ARUP

Roscommon County Council

Lough Funshinagh Interim Flood Relief Scheme

Screening for Appropriate Assessment & Natura Impact Statement

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Executive Summary

Ove Arup & Partners Ireland Ltd (Arup) has been appointed by Roscommon County Council (RCC) to prepare this combined Screening for Appropriate Assessment (AA) and Natura Impact Statement (NIS) for a proposed interim flood relief scheme for Lough Funshinagh, Co. Roscommon.

The proposed interim flood relief scheme referred to hereafter as the 'proposed scheme' relates to the installation and operation (for a period up to two years) of pumps and an overland pipeline to provide interim flood relief for the land adjacent to Lough Funshinagh. Article 6(3) of the Habitats Directive requires that any plan or project, which is not directly connected with, or necessary to the management of a European site, but would be likely to have a significant effect alone or in combination with other plans or projects, should be subject to AA. The proposed scheme is subject to such an assessment. This means that, in line with the precautionary principle, the proposed scheme can only be approved once it has been determined, following an assessment, that adverse effects on the integrity of a European site(s) can be ruled out.

The Source-Pathway-Receptor (SPR) model is used to assess where a potential effect may result by examining the source, its pathway and the receptor. This assessment has been undertaken with reference to Irish and European guidance and informed by baseline data from a range of sources including historic reports on the relevant European sites, National Parks and Wildlife Service (NPWS) data, National Biodiversity Data Centre maps, and reports from ecological surveys undertaken for the proposed scheme. The conclusions drawn from technical assessments relating to water quality, hydrology, and fluvial geomorphology have also been reviewed to inform the assessment. Consultation with Inland Fisheries Ireland and NPWS has been undertaken relating to the proposed scheme from July to August 2024.

The main elements of the proposed scheme consist of an intake pump system (located within the Lough), an intake compound, a pipeline route from the Lough to the Cross River, and a pipeline outfall at the Cross River.

The Screening for AA identified the potential for likely significant effects upon the following European sites: Lough Funshinagh Special Area of Conservation (SAC), River Shannon Callows SAC, Lower River Shannon SAC, Lough Ree SAC, Lough Ree SPA, Four Roads Turlough SPA, Lough Croan Turlough SPA, Middle Shannon Callows SPA, and Mongan Bog SPA.

Potential sources of impact and pathways for effect were considered as per the SPR methodology. In review of the conservation objectives for each European site, it was concluded that there was potential for likely significant effect upon the qualifying interests of the following European sites: Lough Funshinagh SAC, Lough Ree SAC, River Shannon Callows SAC, and Lower River Shannon SAC. These sites were therefore "screened in" for Appropriate Assessment.

Mitigation has been proposed in relation to the following potential effects on the European sites:

- Lough Funshinagh SAC – accidental pollution event and introduction/spread of invasive non-native species (INNS) to turlough habitat.
- Lough Ree SAC – Species disturbance/displacement to otter
- River Shannon Callows SAC – Species disturbance/displacement to otter; and
- Lower River Shannon SAC – Water quality changes to brook lamprey.

Proposed mitigation includes pollution prevention measures, as outlined within a Construction Environmental Management Plan (CEMP), provision of an Ecological Clerk of Works (ECoW), and implementation of strict biosecurity measures.

With the implementation of the mitigation measures proposed within this report, alongside the embedded design measures within the proposed scheme, there is sufficient evidence for the Appropriate Assessment to conclude that the implementation of the proposed scheme would not result in adverse effects, alone or in-combination, on the integrity of Lough Funshinagh SAC, Lough Ree SAC, the River Shannon Callows SAC and the Lower River Shannon SAC, including with respect to the qualifying interests that were scoped in for assessment.

1. Introduction

1.1 Overview

Ove Arup & Partners Ireland Ltd (Arup) has been appointed by Roscommon County Council (RCC) to prepare this combined Screening for Appropriate Assessment (AA) and Natura Impact Statement (NIS) for a proposed interim flood relief scheme for Lough Funshinagh, Co. Roscommon.

The proposed interim flood relief scheme referred to hereafter as the 'proposed scheme' relates to the installation and operation (for a period up to two years) of pumps and an overland pipeline to provide interim flood relief for the land adjacent to Lough Funshinagh. Article 6(3) of the Habitats Directive requires that any plan or project, which is not directly connected with, or necessary to the management of a European site, but would be likely to have a significant effect alone or in combination with other plans or projects, should be subject to AA.

The proposed scheme is subject to such an assessment. This means that, in line with the precautionary principle, the proposed scheme can only be approved once it has been determined, following an assessment, that adverse effects on the integrity of a European site(s) can be ruled out.

1.2 Report Aim

The AA Screening section of this report has been prepared to provide information for the 'competent authority' regarding the potential for 'Likely Significant Effects' (LSE) arising from the proposed scheme on European sites within the 'Zone of Influence' (ZoI).

Where likely significant effects cannot be ruled out, those European sites at risk shall undergo AA.

The AA Section of the report provides the information necessary to enable an Appropriate Assessment on the potential for Adverse Effects on the Integrity (AEoI) of a European site(s) to be undertaken by the competent authority. Mitigation is proposed to eliminate any identified possible adverse effects.

1.3 Basis for Appropriate Assessment

The Habitats Directive on the conservation of natural habitats and wild fauna and flora (92/43/EEC) (the 'Habitats Directive') provides the legal protection for habitats and species, with Articles 3 to 9 providing legal protection to the EU wide network of sites known as the Natura 2000 site. Natura 2000 is a network of protected sites which comprises Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), and proposals for such sites (referred to as European sites within this report). The definitions of both SACs and SPAs are provided in Section 2.1.1.

