough vegetation, invertebrate, mammal and/or bird populations	See turloughs supporting document for further details

Vegetation structure: turlough woodland	Species diversity and woodland structure	Maintain appropriate turlough woodland diversity and structure	See turloughs supporting document for further details

5130 Juniperus communis formations on heaths or calcareous grasslands

To restore the favourable conservation condition of *Juniperus communis* formations on heaths or calcareous grasslands in Galway Bay Complex SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Occurrence	Area stable or increasing, subject to natural processes. At least 1.4ha at mapped location. See map 10	Minimum area from one mapped location. Based on site visit in March 2013. Appropriate management might encourage expansion of the area. NB further unsurveyed areas maybe present within the SAC
Habitat distribution	Hectares	No decline. Known location shown on map 10	Distribution based on NPWS site visits in 2002, 2003 and 2013 (internal NPWS files). NB further unsurveyed locations maybe present within the SAC
Juniper population size	Number	At least 50 plants	To classify as a juniper fomation, at least 50 plants should be present (Cooper et al., 2012). A site visit in March 2013 estimated c.130 plants
Formation structure: cover and height	Percentage and metres	Well-developed structure with an open to closed cover of juniper up to or exceeding 0.5 m in height with associated species	Structure currently open with most plants less than 0.5m in height (February 2013)
Formation structure: community diversity and extent	Hectares	Appropriate diversity and extent of formation	Suitable management could lead to expansion of the formation and increased diversity of associated species
Formation structure: cone-bearing plants	Percentage	At least 10% of plants bearing cones	Target based on Cooper et al., 2012. c.23% of plants were fruiting, some prolifically, during a site visit in March 2013
Formation structure: seedling recruitment	Percentage	At least 10% of juniper plants within the formation are seedlings	Target based on Cooper et al., 2012. No seedlings were recorded in February 2013
Formation structure: dead plants	Percentage	Not more than 10% of plants dead	Target based on Cooper et al., 2012. Only a few dead plants observed February 2013
Vegetation composition: typical species	Occurrence	A variety of typical native species with a minimum of 10 species present (excluding negative indicator species)	The area appears to fall into the *Carex flacca-Succisa pratensis* vegetation group as classified by Cooper et al. (2012), who also list positive indicator species. Few of these species have been recorded but a detailed survey has not been undertaken. Lack of suitable management at this site has resulted in a dominance of gorse (*Ulex europaeus*) and purple moorgrass (*Molinia caerulea*)
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control	Gorse (*Ulex europaeus*) and purple moorgrass (*Molinia caerulea*) are currently competing strongly with the juniper. Blackthorn (*Prunus spinosa*) and the non-native cotoneaster (*Cotoneaster integrifolius*) also pose a threat

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

To maintain the favourable conservation condition of Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco Brometalia*) in Galway Bay Complex, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Extent of this habitat in the SAC is currently unknown. Areas are likely to be small and often in mosaic with other habitats such as limestone pavement and scrub (Dwyer et al., 2007; internal NPWS files). Dwyer et al. (2007) surveyed a number of sub-sites in 2006. The Irish semi-natural grasslands survey undertook survey work in Counties Clare and Galway in 2012 and additional information is likely to be available for this SAC following data analysis
Habitat distribution	Occurrence	No decline, subject to natural processes	Full distribution of this habitat in this SAC is currently unknown- see note above
Vegetation composition: broadleaf herb: grass ratio	Percentage	Broadleaf herb component of vegetation between 40 and 90%	Attribute and target based on O'Neill et al. (2010)
Vegetation composition: typical species	Number	At least 7 positive indicator species present, including 2 "high quality" species	List of positive indicator species, including high quality species, identified by O'Neill et al. (2010)
Vegetation composition: negative indicator species	Percentage	Negative indicator species collectively not more than 20% cover, with cover by an individual species not more than 10%. Non-native invasive species, absent or under control	List of negative indicator species identified by O'Neill et al. (2010)
Vegetation structure: sward height	Percentage	30-70% of sward 5-40cm high	Attribute and target based on O'Neill et al. (2010)
Vegetation structure: woody species and bracken (*Pteridium aquilinum*)	Percentage	Cover of bracken (*Pteridium aquilinum*) and woody species (except juniper (*Juniperus communis*)) not more than 5% cover	Attribute and target based on O'Neill et al. (2010)
Physical structure: bare ground	Percentage	Not more than 10% bare ground	Attribute and target based on O'Neill et al. (2010)

7210 Calcareous fens with Cladium mariscus and species of the Caricion davallianae

To maintain the favourable conservation condition of Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* in Galway Bay Complex 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 full extent of this habitat within the SAC is currently unknown. Fen vegetation occurs in wetland areas to the east of Oranmore (Internal NPWS files). It has also been recorded in Ballindereen Lough (see turloughs supporting document for further details). This habitat is found in mosaic with another habitats including the Annex I habitat: Alkaline fens (7230) (Internal NPWS Files). NB further areas of fen are likely to occur within the SAC
Habitat distribution	Occurrence	No decline, subject to natural processes	Full distribution of this habitat in this SAC is currently unknown- see note above
Hydrological regime	Flow rates, metres	Appropriate natural hydrological regime necessary to support the natural structure and functioning of the habitat	Maintenance of groundwater, surface water flows and water table levels within natural ranges is essential for this wetland habitat
Peat formation	Flood duration	Active peat formation, where appropriate	In order for peat to form, water levels need to be slightly below or above the soil surface for c.90% of the time (Jim Ryan, pers. comm.)
Water quality: nutrients	Water chemistry measures	Appropriate water quality to support the natural structure and functioning of the habitat	Fens receive natural levels of nutrients (e.g. iron, magnesium and calcium) from water sources. However, they are generally poor in nitrogen and phosphorus with the latter tending to be the limiting nutrient
Vegetation composition: typical species	Presence	Maintain vegetation cover of typical species including brown mosses and vascular plants	Mosses listed for fen at this site include *Campylium stellatum*, *Fissidens adianthoides* and *Ctenidium molluscum*. Other species recorded include saw sedge (*Cladium mariscus*), black bog rush (*Schoenus nigricans*), purple moor-grass (*Molinia caerulea*), water mint (*Mentha aquatica*), wild angelica (*Angelica sylvestris*) and bogbean (*Menyanthes trifoliata*) (Internal NPWS files)
Vegetation composition: trees and shrubs	Percentage	Cover of scattered native trees and shrubs not more than than 10%	Scrub and trees will tend to invade if fen conditions become drier. Internal NPWS files report scattered multi-stemmed trees over much of the habitat. Attribute and target based on upland habitat conservation assessment criteria (Perrin et al., in prep.)
Physical structure: disturbed bare ground	Percentage	Cover of disturbed bare ground not more than 10%. Where tufa is present, disturbed bare ground not more than 1%	While grazing may be appropriate in this habitat, excessive areas of disturbed bare ground may develop due to unsuitable grazing regimes. Attribute and target based on upland habitat conservation assessment criteria (Perrin et al., in prep.)
Physical structure: drainage	Percentage	Areas showing signs of drainage as a result of drainage ditches or heavy trampling not more than 10%	Attribute and target based on upland habitat conservation assessment criteria (Perrin et al., in prep.)

7230 Alkaline fens

To maintain the favourable conservation condition of Alkaline fens in Galway Bay Complex 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 full extent of this habitat within the SAC is currently unknown. Fen vegetation occurs in wetland areas to the east of Oranmore (Internal NPWS files). It has also been recorded in Ballindereen Lough (see turloughs supporting document for further details). This habitat is found in mosaic with another habitats including the Annex I habitat: Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae (7210). NB further areas of fen are likely to occur within the SAC
Habitat distribution	Occurrence	No decline, subject to natural processes	Full distribution of this habitat in this SAC is currently unknown- see note above
Hydrological regime	Flow rates, metres	Appropriate natural hydrological regime necessary to support the natural structure and functioning of the habitat	Maintenance of groundwater, surface water flows and water table levels within natural ranges is essential for this wetland habitat
Peat formation	Flood duration	Active peat formation, where appropriate	In order for peat to form, water levels need to be slightly below or above the soil surface for c.90% of the time (Jim Ryan, pers. comm.)
Water quality: nutrients	Water chemistry measures	Appropriate water quality to support the natural structure and functioning of the habitat	Fens receive natural levels of nutrients (e.g. iron, magnesium and calcium) from water sources. However, they are generally poor in nitrogen and phosphorus with the latter tending to be tbe limiting nutrient
Vegetation composition: typical species	Presence	Maintain vegetation cover of typical species including brown mosses and vascular plants	Mosses listed for fen at this site include *Campylium stellatum*, *Fissidens adianthoides* and *Ctenidium molluscum*. Other species recorded include black bog rush (*Schoenus nigricans*), purple moor-grass (*Molinia caerulea*), sedge species (*Carex* spp.), water mint (*Mentha aquatica*), butterwort (*Pinguicula* spp.) and ling heather (*Calluna vulgaris*) (Internal NPWS files)
Vegetation composition: trees and shrubs	Percentage	Cover of scattered native trees and shrubs less than 10%	Scrub and trees will tend to invade if fen conditions become drier. Internal NPWS files report scattered multi-stemmed trees over much of the habitat. Attribute and target based on upland habitat conservation assessment criteria (Perrin et al., in prep.)
Physical structure: disturbed bare ground	Percentage	Cover of disturbed bare ground less than 10%. Where tufa is present, disturbed bare ground less than 1%	While grazing may be appropriate in this habitat, excessive area of disturbed bare ground may develop due to unsuitable grazing regimes. Attribute and target based on upland habitat conservation assessment criteria (Perrin et al., in prep.)
Physical structure: drainage	Percentage	Areas showing signs of drainage as a result of drainage ditches or heavy trampling less than 10%	Attribute and target based on upland habitat conservation assessment criteria (Perrin et al., in prep.)