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. Article 6(3) establishes the requirement for AA whilst Article 6(4) sets out the Alternative Solutions, Imperative Reasons of Overriding Public Interest (IROPI) and Compensatory Measures where adverse effects on the integrity of European sites cannot be excluded.

The Habitats Directive has been transposed in Ireland by the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) (as amended), and by Part XAB of the Planning and Development Act, 2000 (as amended). In the context of the proposed scheme, the governing legislation is principally the Planning and Development Act, 2000 (as amended), with an application made under section 177AE of the Planning and Development Act, 2000 (as amended).

Under the Planning & Development Act 2000 (as amended), prior to submitting for approval a project or plan that is not directly connected with or necessary to the management of either a candidate SAC, proposed SPA, SPA or SAC, competent authorities are required to consider whether the plan may have a significant effect on such a site; and where this is the case, that an AA of the implications of the project or plan must be carried out.

1.4 Statement of Competency

The statements of competencies for the contributing authors to this AA report are provided in Appendix A adjoining this report.

1.5 Layout of Report

This report is structured as follows:

- Section 2 presents the methodology, guidance and data sources used to inform this AA Screening and NIS report.
- Section 3 provides the background information on Lough Funshinagh
- Section 4 provides the proposed scheme description
- Section 5 details the Screening Assessment utilising the Source-Pathway-Receptor method to establish the Zone of Influence and identify European sites with potential likely significant effects.
- Section 6 presents the information required for the competent authority to carry out an Appropriate Assessment detailing features at risk, outlining any potential for adverse effects upon the integrity of any European site and consequently provides recommended mitigation to eliminate or render insignificant such effects; and
- Section 7 closes the report with the summary and conclusions of the AA part of the report.

2. Methodology, Guidance and Data Sources

2.1 Definitions

2.1.1 European Sites

European sites, as defined under Section 177R of the Planning & Development Act 2000 (as amended) are part of the Natura 2000 network and include those designated as Special Areas of Conservation (SACs), candidate SACs (cSACs), Special Protection Areas (SPAs) or proposed SPAs (pSPAs).

SACs are selected for the conservation of Annex I habitats[1] (including priority types which are in danger of disappearance) and Annex II species[2] as defined by the respective annexes of the Habitats Directive.

SPAs are selected for the conservation of Annex I birds and all migratory birds, and their habitats as defined by the respective annexes of the Birds Directive.

The Annex habitats and species, for which each site is selected, are termed the Qualifying Interests (QI) for SACs and termed Special Conservation Interests (SCI) for SPAs. Sites are considered within Section 5 of this report.

2.1.2 Conservation Objectives

Conservation Objectives (COs) for European sites are defined for the relevant QIs and SCIs. In its most general sense, a CO is the specification of the overall target for the species and/or habitat types for which a site is designated in order for it to contribute to maintaining or reaching favourable conservation status[3].

[1] Annex I habitats are habitats whose conservation requires the designation of Special Areas of Conservation
[2] Annex II species are animal and plant species whose conservation requires the designation of Special Areas of Conservation
[3] Commission Note on Setting Conservation Objectives for Natura 2000 Sites (November 2012) European Commission, Doc. Hab.12-04/06. Accessed at: http://ec.europa.eu/environment/nature/natura2000/management/docs/commission_note/commission_note2_EN.pdf

The COs for a given site are underpinned by a list of attributes and targets for each QI/SCI, with those targets needing to be reached to maintain or restore favourable conservation condition of each QI/SCI.

2.1.3 Source-Pathway-Receptor Model

The Source-Pathway-Receptor (SPR) model is used to assess where a potential effect may result by examining the source, its pathway and the receptor. As per guidance from the Office of the Planning Regulator (OPR)[4] these can be defined as follows:

- **Source**: The origin of a potential effect which may include characteristics of a plan or project that have the potential to result in effects e.g. direct impacts such as loss of habitat.
- **Pathway**: How the potential effect may occur on the receptor. These are identifiable through linkages that may occur through the plan or project and European sites e.g. direct pathways such as physical proximity, hydrological connections or indirect pathways such as disturbance to migrating species; and
- **Receptor**: The European site network and respective QIs/SCIs, their ecological condition and sensitivities e.g. freshwater pearl mussel is sensitive to siltation in water.

2.1.4 Zone of Influence

A ZoI within any assessment of projects or plans considers the area over which ecological features may be affected by biophysical changes as a result of the proposed plan/project and associated activities. The ZoI is established using the SPR method.

2.1.5 Screening vs Scoping

For the purposes of this Screening for AA and NIS the terms[5] screening and scoping are described as:

- **Screening –** Screening shall refer to the screening of the project only; and
- **Scoping –** Scoping shall refer to the activity of identifying European sites and their respective QI/SCIs that are being considered for assessment within the report.

2.2 Guidance

The following guidance was used in carrying out the assessment:

- Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities (Department of Environment, Heritage and Local Government, 2010 revision).
- Appropriate Assessment under Article 6 of the Habitats Directive; Guidance for Planning Authorities. Circular National Parks and Wildlife Service (NPWS) 1/10 and PSSP 2/10.
- Assessment of plans and projects in relation to Natura 2000 Sites: Methodical guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC (European Commission Environment Directorate-General, 20214).
- Communication from the Commission on the precautionary principle. European Commission (2000)
- Guidance Document on Article 6(4) of the Habitats Directive 92/43/EEC (European Commission, 2007)
- Guidelines for Good Practice Appropriate Assessment of Plans under Article 6(3) Habitats Directive (International Workshop on Assessment of Plans under the Habitats Directive, 2011).
- Managing Natura 2000 Sites: The Provision of Article 6 of the Habitats Directive 92/43/EEC (EC Environment Directorate-General, 2019); and

[4] OPR (2021) Appropriate Assessment Screening for Development Management. OPR Practice Note PN01. Accessed at .ie/wp-content/uploads/2021/03/9729-Office-of-the-Planning-Regulator-Appropriate-Assessment-Screening-booklet-15.pdf November 2023.