1355 Otter *Lutra lutra*

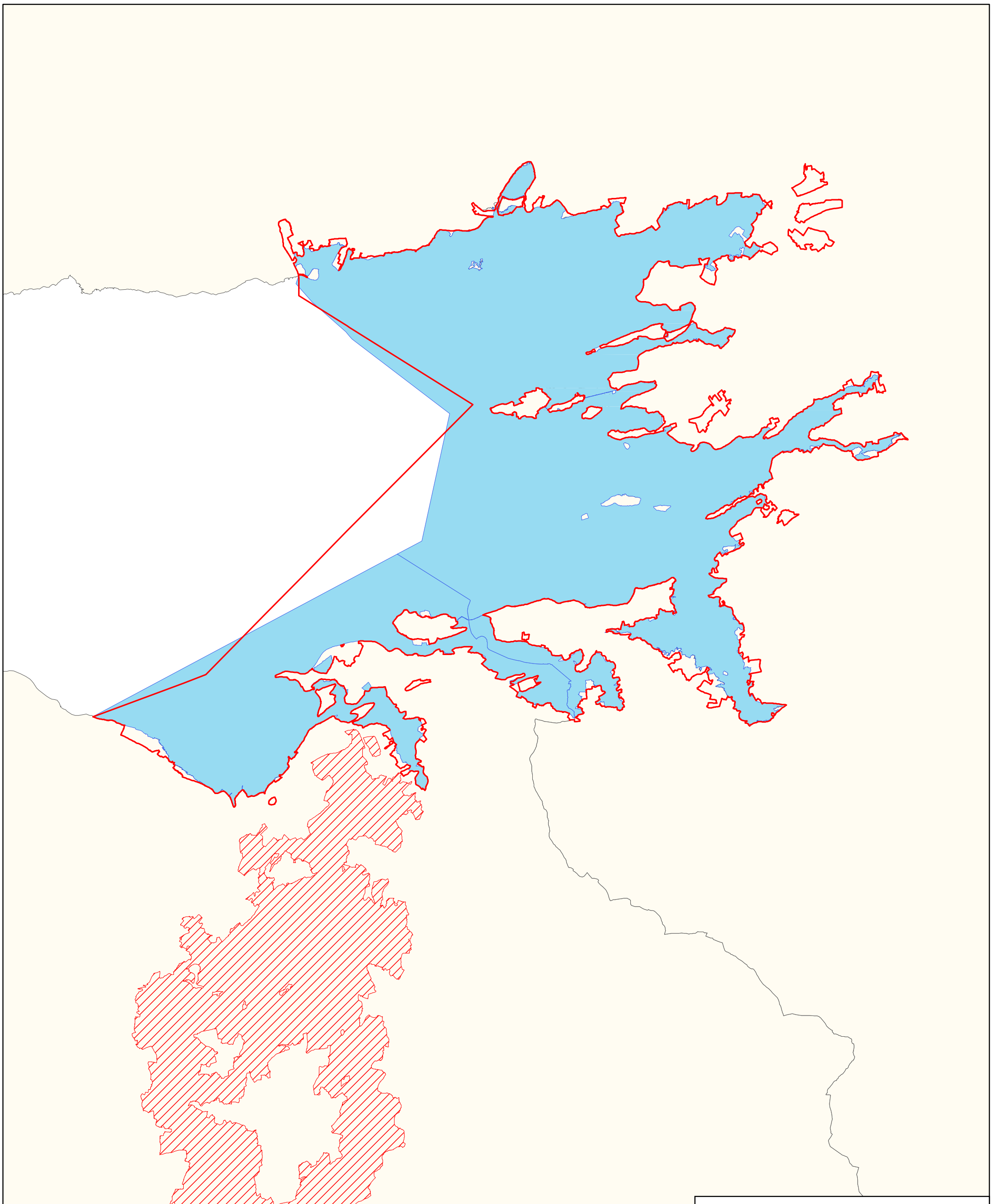
To restore the favourable conservation condition of Otter in Galway Bay Complex SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Percentage positive survey sites	No significant decline	Measure based on standard otter survey technique. FCS target, based on 1980/81 survey findings, is 88% in SACs. Current range in the west is estimated at 70% (Bailey and Rochford, 2006).
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 262ha above high water mark (HWM); 14ha along river banks/around ponds	No field survey. Areas mapped to include 10m terrestrial buffer along shoreline (above HWM and along river banks) identified as critical for otters (NPWS, 2007)
Extent of marine habitat	Hectares	No significant decline. Area mapped and calculated as 2040ha	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 4km	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 21ha	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) and wrasse and rockling in coastal waters (Kingston et al., 1999)
Barriers to connectivity	Number	No significant increase. For guidance, see map 11	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

1365 Harbour seal *Phoca vitulina*

To maintain the favourable conservation condition of Harbour Seal in Galway Bay Complex SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Access to suitable habitat	Number of artificial barriers	Species range within the site should not be restricted by artificial barriers to site use. See map 12	See marine supporting document for further details
Breeding behaviour	Breeding sites	Conserve breeding sites in a natural condition. See map 12	Attribute and target based on background knowledge of Irish breeding populations, review of data summarised by Summers et al. (1980), Warner (1983), Harrington (1990), Doyle (2002), Lyons (2004), and unpublished NPWS records. See marine supporting document for further details
Moulting behaviour	Moult haul-out sites	Conserve moult haul-out sites in a natural condition. See map 12	Attribute and target based on background knowledge of Irish populations, review of data from Doyle (2002), Lyons (2004), Cronin et al. (2004), NPWS (2010, 2011, 2012) and unpublished NPWS records. See marine supporting document for further details
Resting behaviour	Resting haul-out sites	Conserve resting haul-out sites in a natural condition. See map 12	Attribute and target based on background knowledge of Irish populations, review of data from Doyle (2002), Lyons (2004) and unpublished NPWS records. See marine supporting document for further details
Disturbance	Level of impact	Human activities should occur at levels that do not adversely affect the harbour seal population at the site	See marine supporting document for further details



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MAP 2:
GALWAY BAY COMPLEX SAC CONSERVATION OBJECTIVES ADJOINING / OVERLAPPING DESIGNATIONS

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

SITE CODE:
SAC 000054 CO.CLARE; version 1.02
SAC 000268 CO.CLARE; version 1.01, CO.GALWAY; version 1.08
SPA 004031 CO.CLARE; version 1.03, CO.GALWAY; version 1.06

Map Version 1
Date: Nov 2012

Legend

- SAC 000268
- 1140 Mudflats and sandflats not covered by sea water at low tide
- OSi Discovery Series County Boundaries

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MAP 3:
GALWAY BAY COMPLEX SAC
CONSERVATION OBJECTIVES
TIDAL MUDFLATS AND SANDFLATS

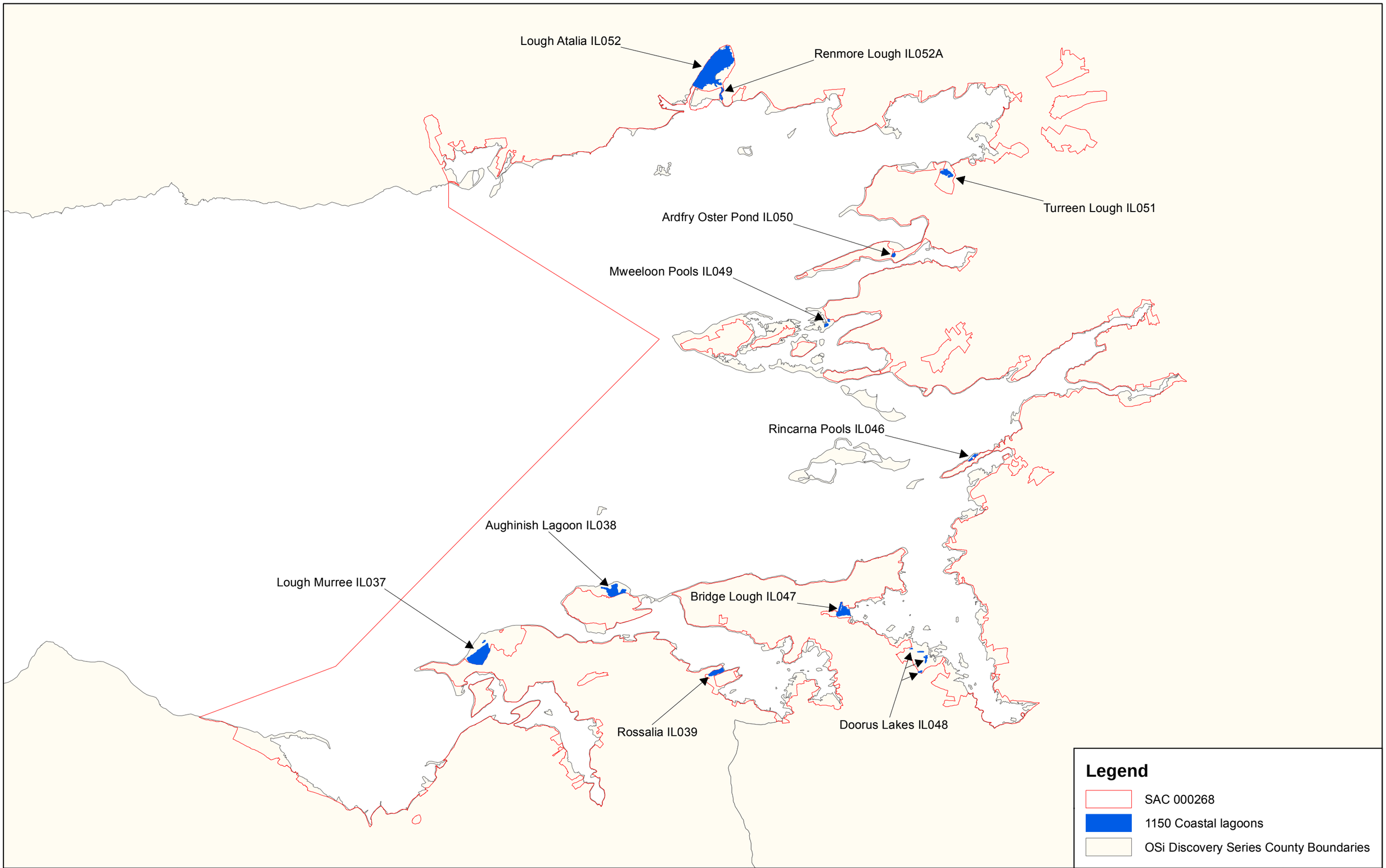
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 000268
CO. CLARE; version 1.1, CO. GALWAY; version 1.08

0 1 2 3 4 5 km

N

Map Version 1
Date: Nov 2012



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MAP 4:
GALWAY BAY COMPLEX SAC
CONSERVATION OBJECTIVES
COASTAL LAGOONS

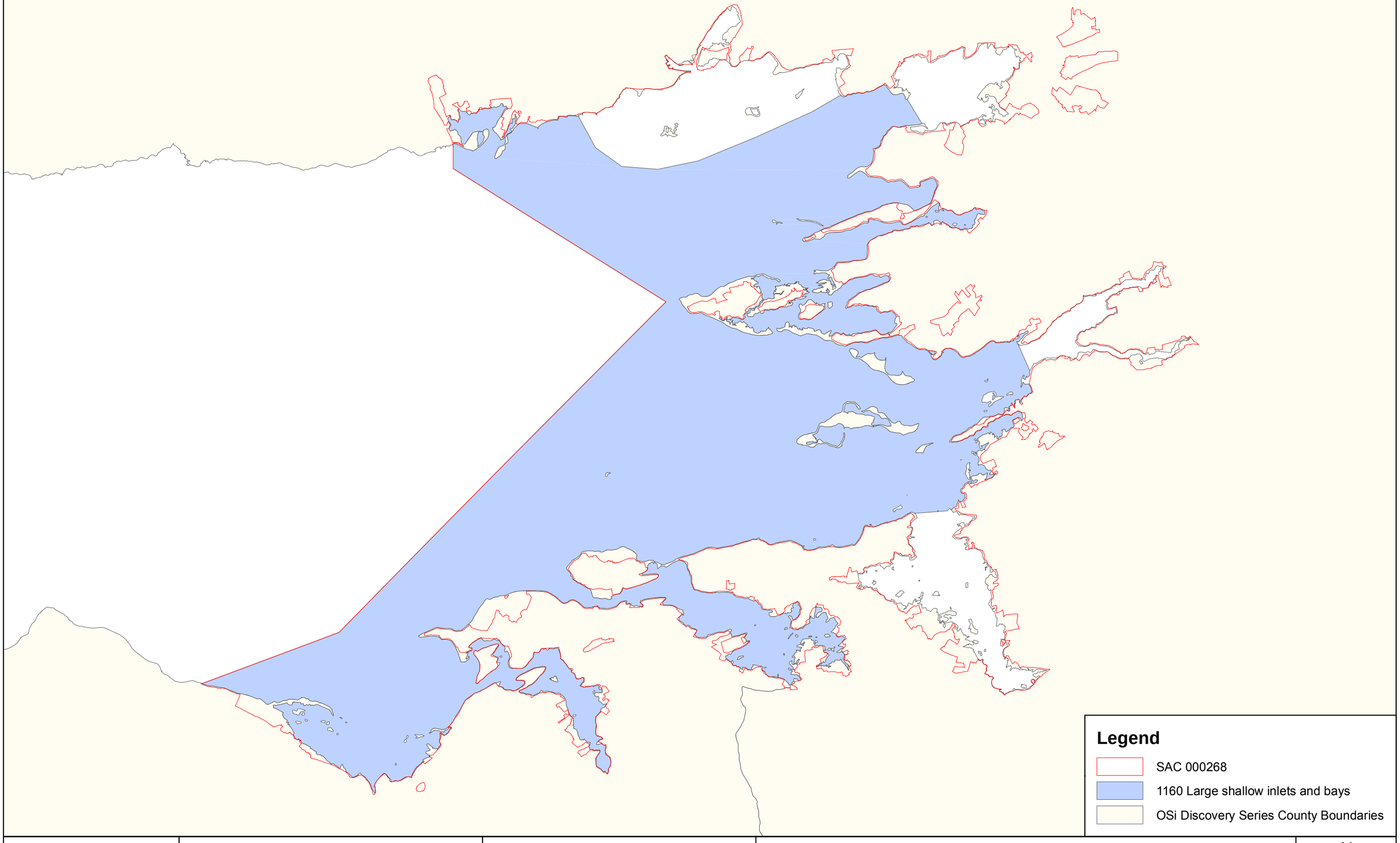
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 000268
CO. CLARE; version 1.1, CO. GALWAY; version 1.08