[5] Following early consultation with NPWS in August 2024 regarding the proposed scheme and the AA report, the terminology of 'screening' and 'scoping' was recommended to be used in respect of the text provided.

- Office of the Planning Regulator Practice Note PN01 - Appropriate Assessment Screening for Development Management (OPR, 2021).

The requirements for Screening for AA, and AA, for European sites, are set out in section 177AE and Part XAB of the Planning and Development Act 2000 (as amended), with numerous relevant rulings and opinions in both Irish and EU courts.

2.3 Data Sources

2.3.1 Ecological data

The ecological data reviewed to inform this report comprises:

- EcoQuest Environmental (2021) Lough Funshinagh Flood Management Works. Baseline and Quarterly Water Quality Monitoring Reports.
- Catchments Water Framework Directive Data[6]
- Environmental Protection Agency (EPA) Map Viewer[7]
- Environmental Protection Agency (EPA) Water Maps[8]
- Goodwillie and Fahy (1974) A preliminary report on areas of Scientific Interest in Co. Roscommon[9]
- International Association of Hydrogeologists (2018) Karst Hydrogeology of Mid-Roscommon Field Guide[10].
- Malachy Walsh & Partners (2024) Lough Funshinagh Interim Pumping System. Engineering Report[11].
- National Parks and Wildlife Service (NPWS) Designations web viewer[12]
- NPWS ArcRest GIS Services[13]
- National Biodiversity Data Centre map viewer[14]
- NPWS (2023) Conservation Objectives Series[15]
- NPWS (2023) SAC and SPA Datasheets[16]
- NPWS Lough Funshinagh Site Synopsis[17]
- NPWS Protected Sites in Ireland[18]

[6] Catchments (2024) Data – Accessed at https://www.catchments.ie/data/#/?_k=mh0a2p August 2024.
[7] EPA Map Viewer accessed at https://gis.epa.ie/EPAMaps/ accessed August 2024
[8] EPA Water Map Viewer. Accessed at https://gis.epa.ie/EPAMaps/Water August 2024.
[9] Goodwillie and Fahy (1974) A preliminary report on areas of Scientific Interest in Co. Roscommon. Accessed at https://www.npws.ie/sites/default/files/publications/pdf/Goodwillie_&_Fahy_1974_ASI_Roscommon.pdf July 2024.
[10] IAH (2018) International Association of Hydrogeologists (IAH) Irish Group. Karst Hydrogeology of Mid Roscommon. Field Guide.
[11] MWP (2024) Lough Funshinagh Interim Pumping System. Engineering Report. Roscommon County Council. September 2024.
[12] NPWS Designations web viewer accessed at https://dahg.maps.arcgis.com/apps/webappviewer/index.html?id=8f7060450de3485fa1c1085536d477ba accessed August 2024
[13] NPWS GIS Web Services for NPWS Designations. Accessed at https://webservices.npws.ie/arcgis/rest/services/NPWS/NPWSDesignatedAreas/MapServer
[14] Biodiversity Maps – National Biodiversity Data Centre. Accessed at https://maps.biodiversityireland.ie/Map August 2024.
[15] NPWS Conservation objectives accessed at https://www.npws.ie/protected-sites/conservation-management-planning/conservation-objectives accessed August 2024
[16] NPWS SAC and SPA Datasheets accessed at https://www.npws.ie/maps-and-data/designated-site-data/sac-and-spa-datasheets-downloads accessed August 2024
[17] NPWS (2015) Lough Funshinagh SAC Site Synopsis accessed at https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY000611.pdf accessed July 2024
[18] NPWS Protected sites accessed at https://www.npws.ie/protected-sites accessed August 2024

- NPWS The Status of EU Protected Habitats and Species in Ireland Web Viewer[19]
- O Connor, Á. (2017) Conservation objectives supporting document: Turloughs* and Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation. Conservation Objectives Supporting Document Series. National Parks and Wildlife Service, Dublin[20].
- Ryan Hanley (2024) Wintering Birds Survey (2023-2024) of Lough Funshinagh[21]
- Ryan Hanley (2024) Breeding Bird Surveys of Lough Funshinagh[22]
- Ryan Hanley (2024) Baseline Survey of Lough Funshinagh to Cross River 2024[23]
- Triturus (2024) Aquatic baseline report for the Lough Funshinagh Interim Flood Relief Scheme[24]
- The Status of EU Protected Habitats and Species in Ireland. Volume 1: Summary Overview. Unpublished NPWS report[25]. NPWS (2019)
- The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments. Unpublished NPWS report[26]. Edited by: Deirdre Lynn and Fionnuala O'Neil. NPWS (2019); and
- The Status of EU Protected Habitats and Species in Ireland. Volume 3: Species Assessments. Unpublished NPWS report[27] (2019). Edited by: Deirdre Lynn and Fionnuala O'Neill (2020).

2.3.2 Technical Assessment

2.3.2.1 Water Quality Assessment

The assessment of potential changes in water quality at sites identified within the Screening for AA, and where applicable, the AA, is underpinned by Water Framework Directive (WFD) water quality samples in the ZoI and samples taken in-situ. Water quality records were reviewed via freely accessible records on the EPA and Catchments.ie websites. Water quality samples were taken from both Lough Funshinagh and across locations within the Cross River. One sample from the Cross River was taken upstream from the proposed scheme to act as a control. The remaining six sample locations within the watercourse were taken downstream of the proposed scheme.