0 1 2 3 4 5 km

N

Map Version 1
Date: Nov 2012



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MAP 5:
GALWAY BAY COMPLEX SAC
CONSERVATION OBJECTIVES
LARGE SHALLOW INLETS AND BAYS

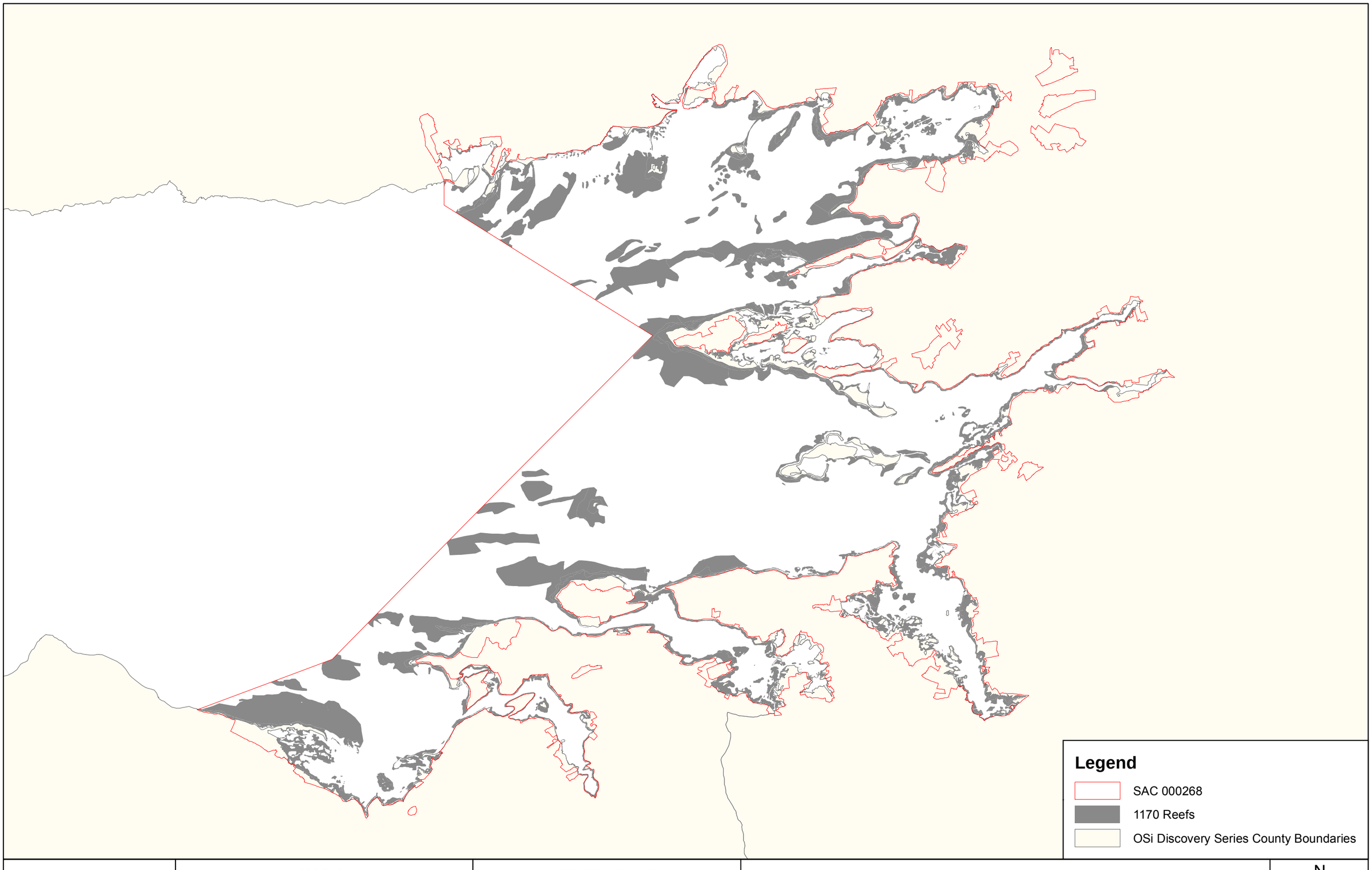
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 000268
CO. CLARE; version 1.1, CO. GALWAY; version 1.08

0 1 2 3 4 5 km

N

Map Version 1
Date: Nov 2012



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

MAP 6:
GALWAY BAY COMPLEX SAC
CONSERVATION OBJECTIVES
REEFS

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

SITE CODE: SAC 000268
CO. CLARE; version 1.1, CO. GALWAY; version 1.08

0 1 2 3 4 5 km

N

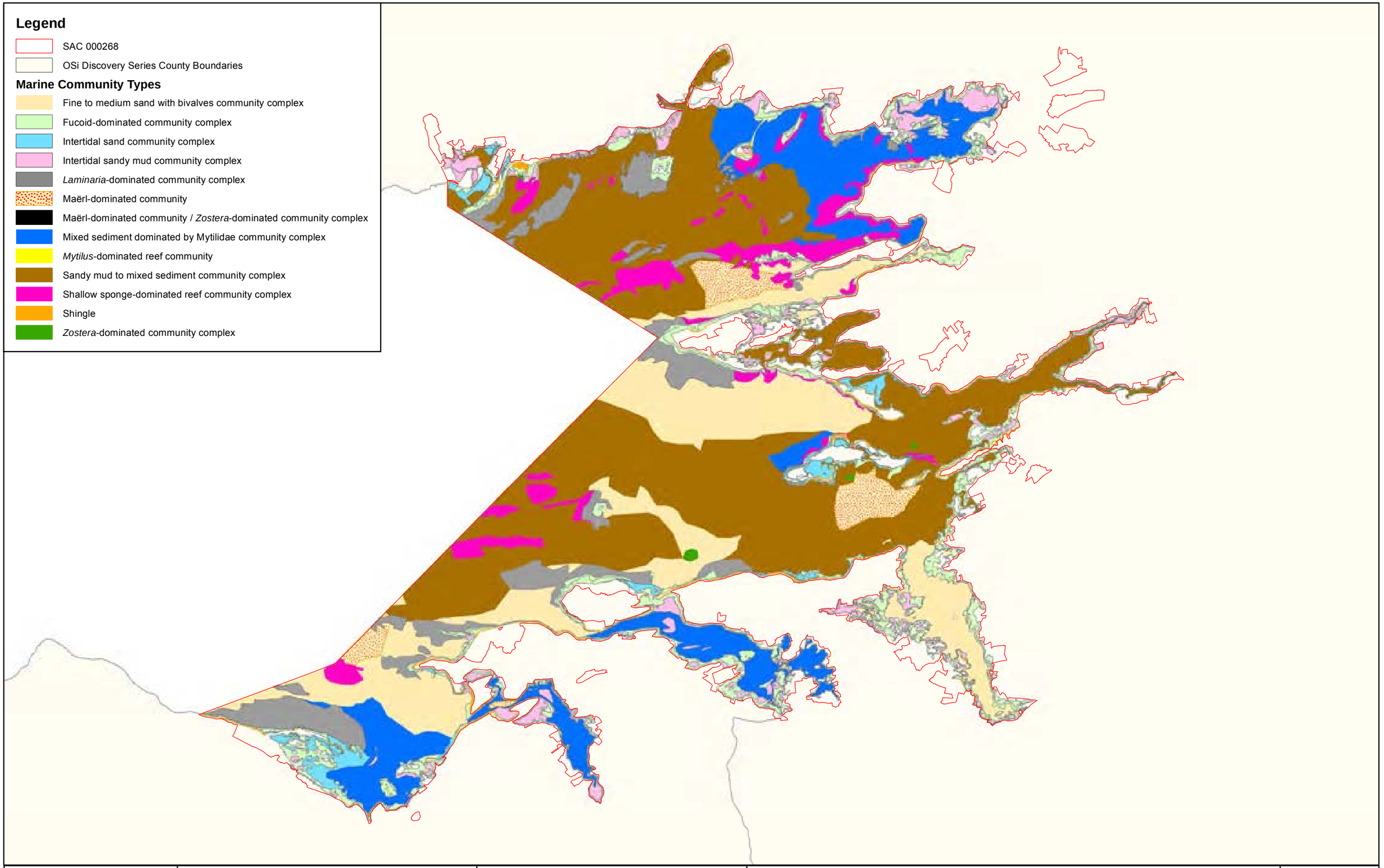
Map Version 1
Date: Nov 2012

Legend

- SAC 000268
- OSi Discovery Series County Boundaries

Marine Community Types

- Fine to medium sand with bivalves community complex
- Fucoid-dominated community complex
- Intertidal sand community complex
- Intertidal sandy mud community complex
- *Laminaria*-dominated community complex
- Maërl-dominated community
- Maërl-dominated community / *Zostera*-dominated community complex
- Mixed sediment dominated by Mytilidae community complex
- *Mytilus*-dominated reef community
- Sandy mud to mixed sediment community complex
- Shallow sponge-dominated reef community complex
- Shingle
- *Zostera*-dominated community complex



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

MAP 7:
GALWAY BAY COMPLEX SAC
CONSERVATION OBJECTIVES
MARINE COMMUNITY TYPES

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

SITE CODE: SAC 000268
CO. CLARE; version 1.1, CO. GALWAY; version 1.08

0 1 2 3 4 5 km

N

Map Version 1
Date: Nov 2012

CMP: 093

Rinville Point

Tawin Point

CMP: 088

Blackhead to Carrickada

Legend

SAC 000268

OSi Discovery Series County Boundaries

CMP: 088 Coastal Monitoring Project Site Codes

Coastal Monitoring Project

1220 Perennial vegetation of stony banks

National Shingle Beach Survey sub-sites

1220 Perennial vegetation of stony banks

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Department of Arts, Heritage and the Gaeltacht

MAP 8:
GALWAY BAY COMPLEX SAC
CONSERVATION OBJECTIVES
PERENNIAL VEGETATION OF STONY BANKS

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

SITE CODE: SAC 000268
CO. CLARE; version 1.1, CO. GALWAY; version 1.08

0 1 2 3 4 5 km

N

Map Version 1
Date: Nov 2012

Rocklands Juniper Formation

Ballinacourty Turlough

Ballinderreen Lough

Ballyvelaghan Lough

Lough Rask

Legend

- SAC 000268
- 3180 Turloughs
- 5130 *Juniperus communis* formations on heaths or calcareous grasslands
- OSi Discovery Series County Boundaries

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

MAP 10:
GALWAY BAY COMPLEX SAC
CONSERVATION OBJECTIVES
TURLOUGHS & JUNIPER FORMATIONS

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

SITE CODE: SAC 000268
CO. CLARE; version 1.1, CO. GALWAY; version 1.08

0 1 2 3 4 5 km

N

Map Version 1
Date: Nov 2012

Legend

SAC 000268

OSi Discovery Series County Boundaries

1355 Otter -*Lutra lutra*

Otter Commuting 250m HWM buffer

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Department of
Arts, Heritage and the Gaeltacht

MAP 11:
GALWAY BAY COMPLEX SAC
CONSERVATION OBJECTIVES
OTTER

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

SITE CODE: SAC 000268
CO. CLARE; version 1.1, CO. GALWAY; version 1.08

0 1 2 3 4 5 km

N

Map Version 1
Date: Nov 2012

Legend

- SAC 000268
- 1365 Harbour Seal - *Phoca vitulina* breeding sites
- 1365 Harbour Seal - *Phoca vitulina* moulting sites
- 1365 Harbour Seal - *Phoca vitulina* resting sites
- 1365 Harbour Seal - *Phoca vitulina* habitat
- OSi Discovery Series County Boundaries

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

MAP 12:
GALWAY BAY COMPLEX SAC
CONSERVATION OBJECTIVES
HARBOUR SEAL

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

SITE CODE: SAC 000268
CO. CLARE; version 1.1, CO. GALWAY; version 1.08

0 1 2 3 4 5 km

N

Map Version 1
Date: Nov 2012

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Kiltartan Cave (Coole) SAC 000286

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

90 King Street North, Dublin 7, D07 N7CV, Ireland.

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

Citation:

NPWS (2018) Conservation Objectives: Kiltartan Cave (Coole) SAC 000286. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.