2.3.2.2 Hydrology Assessment

The assessment of potential changes in hydrological processes in watercourses affected by the proposed scheme is underpinned by hydrological modelling[11]. This detailed methodology is described in the MWP (2024) Lough Funshinagh Interim Pumping System – Engineering Report. The modelling has been undertaken to assess the potential impacts that the proposed scheme would have upon the hydrological function of Lough Funshinagh and the Cross River and has been used to inform the assessment and conclusions of this report. The assessment includes a review of available flow gauge data, estimations of the flow (m^3/s) during both high and low flow events with and without the proposed scheme (i.e. additional pumped water) and the flow discharge (m^3/s). Flood risk at both low and high flows is provided within the engineering report and is referenced within this Screening for AA and NIS.

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[19] NPWS The Status of EU Protected Habitats and Species in Ireland web viewer accessed at https://storymaps.arcgis.com/collections/1a721520030d404f899d658d5b6e159a accessed August 2024

[20] O Connor, Á. (2017) Conservation objectives supporting document: Turloughs* and Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation. Conservation Objectives Supporting Document Series. National Parks and Wildlife Service, Dublin. Accessed at https://www.npws.ie/sites/default/files/publications/pdf/Turlough_3180_and_Cheno_rub_3270_SSCO_sup_doc_June_2017_V1.pdf August 2024.

[21] Ryan Hanley (2024) Lough Funshinagh Baseline Surveys. Winter Birds Survey (2023-2024) of Lough Funshinagh. June 2024.

[22] Ryan Hanley (2024) Lough Funshinagh Baseline Surveys. Breeding Birds Survey (2024) of Lough Funshinagh. August 2024.

[23] Ryan Hanley (2024) Baseline Survey of Lough Funshinagh to Cross River 2024.

[24] Triturus. (2024). Aquatic baseline report for the Lough Funshinagh Interim Flood Relief Scheme. Report prepared by Triturus Environmental Ltd. for Ryan Hanley. August 2024

[25] The Status of EU Protected Habitats and Species in Ireland: Volume 1 Summary Overview accessed at https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2019_Vol1_Summary_Article17.pdf August 2024

[26] The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments. Unpublished NPWS report https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2019_Vol2_Habitats_Article17.pdf January 2024

[27] The Status of EU Protected Habitats and Species in Ireland. Volume 3: Species Assessments. Unpublished NPWS report accessed at https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2019_Vol3_Species_Article17.pdf January 2024

2.3.2.3 Fluvial Geomorphology Assessment

The assessment of potential changes in the hydromorphology of watercourses affected by the proposed scheme is underpinned by the assessment of the impact of the proposed pumping to the high and low flows of the Cross River. This methodology is described in the MWP (2024) Lough Funshinagh Interim Pumping System – Engineering Report. The stream power analysis considers how a change in stream power will impact the morphological function of the Cross River and hydrologically connected protected areas to support the findings of this report. The findings of the analysis indicated that the natural flow and pumped flow were both below the 35W/m^2 high energy threshold for erosion.

2.4 Methodology

In line with the relevant guidance and case law, the Screening for AA consists of the following steps, which are iterative in nature:

1. **Impact Prediction:** Identify the aspects of the proposed scheme likely to affect the COs of European Sites. The more general classification of impacts can include direct and indirect effects; short and long-term effects; construction, operational and decommissioning effects; and isolated, interactive and cumulative effects. A SPR model has been used to identify the zone of influence.

2. **Assessment of Potential Likely Significant Effects:** The potential impacts of the proposed scheme are assessed as to whether they are likely to result in potential likely significant effects thereby undermining the COs for a European site. This requires understanding of relevant QIs/SCIs and associated COs. Where likely significant affects cannot be excluded, those effects are subject to full AA.

Further, the NIS then consists of:

1. A**ssessment of Adverse Effects**: Here, following identification of the likely significant effects, these effects are assessed to determine whether they would give rise to an adverse effect on the integrity of the relevant European sites in view of the sites COs, either alone or in-combination with other plans and/or projects.

2. **Recommendation of Mitigation Measures:** Mitigation measures are identified to eliminate or render insignificant any adverse effects on the integrity of any European site either alone or in-combination with other projects and/or plans. Such mitigation measures are developed following full and precises analysis of the proposed scheme and its effects upon European sites.

The report is informed by desktop records and from surveys carried out between October 2023 and August 2024. Surveys are referenced within Section 5 of this report and include habitat surveys, wintering bird surveys and breeding bird surveys of Lough Funshinagh, ecological walkover of the Cross River, water sampling of Lough Funshinagh and of the Cross River and eDNA sampling of the Cross River. Full details of these surveys can be found within the EcIA of the proposed scheme[28] with details relevant to the AA Screening and NIS provided in summary in this report.

2.4.1 Impact Prediction: Identifying the Zone of Influence

The ZoI is established using the SPR method and takes into consideration the scale of the elements of the proposed scheme. There is no overarching recommended ZoI, and guidance from the National Parks and Wildlife Service (NPWS) recommends that the distance should be evaluated on a case-by- case basis with reference to the nature, size and location of the plan/project, the sensitivities of the ecological receptors, and the potential for in-combination effects (cumulative).

For an effect to occur there must be a risk enabled by having a source (e.g. construction works at a proposed scheme site), a ‘receptor’ (e.g. QI or SCI of a European site), and a pathway between the source and the receptor (e.g. a watercourse which connects a plan area to an SAC, ex situ foraging habitat for SCI birds).

The identification of the European sites within the ZoI has been carried out by utilising GIS datasets from National Parks and Wildlife Service (NPWS).

[28] Lough Funshinagh Interim Interim Flood Relief Scheme Ecological Impact Assessment (EcIA) (Arup 2024).