Series Editor: Rebecca Jeffrey
ISSN 2009-4086

Introduction

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

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

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

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

Favourable conservation status of a habitat is achieved when:

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

The favourable conservation status of a species is achieved when:

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

Notes/Guidelines:

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

Qualifying Interests

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

000286	Kiltartan Cave (Coole) SAC
1303	Lesser Horseshoe Bat *Rhinolophus hipposideros*
8310	Caves not open to the public

Supporting documents, relevant reports & publications

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

NPWS Documents

Year :	2018
Title :	Conservation objectives supporting document – lesser horseshoe bat (*Rhinolophus hipposideros*)
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	2007
Title :	Protecting and managing underground sites for bats
Author :	Mitchell-Jones, A.J.; Bihari, Z.; Masing, M.; Rodrigues, L.
Series :	EUROBATS Publication Series No. 2
Year :	2008
Title :	The lesser horseshoe bat conservation handbook
Author :	Schofield, H.W.
Series :	The Vincent Wildlife Trust
Year :	2009
Title :	Importance of night roosts for bat conservation: roosting behaviour of the lesser horseshoe bat *Rhinolophus hipposideros*
Author :	Knight, T.; Jones, G.
Series :	Endangered Species Research, 8: 79-86

Spatial data sources

Year :	2018
Title :	NPWS lesser horseshoe bat database
GIS Operations :	Roost identified, clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1303 (map 2)
Year :	2007
Title :	Forest Inventory and Planning System (FIPS)
GIS Operations :	Dataset clipped to 2.5km buffer centred on roost location
Used For :	1303 (map 2)

Conservation Objectives for : Kiltartan Cave (Coole) SAC [000286]

8310 **Caves not open to the public**

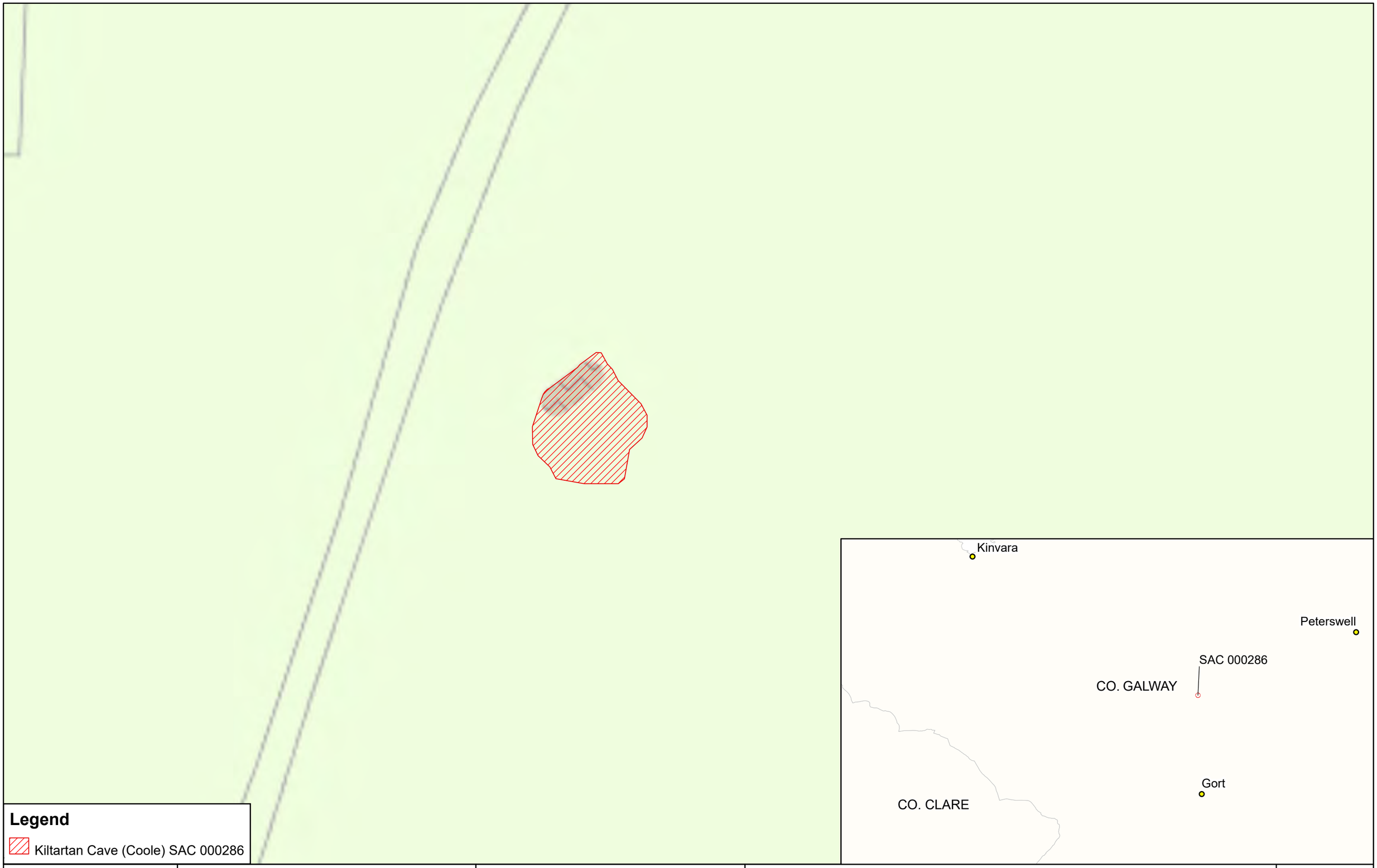
Caves not open to the public (8310) is integrally linked to lesser horseshoe bat (*Rhinolophus hipposideros*) (1303) as part of the habitat for the species; therefore, a separate conservation objective has not been set for the habitat in Kiltartan Cave (Coole) SAC. See map 2. See the conservation objectives supporting document for lesser horseshoe bat (NPWS, 2018) for further details

Attribute	Measure	Target	Notes

1303 Lesser Horseshoe Bat *Rhinolophus hipposideros*

To maintain the favourable conservation condition of Lesser Horseshoe Bat in Kiltartan Cave (Coole) SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population per roost	Number	Minimum number of 20 bats for the winter roost (roost id. 219 in NPWS database). See map 2	A figure of 100 bats for summer roosts and 50 bats for winter roosts was set as a minimum qualifying standard (MQS) when SACs were being selected for lesser horseshoe bat (*Rhinolophus hipposideros*). Where roosts fall below this figure, the MQS is generally used as the target figure. This site, however, is subject to regular natural flooding which on occasion leads to significant bat mortality. In addition, the site appears to be linked to the nearby Garryland roost. On this basis, a lower target figure (20 bats) is considered justified for the winter roost (roost id. 219 in NPWS database) in Kiltartan Cave (Coole) SAC. See the conservation objectives supporting document for lesser horseshoe bat (NPWS, 2018) for further information on all attributes and targets
Winter roosts	Condition	No decline	Kiltartan Cave (Coole) SAC has been selected for lesser horseshoe bat because of the presence of one internationally important winter roost (roost id. 219 in NPWS database). Damage or disturbance to the roost or to the habitat immediately surrounding it will lead to a decline in its condition (Mitchell-Jones et al., 2007)
Auxiliary roosts	Number and condition	No decline	Lesser horseshoe bat populations will use a variety of roosts during the year besides the main summer maternity and winter hibernation roosts. Such additional roosts within the SAC may be important as night roosts, satellite roosts, etc. Night roosts are also considered an integral part of core foraging areas and require protection (Knight and Jones, 2009). In addition, in response to weather conditions for example, bats may use different seasonal roosts from year to year; this is particularly noticeable in winter. A database of all known lesser horseshoe bat roosts is available on the National Biodiversity Data Centre website. NB further unrecorded roosts may also be present within this SAC
Extent of potential foraging habitat	Hectares	No significant decline within 2.5km of qualifying roost	Lesser horseshoe bats normally forage in woodlands/scrub within 2.5km of their roosts (Schofield, 2008). See map 2 which shows a 2.5km zone around the above roost and identifies potential foraging grounds
Linear features	Kilometres	No significant loss within 2.5km of qualifying roost. See map 2	This species follows commuting routes from its roost to its foraging grounds. Lesser horseshoe bats will not cross open ground. Consequently, linear features such as hedgerows, treelines and stone walls provide vital connectivity for this species within 2.5km around each roost (Schofield, 2008)
Light pollution	Lux	No significant increase in artificial light intensity adjacent to named roost or along commuting routes within 2.5km of the roost. See map 2	Lesser horseshoe bats are very sensitive to light pollution and will avoid brightly lit areas. Inappropriate lighting around roosts may cause abandonment; lighting along commuting routes may cause preferred foraging areas to be abandoned, thus increasing energetic costs for bats (Schofield, 2008)



Legend

Kiltartan Cave (Coole) SAC 000286

An Roinn Cultúir, Oidhreachta agus Gaeltachta
Department of Culture, Heritage and the Gaeltacht

MAP 1:
KILTARTAN CAVE (COOLE) SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

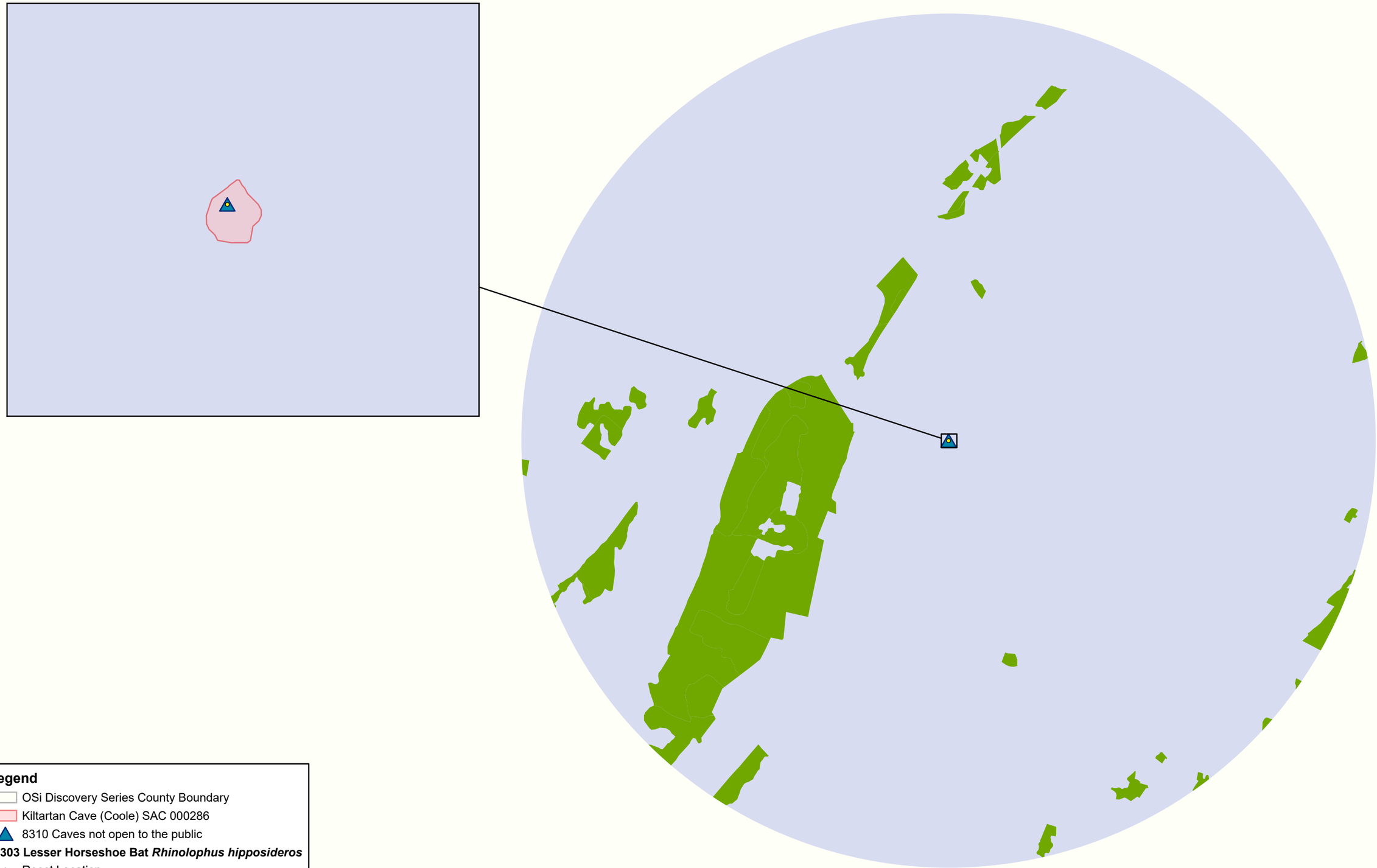
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000286; version 3.0. CO. GALWAY

0 4 8 12 16 Meters

N

Map Version 1
Date: Oct 2018



An Roinn Cultúir, Oidhreachta agus Gaeltachta
Department of Culture, Heritage and the Gaeltacht

MAP 2:
KILTARTAN CAVE (COOLE) SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

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

SITE CODE:
SAC 000286; version 3.0. CO. GALWAY

0 0.25 0.5 0.75 1 Kilometers

N

Map Version 1
Date: Oct 2018

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Inner Galway Bay SPA 004031

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

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

7 Ely Place, Dublin 2, Ireland.

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

Citation:

NPWS (2013) Conservation Objectives: Inner Galway Bay SPA 004031. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

Series Editor: Rebecca Jeffrey
ISSN 2009-4086

Introduction

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

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- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Notes/Guidelines:

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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***

004031	Inner Galway Bay SPA
A003	Great Northern Diver *Gavia immer*
A017	Cormorant *Phalacrocorax carbo*
A028	Grey Heron *Ardea cinerea*
A046	Brent Goose *Branta bernicla hrota*
A050	Wigeon *Anas penelope*
A052	Teal *Anas crecca*
A056	Shoveler *Anas clypeata*
A069	Red-breasted Merganser *Mergus serrator*
A137	Ringed Plover *Charadrius hiaticula*
A140	Golden Plover *Pluvialis apricaria*
A142	Lapwing *Vanellus vanellus*
A149	Dunlin *Calidris alpina alpina*
A157	Bar-tailed Godwit *Limosa lapponica*
A160	Curlew *Numenius arquata*
A162	Redshank *Tringa totanus*
A169	Turnstone *Arenaria interpres*
A179	Black-headed Gull *Chroicocephalus ridibundus*
A182	Common Gull *Larus canus*
A191	Sandwich Tern *Sterna sandvicensis*
A193	Common Tern *Sterna hirundo*
A999	Wetlands

Please note that this SPA overlaps with Galway Bay Complex SAC (000268). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping site as appropriate.

Supporting documents, relevant reports & publications

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

Year :	1985
Title :	The birds of the Western Palaearctic- Volume IV
Author :	Cramp, S.
Series :	Oxford University Press, Oxford
Year :	1995
Title :	Seabird monitoring handbook for Britain and Ireland: a compilation of methods for survey and monitoring of breeding seabirds.
Author :	Walsh, P.; Halley, D.J.; Harris, M.P.; del Nevo, A.; Sim, I.M.W.; Tasker, M.L.
Series :	JNCC, Peterborough
Year :	1996
Title :	Handbook of birds of the world volume 3: hoatzin to auks
Author :	del Hoyo, J; Elliott, A.; Sargatal, J.
Series :	Lynx Edicions, Barcelona
Year :	1997
Title :	The status and distribution of breeding sandwich, roseate, common, arctic and little terns in Ireland in 1995
Author :	Hannon, C.; Berrow, S.D.; Newton, S.F.
Series :	Irish Birds, 6(1): 1-22
Year :	2004
Title :	Seabird Populations of Britain and Ireland
Author :	Mitchell, P.I.; Newton, S.F.; Ratcliffe, N.; Dunn, T.E.
Series :	Poyser, London
Year :	2013
Title :	Seabird Monitoring Programme (SMP) Database
Author :	JNCC
Series :	http://jncc.defra.gov.uk/smp/Default.aspx
Year :	2013
Title :	BirdLife International Seabird Ecology and Foraging Range Database
Author :	BirdLife International
Series :	http://seabird.wikispaces.com
Year :	2013
Title :	Inner Galway Bay SPA (site code 4031) Conservation objectives supporting document V1
Author :	NPWS
Series :	Unpublished report to NPWS

A003 Great Northern Diver *Gavia immer*

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

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by great northern diver, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A017 Cormorant *Phalacrocorax carbo*

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

Attribute	Measure	Target	Notes
Breeding population abundance: apparently occupied nests (AONs)	Number	No significant decline	This attribute applies to breeding cormorant. Measure based on standard survey methods (see Walsh et al., 1995). The Seabird Monitoring Programme (SMP) online database (JNCC, 2013) provides population data for this species. A recent survey of Deer Island (conducted in 2010) estimated 128 AONs at this colony, which represents an approximate decline of 38% since 1985
Productivity rate	Mean number	No significant decline	This attribute applies to breeding cormorant. Measure based on standard survey methods (see Walsh et al., 1995). The Seabird Monitoring Programme (SMP) online database (JNCC, 2013) provides population data for this species
Distribution: breeding colonies	Number; location; area (hectares)	No significant decline	This attribute applies to breeding cormorant. Cormorant colonies are usually sited on flat or rocky islets or sea stack tops, less often on cliffs (Walsh et al., 1995). Deer Island is a traditional breeding colony in this SPA
Prey biomass available	Kilogrammes	No significant decline	This attribute applies to breeding cormorant. Key prey items: fish (mostly benthic), some crustaceans. Key habitats: cormorants use sandy areas as well as rocky and vegetated substrates. Foraging range: max. 50km, mean max. 31.67km, mean 8.46km (BirdLife International Seabird Database (Birdlife International, 2013))
Barriers to connectivity	Number; location; shape; area (hectares)	No significant increase	This attribute applies to breeding cormorant. Seabird species make extensive use of the marine waters adjacent to their breeding colonies. Foraging range: max. 50km, mean max. 31.67km, mean 8.46km (BirdLife International Seabird Database (Birdlife International, 2013))
Disturbance at breeding site	Level of impact	Human activities should occur at levels that do not adversely affect the breeding cormorant population	This attribute applies to breeding cormorant. Cormorant colonies are usually sited on flat or rocky islets or sea stack tops, less often on cliffs (Walsh et al., 1995). Deer Island is a traditional breeding site
Population trend	Percentage change	Long term population trend stable or increasing	This attribute applies to non-breeding cormorant. Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	No significant decrease in the numbers or range of areas used by cormorant, other than that occurring from natural patterns of variation	This attribute applies to non-breeding cormorant. Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A028 Grey Heron *Ardea cinerea*

To maintain the favourable conservation condition of Grey Heron in Inner Galway Bay SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	No significant decrease in the range, timing and intensity of use of areas used by grey heron, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A046 Brent Goose *Branta bernicla hrota*

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

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	No significant decrease in the range, timing and intensity of use of areas by light-bellied brent goose, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A050 Wigeon *Anas penelope*

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

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number, range, timing and intensity of areas used by waterbirds	No significant decrease in the range, timing or intensity of use of areas by wigeon, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A052 Teal *Anas crecca*

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

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	No significant decrease in the range, timing or intensity of use of areas by teal, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A056 Shoveler *Anas clypeata*

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

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	No significant decrease in the range, timing or intensity of use of areas by shoveler, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A069 Red-breasted Merganser *Mergus serrator*

To maintain the favourable conservation condition of Red-breasted Merganser in Inner Galway Bay SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	No significant decrease in the range, timing and intensity of use of areas by red-breasted merganser, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A137 Ringed Plover *Charadrius hiaticula*

To maintain the favourable conservation condition of Ringed Plover in Inner Galway Bay SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	No significant decrease in the range, timing or intensity of use of areas by ringed plover, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of conservation objectives supporting document

A140 Golden Plover *Pluvialis apricaria*

To maintain the favourable conservation condition of Golden Plover in Inner Galway Bay SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trends are presented in part four of theconservation objectives supporting document
Distribution	Number, range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by golden plover, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A142 Lapwing *Vanellus vanellus*

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

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Number, range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by lapwing, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives

A149 Dunlin *Calidris alpina alpina*

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

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Number, range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by dunlin, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A157 Bar-tailed Godwit *Limosa lapponica*

To maintain the favourable conservation condition of Bar-tailed Godwit in Inner Galway Bay SPA, which is defined by the following list of attributes and targets:

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

A160 Curlew *Numenius arquata*

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

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

A162 Redshank *Tringa totanus*

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

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

A169 Turnstone *Arenaria interpres*

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

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

A179 Black-headed Gull *Chroicocephalus ridibundus*

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

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

A182 Common Gull *Larus canus*

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

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Population trends are presented in part four of the conservation objectives supporting document
Distribution	Number and range of areas used by waterbirds	No significant decrease in the range,timing or intensity of use of areas by the common gull, other than that occurring from natural patterns of variation	Waterbird distribution from the 2009/2010 waterbird survey programme is discussed in part five of the conservation objectives supporting document

A191 Sandwich Tern *Sterna sandvicensis*

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

Attribute	Measure	Target	Notes
Breeding population abundance: apparently occupied nests (AONs)	Number	No significant decline	Measure based on standard tern survey methods (see Walsh et al., 1995). Hannon et al. (1997) and Mitchell et al. (2004) provide summary population information. The Seabird Monitoring Programme (SMP) online database (JNCC, 2013) provides population data for this species
Productivity rate: fledged young per breeding pair	Mean number	No significant decline	Measure based on standard tern survey methods (see Walsh et al., 1995). The Seabird Monitoring Programme (SMP) online database (JNCC, 2013) provides population data for this species
Distribution: breeding colonies	Number; location; area (Hectares)	No significant decline	Typical sandwich tern breeding sites are located on low-lying offshore islands or islets in bays or brackish lagoons on spits or remote mainland dunes (Cramp, 1985). Wide fluctuations between years in both breeding numbers and colony locations are known to occur for this species (Mitchell et al., 2004)
Prey biomass available	Kilogrammes	No significant decline	Key prey items: Mostly energy-rich fish, some crustaceans and occasionally insects and rag worms. Key habitats: sandwich tern forage in/over shallow marine waters such as bays, inlets and outflows, gullies, shoals, inshore waters, reefs, and sandbanks; also more open waters nearshore and offshore, including open sea. Foraging range: max. 70km, mean max. 42.3km, mean 14.7km (BirdLife International Seabird Database (Birdlife International, 2013))
Barriers to connectivity	Number; location; shape; area (hectares)	No significant increase	Seabird species can make extensive use of the marine waters adjacent to their breeding colonies. Foraging range: Max 70km, mean max 42.3km, mean 14.7km (Birdlife International Seabird Database (Birdlife International, 2013))
Disturbance at breeding site	Level of impact	Human activities should occur at levels that do not adversely affect the breeding sandwich tern population	Typical sandwich tern breeding sites are located on low-lying offshore islands or islets in bays or brackish bagoons on spits or remote mainland dunes (Cramp, 1985)