The sites have been determined through the identification of the potential sources of the impacts of the proposed scheme and their pathways for effect to European sites

2.4.2 Assessment of Effects

2.4.2.1 Understanding the Conservation Objectives of European Sites

The COs of European sites are focused primarily on maintaining or restoring the favourable conservation status of the habitats and species of interest (i.e. the QIs and SCIs). European sites have Site-Specific Conservation Objectives (SSCOs), which focus on the specific qualifying habitat or populations of species at each site by setting targets for appropriate attributes. The detailed SSCOs area available from the NPWS website[29] and outline the attributes and targets for respective QIs and SCIs of European sites. Consideration of the implications of the proposed scheme against the SSCOs (where relevant) of European sites supports the assessment of whether the proposed scheme would have a likely significant effect or an adverse effect upon the integrity of such sites. For example, where it can be demonstrated that the proposed scheme would not impede any achievement of any SSCOs for a particular site, it would support a conclusion that the proposed scheme would not have a significant or adverse effect on the integrity of the relevant site.

2.4.2.2 Assessment of Effects of the Project

Guidance documents (see Section 2.2) provide proposed criteria to determine if a proposal is likely to have adverse effects. These criteria are particularly suited to AA of individual projects, as detail on the receiving environment will be available for analysis when project locations are known.

2.4.2.3 In-Combination Assessment of Effects

The consideration of in-combination effects discusses the potential for other projects and/or plans that may spatially or temporally overlap with the proposed scheme.

2.4.3 Mitigation Measures

After establishing the elements of the proposed scheme which are likely to result in an adverse effect to a European site, mitigation measures are proposed to eliminate or render insignificant such effects. This AA Report outlines the relevant measures which have been included in the proposed scheme to mitigate the potential adverse effects on the integrity of European sites identified and provides an assessment of whether with such mitigation, implementation of the proposed scheme elements has the potential to result in adverse effects on the integrity of European sites.

2.5 Consultation

Consultations were held between Inland Fisheries Ireland (IFI) and the NPWS from July to August 2024 regarding the proposed scheme. Both organisations have been made aware of the current proposed scheme since July 2024. Notably, while NPWS has been aware of the wider flooding issues at Lough Funshinagh prior to this specific proposal, these consultations have provided a platform for in-depth discussions and collaboration on the potential impacts and mitigation measures related to the proposed scheme.

2.5.1 Inland Fisheries Ireland

IFI was contacted requesting guidance regarding the waterbodies at Lough Funshinagh and the Cross River in relation to the proposed scheme. The purpose was to understand any potential concerns IFI might have about the proposed scheme and obtain advice on the design of the pump intake, screen, mesh sizes, outfall to the Cross River and any potential general impact on fisheries from the proposed scheme and mitigation which might be necessary to minimise or eliminate impacts. Additionally, Arup requested any available data for the Cross River and Lough Funshinagh to inform the relevant reports (AA, EcIA and WFD Assessment). In response to Arup's inquiry, IFI sent a letter on August 13th requesting further information, to which Arup provided a detailed response on August 16th.

[29] NPWS Conservation Objectives. Accessed at https://www.npws.ie/protected-sites/conservation-management-planning/conservation-objectives March 2024.

On August 30th Arup received a response via email from IFI, suggesting several additional mitigation strategies to prevent erosion and water quality impacts are embedded within the proposed scheme. These mitigation strategies are discussed further in Sections 4.1 and 6.2.1.

2.5.2 National Parks and Wildlife Service

Relevant members of the NPWS Ecological Guidance and Advice Unit (EGAU), Development Applications Unit (DAU) and regional management/personnel were consulted regarding the proposed scheme. An online round-table meeting was held on August 22nd, during which NPWS representatives were presented with an overview of the proposed scheme, its design, relevant environmental and ecological baseline parameters, and the current findings of the associated environmental reports, including the AA, EcIA, EIA Screening and WFD Assessment.

3. Baseline Environment

3.1 Introduction

Lough Funshinagh is defined as a turlough or 'disappearing lake' located approximately 13 km to the northeast of Athlone town in Co. Roscommon. In recent years, and in particular since 2016, water levels in the lough have risen, resulting in flooding of nearby property and increasing the flood risk to Curraghboy village which is 1.7 km to the southwest of the lough. Roscommon County Council is in the process of designing a more permanent scheme to manage flood risk in the vicinity of the lough. The proposed scheme is an interim scheme for up to two years only. Prior to the implementation of the permanent scheme, more immediate measures are needed to manage flood risk, particularly for local property and for the village of Curraghboy. To that end, an interim scheme has been designed, with the aim to extract enough water from Lough Funshinagh to prevent flooding in the surrounding areas. This will involve pumping water for up to 24 months when the lough level exceeds 67.50 metres above Ordnance Datum (mOD). Pumping rates will be adjusted based on the receiving river (Cross River) flow conditions and will not exceed 300 litres per second. A remote monitoring system will control the pumping process, allowing for changes in flow rate or shutdowns as needed. Monitoring river flow in the Cross River will also help to ensure effective management of the overall system.

The proposed scheme comprises two pumps working in parallel, pumping water from the lough, into an overland pipe which will run from Lough Funshinagh to the Cross River, approximately 2.7 km southwest of the lough. The overland pipe will discharge the pumped volume of water to the Cross River. The proposed scheme has been designed with due cognisance for the sensitivity of the lough, the River Cross and the pipe route.

Further detailed information about the proposed scheme is presented in Section 4 below.

3.2 Location and Physiography

3.2.1 Lough Funshinagh

Lough Funshinagh is defined as a turlough or ‘disappearing lake’ located 13km to the northwest of Athlone town in Co. Roscommon. It is approximately 430ha in area with an approximate length of 12.5km. The site is also a designated SAC (see Section 3.3). The lough straddles 8 townlands in south Co. Roscommon, near Kiltoom. In a clockwise direction, starting from the north of the lake, these are the townlands of Rahara, Ballagh, Lisphelim, Inchiroe and Gortfree, Carrickbeg, Carrick, Kildurney, and Lysterfield. The pipeline starts in the townland of Carrick.