A193 Common Tern *Sterna hirundo*

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

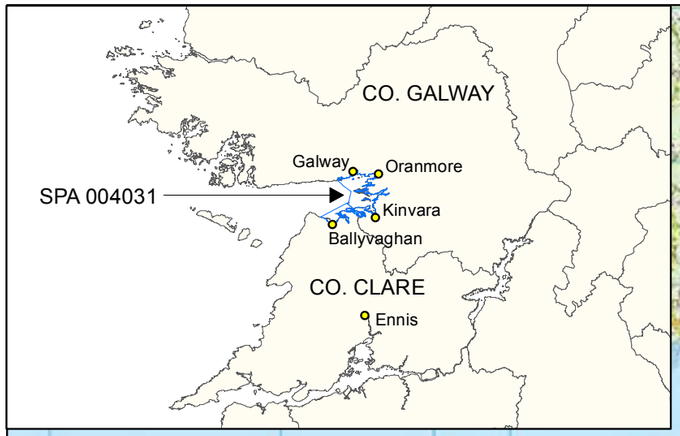
Attribute	Measure	Target	Notes
Breeding population abundance: apparently occupied nests (AONs)	Number	No significant decline	Measure based on standard tern survey methods (see Walsh et al., 1995). Hannon et al. (1997) and Mitchell et al. (2004) provide summary population information. The Seabird Monitoring Programme (SMP) (JNCC, 2013) provides population data for this species
Productivity rate: fledged young per breeding pair	Mean number	No significant decline	Measure based on standard tern survey methods (see Walsh et al., 1995). The Seabird Monitoring Programme (SMP) (JNCC, 2013) provides population data for this species
Distribution: breeding colonies	Number; location; area (Hectares)	No significant decline	Common tern breeding colonies can be sited in both coastal and inland areas using a wide variety of habitats including sandy, rocky or well-vegetated islands in estuaries, lakes and rivers. This species can also use man-made subtrates (Del Hoyo et al., 1996)
Prey biomass available	Kilogrammes	No significant decline	Key prey items: Small fish, crustaceans, insects and occasionally squid. Key habitats: common tern forage in/over shallow coastal waters, bays, inlets, shoals, tidal-rips, drift lines, beaches, saltmarsh creeks, lakes, ponds, or rivers. Foraging range: max. 37km, mean max. 33.81km, mean 8.67km (BirdLife International Seabird Database (Birdlife International, 2013))
Barriers to connectivity	Number; location; shape; area (hectares)	No significant increase	Seabird species can make extensive use of marine waters adjacent to their breeding colonies. Foraging range: max. 37km, mean max. 33.81km, mean 8.67km (BirdLife International Seabird Database (Birdlife International, 2013))
Disturbance at breeding site	Level of impact	Human activities should occur at levels that do not adversely affect the breeding little tern population	Breeding colonies can be sited in both coastal and inland areas using a wide variety of habitats including sandy, rocky or well vegetated islands in estuaries, lakes and rivers. This species can also use man-made subtrates (Del Hoyo et al., 1996)

Conservation Objectives for : Inner Galway Bay SPA [004031]

A999 Wetlands

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

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 13,267ha, other than that occurring from natural patterns of variation	The wetland habitat area was estimated as 13,267ha using OSi data and relevant orthophotographs. For further information see part three of the conservation objectives supporting document



Legend

SPA 004031

MAP 1:
INNER GALWAY BAY SPA
CONSERVATION OBJECTIVES
SPA DESIGNATION

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

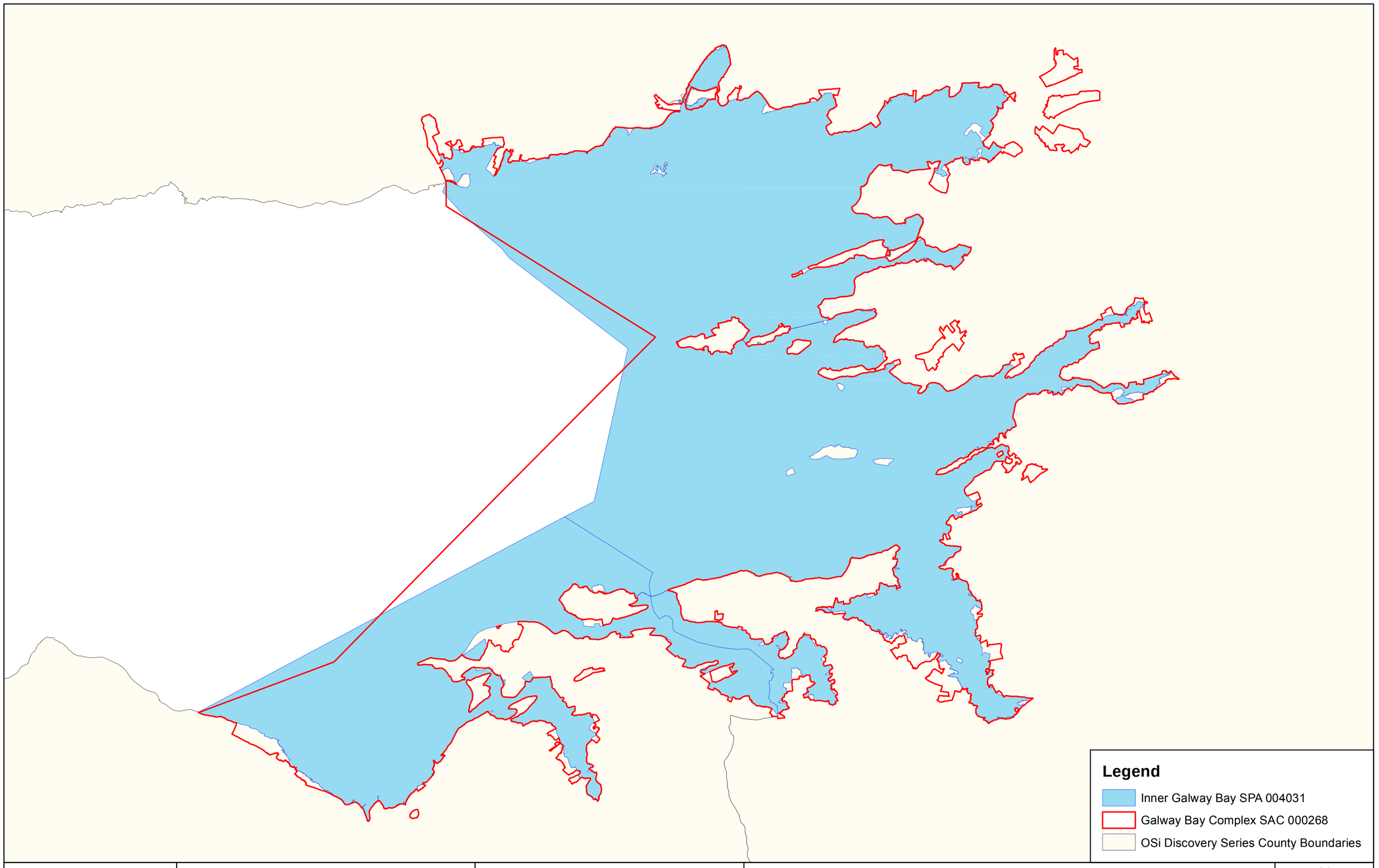
An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

SITE CODE: SPA 004031
CO. CLARE; version 1.03, CO. GALWAY; version 1.06

0 1 2 3 4 5 km

N

Map Version 1
Date: Nov 2012



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

MAP 2:
INNER GALWAY BAY SPA
CONSERVATION OBJECTIVES
ADJOINING / OVERLAPPING DESIGNATIONS

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

SITE CODE: SPA 004031
CO. CLARE; version 1.03, CO. GALWAY; version 1.06
SAC 000268 CO.CLARE; version 1.01, CO.GALWAY; version 1.08

0 1 2 3 4 5 km

N

Map Version 1
Date: Nov 2012

Conservation objectives for Coole-Garryland SPA [004107]

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
A038	Whooper Swan	*Cygnus cygnus*

Citation: *NPWS (2018) Conservation objectives for Coole-Garryland SPA [004107]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

Appendix B

Nutrient Sensitive Qualifying Interests

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

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

Appendix C

EAM Summary Report for 170. Gort WSZ

Irish Water

Lead in Drinking Water Mitigation Plan - EAM

Gort EAM

Issue 5 | 19 January 2022

Job number 257367

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Document Verification

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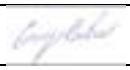
		Signature			
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Contents

1 Introduction

This document presents the results of the implementation of the Lead Mitigation Environmental Assessment Methodology (EAM) to assess the impact of dosing Gort Water Supply 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 Graphic 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 5th January 2022.
- Data relating to rainfall and catchment areas from the OPW Flood Studies Update (FSU) Portal.
- GIS data river segment data providing river flows from the EPA “hydrotool data”.
- Gauge data providing river flows from the EPA web-based HydroNet.

2 Abbreviations & Glossary

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

3 Gort Water Supply Zone

Gort Water Supply Zone (WSZ) (1200PUB1022) is located in County Galway and is fed by Gort Water Treatment Plant (WTP). Raw water source is abstracted from the Cannahowna River (90%) and blended on site (in a balancing tank) with groundwater abstracted from a borehole (10%). The Draft Plumbosolvency Control Plan for the Water Supply Zone (WSZ) proposes universal dosing of Orthophosphate takes places at Gort WTP. Figure 1, at the end of this report, shows the location of the area proposed to receive Orthophosphate dosed water.

The average flows from the WTP is 1200 m^3/day. Approximately 62% of the flow is accounted for, and this fixed rate for water mains leakage (38%) is assumed in the WSZ. Gort town is serviced by Gort Waste Water Treatment Plant (WWTP) agglomeration. There are an estimated 62 properties across the WSZ that are serviced by Domestic Wastewater Treatment Systems (DWWTS).

Water Supply Zone	Gort (1200PUB1022)
Step 1 – Appropriate Assessment Screening	*To be completed by Ryan Hanley*
Model Assumptions	All concentration and loading units for orthophosphate (PO_4-P) are expressed as mg/l P and kg P/yr. Adopted Orthophosphate Optimum Dosing Concentration is 1.0 mg/l P. Unaccounted for water from the mains is 38%. Seepage from the mains is distributed evenly across the entire length of the WSZ network. The water consumption per person has been assigned as 125 litres per day in order to calculate the direct discharges to surface water with 2.7 people per household. The water discharge per person is assigned as 105 litres per day for the discharge to DWWTS with 2.7 persons per household. Conversion factor for Total Phosphorus (TP) to Orthophosphate (P) for WWTP effluent is 0.5. 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. Where existing monitoring data is not available a surrogate status is derived from the Orthophosphate indicative quality of RWB in the following hierarchy: • Upstream water bodies

Water Supply Zone	Gort (1200PUB1022)
	• Downstream waterbodies • Adjacent waterbodies of similar hydrological settings • ecological status of the RWB. The mid-point of that surrogate indicative quality range is used as baseline concentration.
Step 2 & 3 – Impact on Waste Water Treatment Plant (WWTP) Effluent Concentrations and receiving WBs	This section assesses the influent and effluent P loads and resultant 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. The treatment level and PE of the WWTP within the agglomeration is as follows; Gort – Secondary treatment PE 3,702 A sensitivity analysis was carried out on the conversion between Orthophosphate and Total Phosphorus at three factors; 0.4, 0.5 and 0.68. The results of the assessment are presented in Table 1.
Step 4 - Subsurface pathways	The loading from mains leakage is 460 m^3/d (168kg/yr P). Approximately 153 kg/yr P of the load is attenuated along the flowpaths. The hydraulic loading from the DWWTS is 18 m^3/d (6.42 kg/yr P). Approximately 6.39 kg/yr P of the load is attenuated along the flowpaths. Cutra (station 29071) flow monitoring gauge is available within the assessment area and used to estimate the flow for the Cannahowna_010 subbasin. For the remaining receiving waterbodies, the river flows are established from Hydrotool data or, if that is not available, using the using the Area-Standard-period Average Annual Rainfall (SAAR) method. Baseline Orthophosphate monitoring data and associated thresholds are available for Cannahowna_010 RWB . There is no monitoring data available for Boleyneendorrish_030, a surrogate status is derived from the Orthophosphate indicative quality of adjacent RWBs. The mid-range of that surrogate status is used as baseline concentration. Kilchreest baseline concentration is based on water quality data from the Poldeelin Spring which is located within the sub-basin The potential impact on the SAC Caherglassaun turloughs within the Kilchreest_010 river water body was assessed by delineating a sub-catchment to these from the main Kilchreest waterbody. The water quality threshold adopted for the waterbody is 0.01mg/l, from which the 75% threshold (0.0075mg/l) is applied. The results

Water Supply Zone	Gort (1200PUB1022)
	for the turloughs is presented in Table 2 and demonstrates there is no deterioration in status. Orthophosphate drinking water dosing does not lead to a deterioration in RWB status from subsurface and near surface pathways.
Step 5 and 6 - Combined Impact from direct and diffuse sources on River Waterbodies (RWB)	This section assesses the combined impact as a result of increased Orthophosphate load from WWTP discharges (Steps 2 & 3), seepage from mains and DWWTS and cumulative impacts from other drinking water dosing areas on River Waterbodies (RWBs). The increase in Orthophosphate concentrations in the RWBs as a result of the P drinking water dosing is shown in Table 2. Figure 2 illustrates the scale of Orthophosphate loading to the receiving waterbodies from direct discharges from WWTP and SWOs, mains leakage, DWWTS and direct discharges from WWTP and SWOs. This illustrates that a significant proportion of the loads come from primary discharges from WWTP and mains seepage through the subsurface pathway. 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, primary WWTP discharges account for the largest proportion of load and that there is a large proportion of the mains leakage is attenuated. Direct discharge from WWTP is combined with diffuse discharge at the Cannahowna_010 water body and tracked downstream from that point. The Orthophosphate concentrations in the RWBs following drinking water dosing are presented in Table 2. 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.
Step 5 and 6 - Combined Impact through subsurface and surface pathways on Groundwater Waterbodies (GWB)	The increase in Orthophosphate concentrations in the Groundwater Waterbody (GWB) as a result of the P drinking water dosing is shown in Table 3. Monitoring data is available for the groundwater body. The increase in concentration as a result of the drinking water dosing with Orthophosphate does not cause a deterioration in the status of GWB.
Step 5 and 6 - Combined Impact from direct and diffuse sources on Lakes (LWB) within	Two Lake Waterbodies (LWB) were identified in the vicinity of the dosing area. Since both Lakes (Mannagh, Skeardeen) are located upstream of the Gort dosing area, they are not being considered further.

Water Supply Zone	Gort (1200PUB1022)
the Water Supply Zone	
Step 5 and 6 - Combined Impact from direct and diffuse sources on Transitional and Coastal Waterbodies	The increase in Orthophosphate concentrations in the downstream Transitional Waterbodies and small Coastal (TraC) Waterbodies as a result of drinking water dosing is shown in Table 4. Baseline Orthophosphate monitoring data and associated thresholds are not available for Aughinish Bay or Inner Galway Bay South. The drinking water dosing with Orthophosphate does not deteriorate the status of the coastal waterbody.
Step 5 and 6 Cumulative Assessment of impact from all EAMs within the catchment on: **Transitional and Coastal Water Bodies** **AND** **Protected Waterbodies**	<u>Step 5 and 6 Cumulative Assessment of impact from all EAMs within catchment on Transitional and Coastal Waterbodies</u> A cumulative assessment was undertaken to assess the impact on TraC WBs from all the contributing EAMs. The assessment is carried out on a catchment scale. <u>Corrib and Galway Bay South East</u> The following EAMs are within the Galway Bay South East catchment and contribute to the same TraC WBs as Gort, see Figure 4: 012 Tuam 209 Kinvara The increase in Orthophosphate concentrations in the downstream TraC WBs as a result of the drinking water dosing of all three EAMs with Orthophosphate is shown in Table 5. There is was no deterioration in waterbody status as a result of the cumulative assessment. <u>Step 5 and 6 Cumulative Assessment of impact from EAMs on downstream Protected Waterbodies</u> There are no additional protected waterbodies downstream of this EAM that are not already included in this assessment.
Conclusions	**Red, Amber, Green (RAG) STATUS: EAM Result - GREEN** The purpose of the RAG status is to indicate the waterbodies that are failing the EAM assessment on a map. Any waterbodies failing the EAM model will be marked as **Amber** in the interim while further analysis is being completed, where the further analysis confirms the water body is failing the water body will be coloured **Red**. If the EAM indicates there will not be a deterioration in the waterbody status as a result of drinking water dosing it will remain **Green**. A map of the RAG status of waterbodies is presented in Figure 5.
Recommendation	No mitigation measures are required.

Table 1: Increased loading/concentration from WWTPs due to dosing of drinking water – Dosing rate = 1.0 mg/l

Agglomeration and Discharge Type	Effluent Treatment level	WWDL ELV AER (2017) Compliance	Primary Discharge Receiving WB		Annual average TP Load kg/yr	Ortho P Concentration mg/l P TP – Ortho P Conversion factor varied for sensitivity analysis (40%, 50%, 68%)		
						0.5	0.4	0.68
Gort Primary Discharge	Secondary	Orthophosphate 0.5mg/l - Non-Compliant	Cannahowna_010	Pre-Dosing	325	0.29	0.23	0.39
				Post Dosing	583	0.51	0.41	0.70
Gort SWOs (4 No.)				Pre-Dosing	202	0.87	0.70	1.18
				Post Dosing	210	0.90	0.72	1.23

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

Name	EU_CD	Indicative Quality *Surrogate Status in italic*	Baseline Conc. (mg/l P)	75% of status threshold (mg/l P)	Cumulative load (kg/yr P)	Modelled dosing conc. (mg/l P)	Potential conc. following dosing (mg/l P)
Boleyneendorrish_030	IE_WE_29B040800	*High*	0.0125	0.0188	0.001	0.00000001	0.0125
Cannahowna_010	IE_WE_29C010200	High	0.0067	0.0188	142.0	0.0009	0.0076
Kilchreest_010	IE_WE_29K022100	High*	0.0088	0.0188	147.8	0.0003	0.0091

*Baseline concentration based on Poldeelin spring located within the sub-catchment

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

Name	EU_CD	Indicative Quality *Surrogate Status in italic*	Baseline Conc. used in calculation (mg/l P)	75% of status threshold (mg/l P)	Cumulative load (kg/yr P)	Modelled dosing conc. (mg/l P)	Potential Baseline conc. following dosing (mg/l P)
GWDTE-Caherglassaun Turlough (SAC000238)	IE_WE_G_0091	Good	0.0088	0.0263	14.6	0.0003	0.0091
Kilchreest_010_ (Turloughs)	N/A	Good	0.0088**	0.0075*	147.8	0.0006	0.0094

*Threshold based on NPWS turlough conservation objectives
**Baseline concentration >75% threshold but concentration increase is below significance threshold (0.00125mg/l)

Table 4: Orthophosphate concentrations in transitional and coastal water bodies following dosing of drinking water

Name	EU_CD	Season	Indicative Quality *Surrogate Status in italic*	Baseline conc 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)
Kinvarra Bay	IE_WE_160_0100	Summer	High	0.0130	0.0188	147.8	0.0003	0.0133
		Winter	High	0.0060	0.0188	147.8	0.0003	0.0063
Aughinish Bay	IE_WE_130_0000	Summer	*High*	0.0125	0.0188	147.8	0.0003	0.0128
		Winter	*High*	0.0125	0.0188	147.8	0.0003	0.0128
Inner Galway Bay South	IE_WE_160_0000	Summer	*High*	0.0125	0.0188	147.8	0.0002	0.0127
		Winter	*High*	0.0125	0.0188	147.8	0.0002	0.0127

Table 5: Cumulative assessment of orthophosphate concentrations in transitional and coastal water bodies following dosing of drinking water

Name	**EU_CD**	**Season**	**Indicative Quality** ***Surrogate Status in italic***	**Baseline conc used in calculation (mg/l P)**	**75% of status threshold (mg/l P)**	**Load, (kg/yr P) from current EAM**	**Cumulative load (kg/yr P)**	**Modelled dosing conc. (mg/l P)**	**Potential conc. following dosing (mg/l P)**
Kinvarra Bay	IE_WE_160_0100	Summer	High	0.0130	0.0188	147.8	276.4	0.0006	0.0136
		Winter	High	0.0060	0.0188	147.8	276.4	0.0006	0.0066
Aughinish Bay	IE_WE_130_0000	Summer	*High*	0.0125	0.0188	147.8	250.1	0.0005	0.0130
		Winter	*High*	0.0125	0.0188	147.8	250.1	0.0005	0.0130
Inner Galway Bay South	IE_WE_160_0000	Summer	*High*	0.0125	0.0188	147.8	326.5	0.0003	0.0128
		Winter	*High*	0.0125	0.0188	147.8	326.5	0.0003	0.0128