Turloughs and associated habitats and systems typically are seasonally inundated with water. They typically form when groundwater rises, filling surface depressions on karst landscapes. As the water table falls they drain, with some turloughs completely drying out, typically in summertime.

The draining feature of a turlough is its swallow holes, allowing surface water and groundwater to enter the underground karst system. The turlough at Lough Funshinagh does not drain completely and in recent years, as turlough levels have increased resulting in flood events during winter on a number of occasions.

There is a history of repeat flooding in Lough Funshinagh, with significant weather events in the winters of 2009/2010 and again in 2015/2016, 2017/2018, 2019/2020, 2020/2021, 2021/2022, 2022/2023 and 2023/2024 meaning the maximum water level in the lake rose to a level exceeding road level and finished floor levels of dwellings. These floods have had a significant impact on homes, property, agricultural land, and public roads along the periphery of the turlough, and pose an ongoing serious risk to life and property. There has been a shift towards higher flood levels from 2007 to present and the turlough no longer 'resets' its flood patterns. It is considered, on a precautionary basis, that the turlough no longer functions as normal i.e. recedes in summer and fills in winter.

Although Lough Funshinagh is not a designated WFD lake waterbody, the groundwater body is designated under the WFD (i.e. Funshinagh groundwater body).

3.2.2 Cross River

The Cross River is located approximately 2.5 km southwest of Lough Funshinagh and flows downstream for approximately 22km until it discharges into the River Shannon, approximately 2km south of Athlone, Co. Westmeath. The river provides a direct hydrological linkage to the River Shannon. Under the Water Framework Directive (WFD) the Cross River is a designated river (Cross (Roscommon)_020), meaning the river is subject to water quality sampling and monitoring under WFD requirements. The length of the Cross River is designated under the WFD as four WFD river waterbodies (CROSS (ROSCOMMON)_010; CROSS (ROSCOMMON)_020; CROSS (ROSCOMMON)_030; CROSS (ROSCOMMON)_040).

No flood events of the Cross River are known to occur[30].

3.2.3 River Shannon

The River Shannon is located approximately 22km downstream of the proposed scheme and forms part of the European site network with three European sites designated within its boundary: River Shannon Callows SAC, Lower River Shannon SAC and Middle Shannon Callows (See Section 5.5 for further detail). The river traverses five counties being Roscommon, Westmeath, Galway, Offaly and Tipperary and is approximately 360km in length with an estimated area of 15,695 km^2. The River Shannon is designated under the WFD as a WFD river waterbody Shannon (Upper)_120 for the upstream catchment within Co. Roscommon. The River Shannon is known to flood periodically in the wintertime[30] between Athlone and Shannonbridge[31].

3.3 Lough Funshinagh Turlough

Lough Funshinagh is designated as a Special Area of Conservation (SAC) under the European Communities (Birds and Natural Habitats) Regulations 2011 (SI No 477 of 2011).

The lake lies upon Carboniferous limestone and is designated as a turlough[32]. In recent years, Lough Funshinagh has experienced prolonged flood periods that typically occur in winter and have lasted through to the summer seasons. As such the turlough is considered to not be operating as a typical turlough. Hydraulic modelling of the water levels in Lough Funshinagh has been carried out by GSI to evaluate flood durations in scenarios including the conditions pre-2015/16 (Past), and the current conditions post-2015/16 (Present)[33]. The analysis shows that prior to 2015, 4.6% of the SAC was flooded 90% of the time but post 2016, 85% of the SAC was flooded 90% of the time.
While the lake has apparent karst drainage features (and has been successfully traced to a spring 5km to the south), it is filled predominantly by surface water rather than groundwater.

[30] OPW Flood Maps. Accessed at https://www.floodinfo.ie/map/floodmaps/ August 2024
[31] OPW (2024) Past Flood Event Local Area Summary Report. Accessed at https://www.floodinfo.ie/map/floodmaps/pf_report/?X=7060817.937386209&Y=-884524.5140017918 August 2024.
[32] A turlough is defined as 'Topographic depressions in karst, which are intermittently flooded on an annual cycle via groundwater sources and have substrate and/or ecological communities characteristic of wetlands'
[33] Naughton, O., McCormack, T., Regan, S. and Johnston, P. (2024) Draft Report – Modelling and Analysis of Changes to Lough Funshinagh Flood Levels

The turlough has five known streams entering at the northern and western shores of the turlough[34] and two swallow holes in the southeastern corner which facilitates as the natural draining feature of the turlough[35]. The EPA operates a gauging station on the largest stream, with data indicating that during filling events the turlough can receive over 40% of its net change in volume from this stream alone. This suggests that the lake is predominantly surface water fed and groundwater drained. As such, the turlough essentially behaves more as a backed-up swallow hole than a typical groundwater fed turlough. Similarly to other turloughs that behave this way (e.g. Blackrock and Coole turloughs in South Galway), the combination of unrestricted input and a restricted output can result in extensive prolonged flooding after periods of heavy rainfall.

3.4 Water Levels/ Management & Monitoring of Lough Funshinagh SAC

Historically Lough Funshinagh dried out 2-3 times every 10 years. However, following a flood event in 2015/2016, GSI recorded the net inflow to Lough Funshinagh was three orders of magnitude higher than the outflow recorded[36]. GSI commenced monitoring the water levels in Lough Funshinagh from January 2018 and the monitoring is ongoing. The peak water level was recorded to be 69.38 mOD in April 2024 and the lowest level recorded in that period was 65.34 in August 2019. The levels suggested a change in the subsurface drainage network following the 2015/2016 flood event resulting in a change in the filling and draining dynamics.

The lough overflowed in 2024 and flooded a large area of land at Carrick/ Lysterfield. An analysis of the rate of change in level over the past eight years indicates that the 2024 peak water level may be exceeded in the next winter seasons, in the absence of intervention.

3.5 Surface Water Catchment

Lough Funshinagh is located within the Water Framework Directive (WFD) catchment of 26G: Upper Shannon and Shannon (Upper)_SC_100 sub catchment (Figure 3-1). The 26G catchment area is 383km^2 and covers an area from Athlone to Shannonbridge. The catchment is characterised by flat topography underlain by karst features and poorly draining soils. Groundwater is closely connected to surface water in the headwaters. Lough Funshinagh is located north of Curraghboy in a karstified part of the catchment. Although there is no surface outflow channel, underground flow has been identified through dye tracing, discharging to the Cross River near Brideswell (Drew and Burke, 1996).

[34] River Network Data was accessed from the EPA GIS platform at https://gis.epa.ie/EPAMaps/. Accessed July 2024.
[35] GSI (1996) Geological Survey of Ireland, Groundwater Data Viewer, Groundwater Karst Data, Traced Underground Connection (Drew, D. and Burke, M. (1996) The Disappearance of Lough Funshinagh. Groundwater Newsletter No. 30, November 1996)

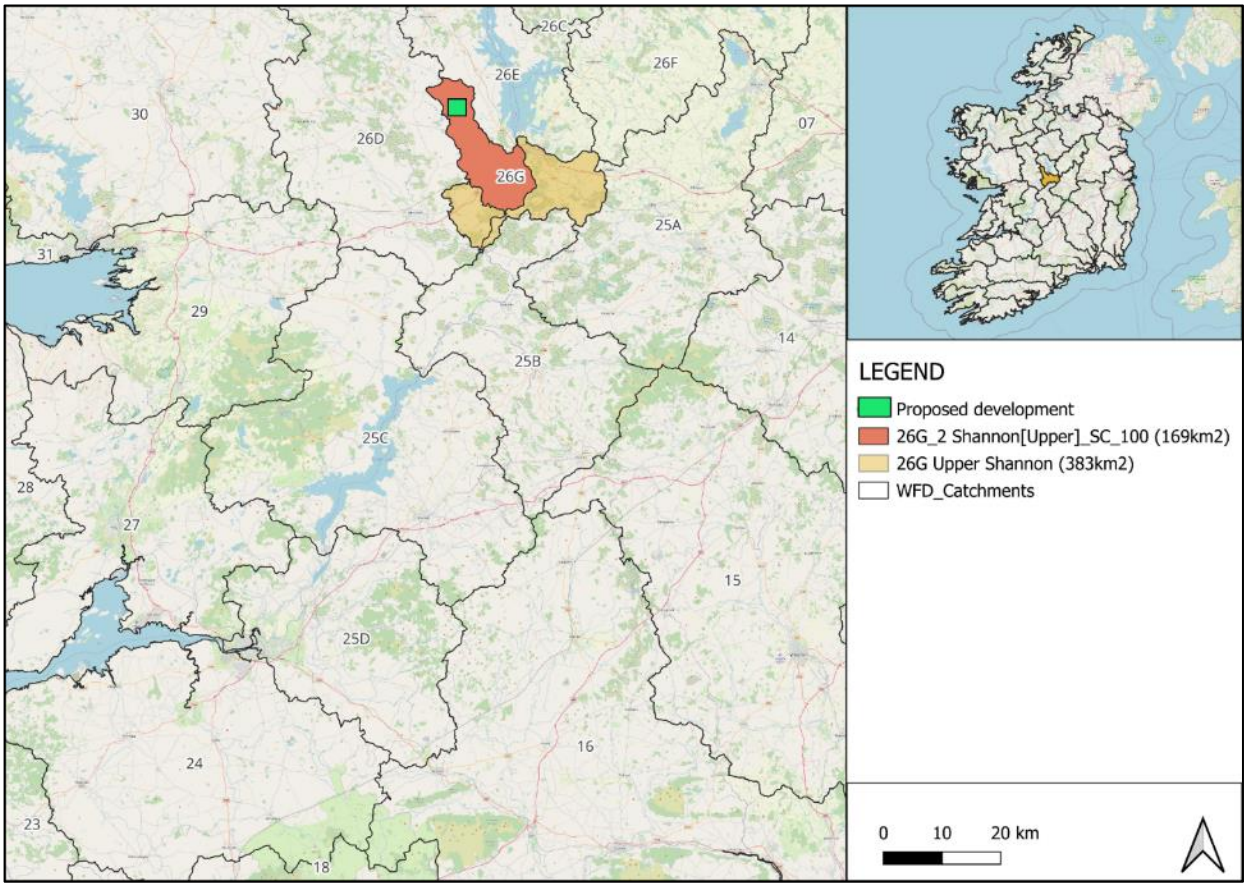

Figure 3-1 Location of proposed scheme within the 26G Upper Shannon WFD catchment and 26G_2 WFD sub catchment

The proposed outfall to the Cross River occurs within the 42.7 km^2 CROSS (ROSSCOMMON)_010 WFD river waterbody (Table 3-1). It is a lowland river that originates from groundwater springs about 2.8 km south of Lough Funshinagh and flows for 22 km before joining the Shannon River. The Shannon River drains from Lough Ree into 26G through Athlone, before being joined by the Cross River from the west. Continuing south, the Shannon River is then joined from the east by the Cloonbonny and Boor Rivers, before being joined from the west by a series of small tributaries, the largest of which is the Ballydangan River. The Shannon River flows out of the catchment at Shannonbridge. There are five WFD river waterbodies within 26G_2 Shannon (Upper)_SC_100 sub-catchment that are hydrologically connected to the proposed scheme (Table 3-1).