Figure 1: Gort Water Supply Dosing Area

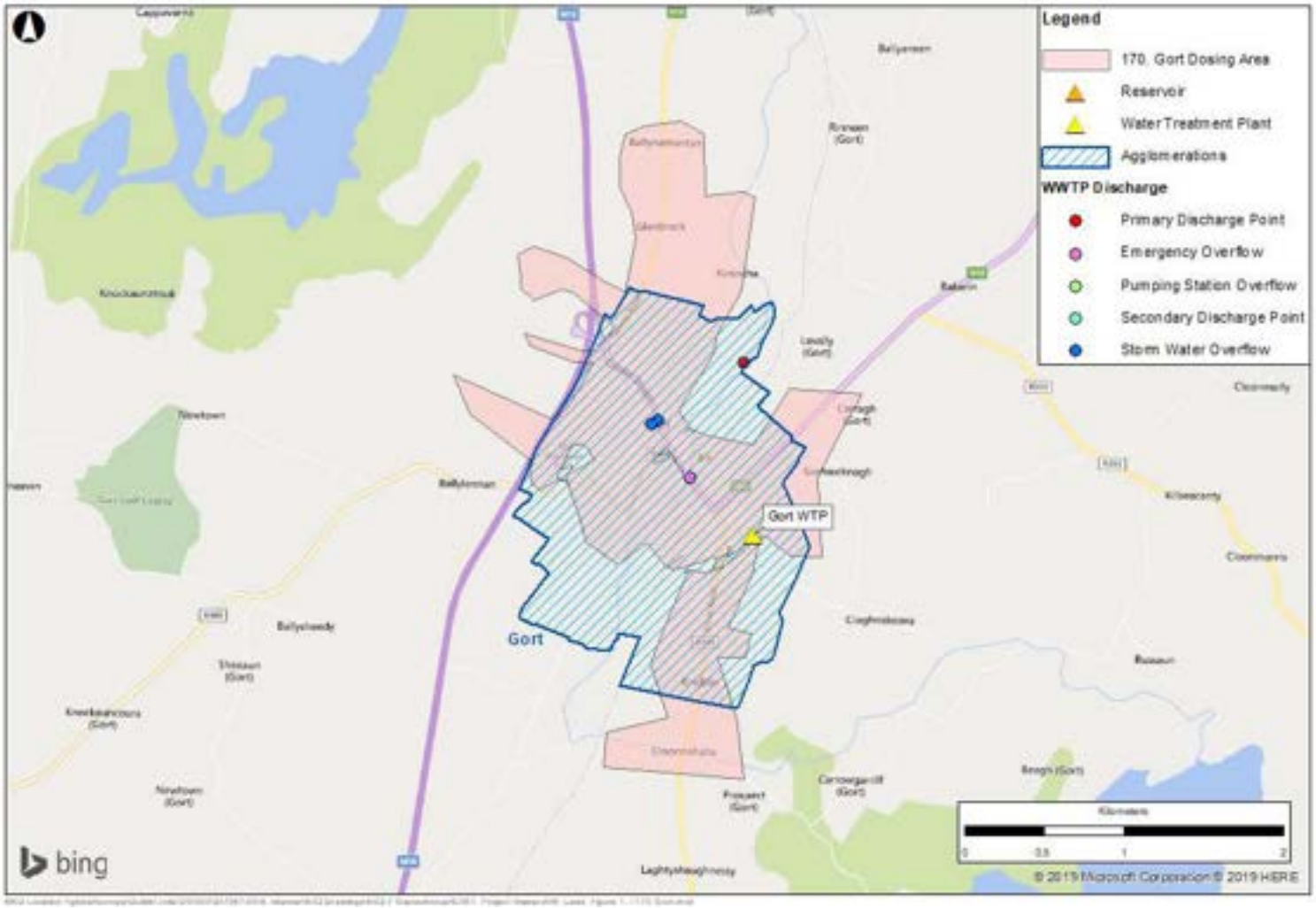

Figure 2: RWB Cumulative Loading Assessment

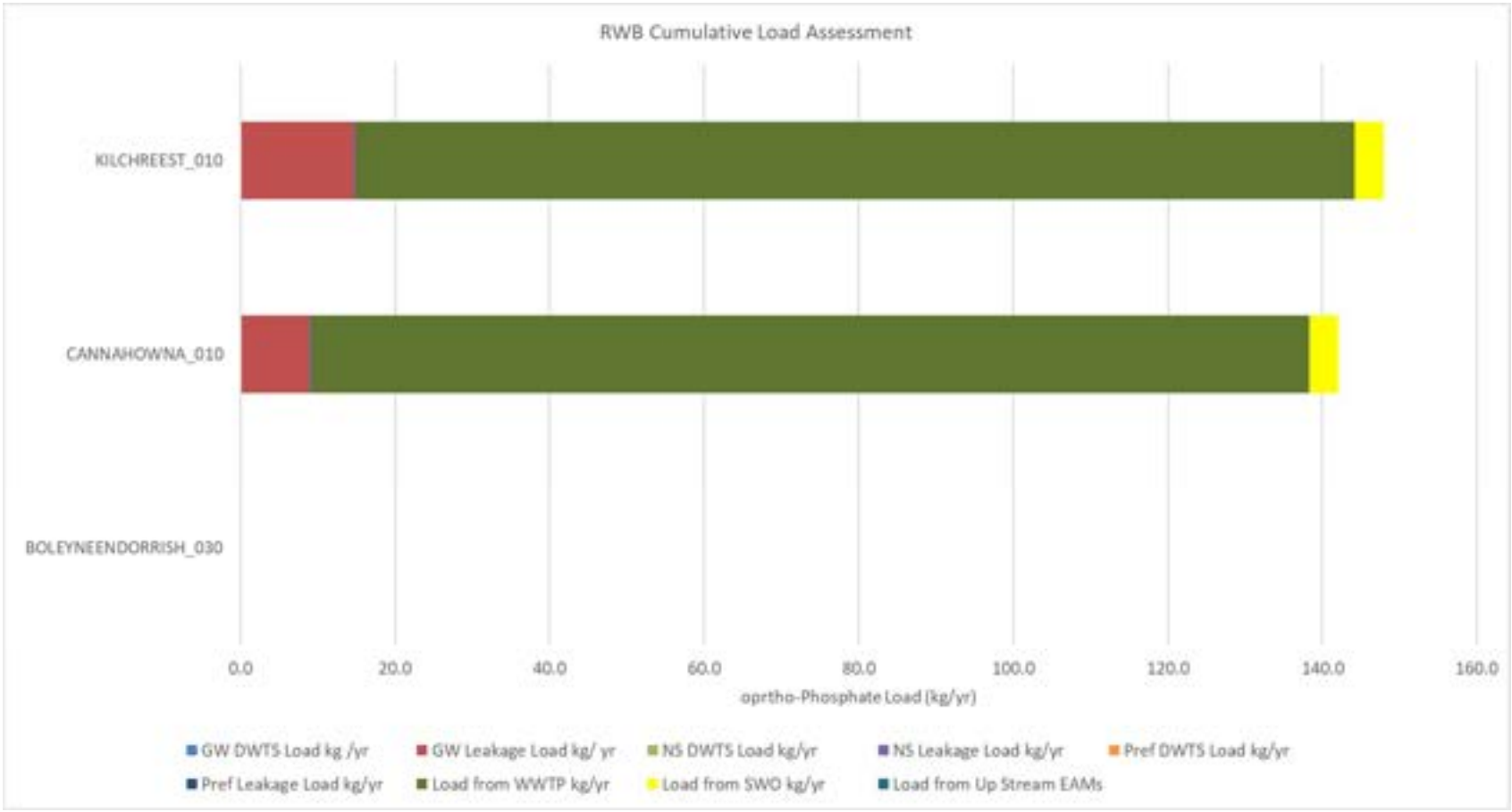

Figure 3: Total dosing area Attenuated, Treated and Transported Loads

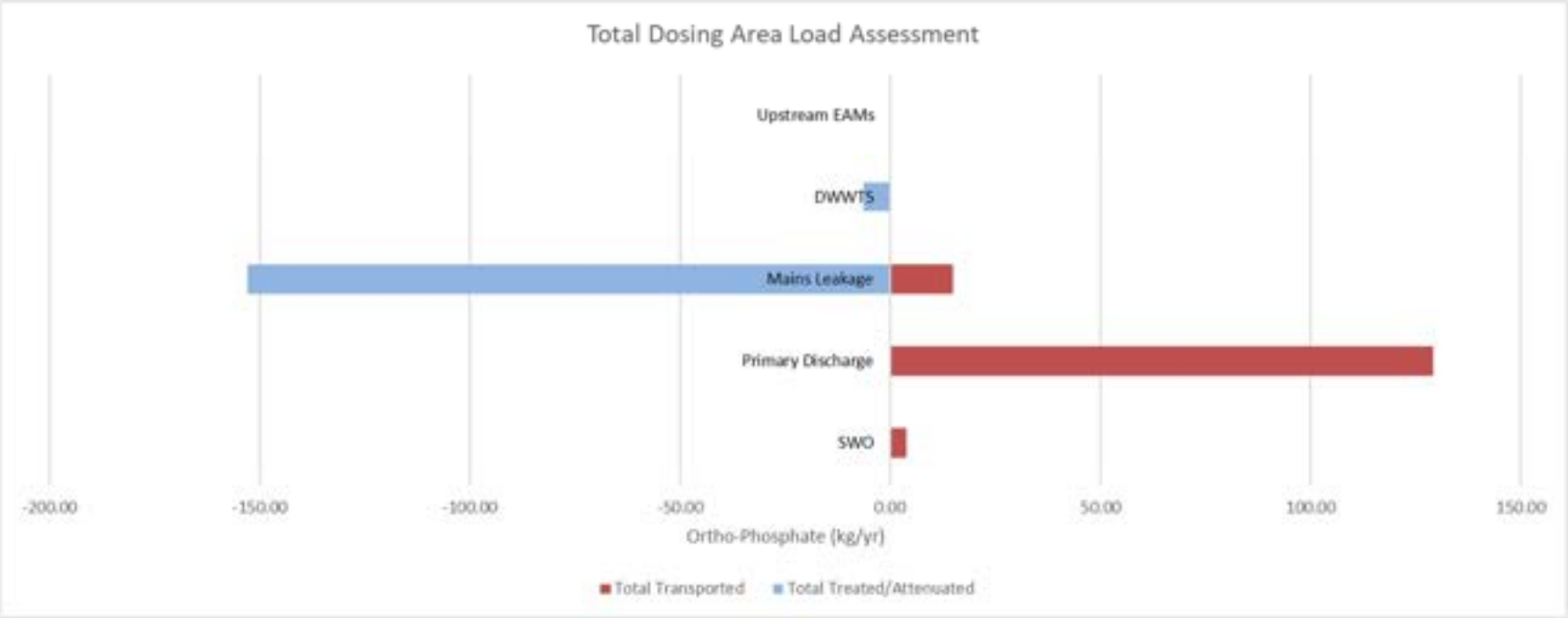

Figure 4: Upstream and downstream EAMs within WFD catchment

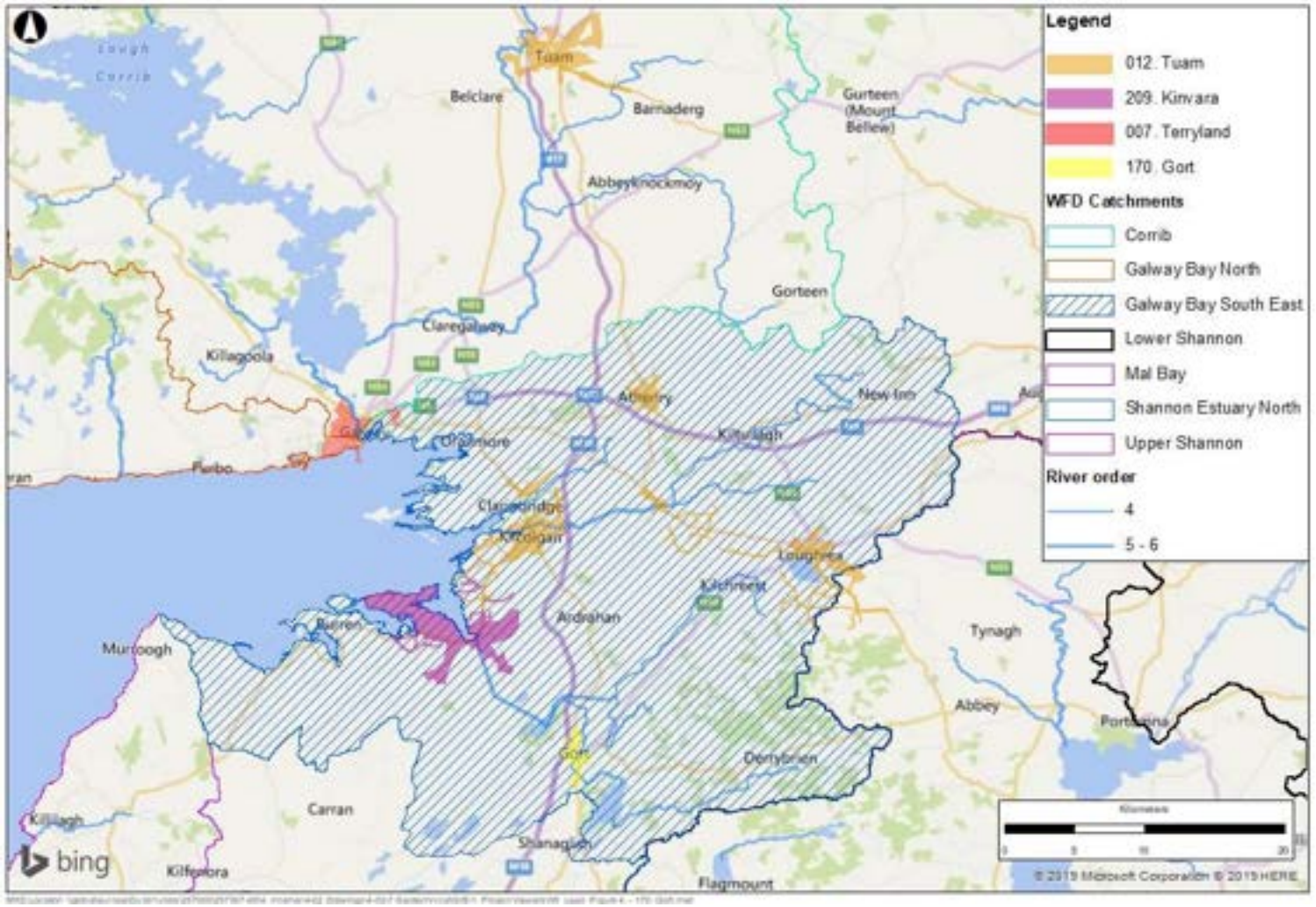

Figure 5: Red, Amber, Green (RAG) Status of waterbodies