Table 3-1 WFD river waterbodies hydrologically connected to the proposed scheme

Code	Name	Area (km^2)	Type
IE_SH_26C100060	CROSS (ROSSCOMMON)_010	42.7	River waterbody
IE_SH_26C100200	CROSS (ROSSCOMMON)_020	37.4	River waterbody
IE_SH_26C100300	CROSS (ROSSCOMMON)_030	6.5	River waterbody
IE_SH_26D100400	CROSS (ROSCOMMON)_040	13.9	River waterbody
IE_SH_26S021800	SHANNON (Upper)_120	108.9	River waterbody

The catchment area of Cross River at its outlet is 108km^2 (Figure 3-2) and the catchment area above the proposed outfall is 4.17 km^2 (Figure 3-3) (MWP, 2024). The topography of the Cross River catchment is dominated by quaternary deposits of till derived from limestone and presents as a karstified bedrock.

Evidence of numerous karst landforms including springs, swallow holes, turloughs and enclosed depressions indicate places where significant karstification of the bedrock has occurred and where there is likely to be significant water bearing conduits or fractures. Along the length of Cross River the bedrock geology is predominantly Visean Limestone, consisting of undifferentiated limestones. This underlies a quaternary sediment layer, primarily of Alluvium with areas of gravels derived from limestone, peat and till derived from limestone. The cut-over raised peat underlies the Cross River at four locations. The presence of wetlands in the catchment indicates the complex surface water, groundwater and sediment dynamics to the Cross River.

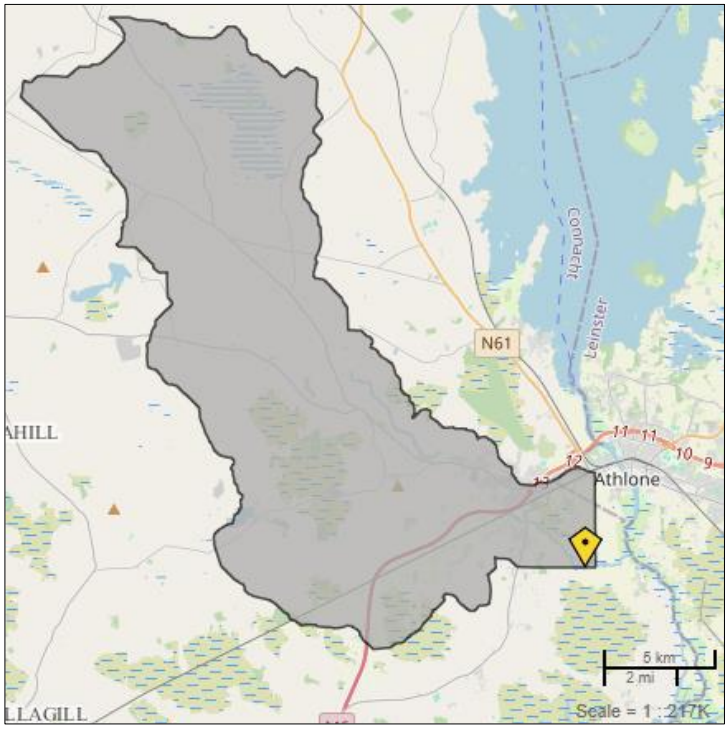

Figure 3-2 Surface water drainage of Cross River (MWP, 2024) | not to scale.

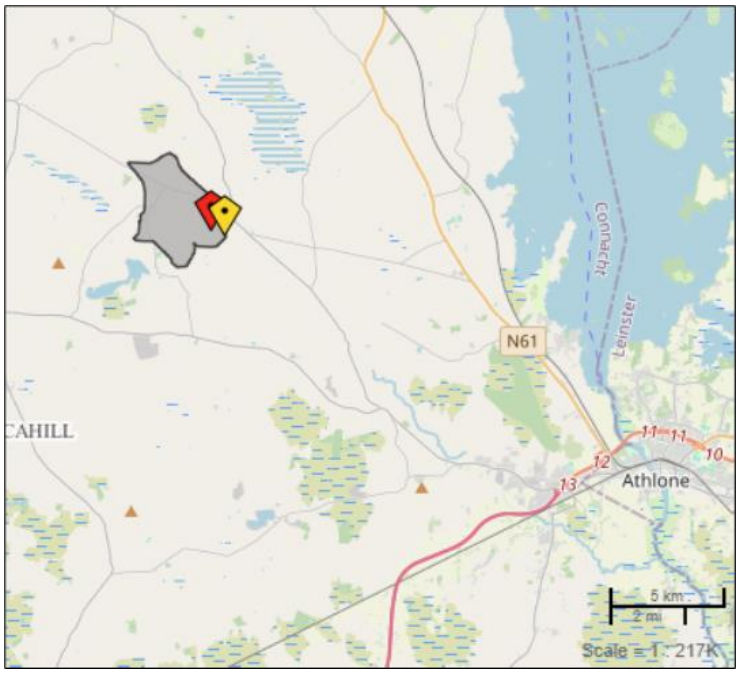

Figure 3-3 Surface water catchment area of the proposed outfall point on Cross River (MWP, 2024) | not to scale.

3.5.1 Hydromorphology

A river habitat survey (Ryan Hanley, 2024) indicated that the upper reaches of the Cross River have been extensively modified (historically straightened and deepened), resulting in a channel with typically poor hydromorphology. Siltation and eutrophication pressures from adjoining agricultural land are a threat to biological water quality. Relatively low summer flows and natural bed calcification further reduced the quality of aquatic habitats in the upper reaches. However, water flows and volumes increased significantly downstream. This, coupled with the retention of more natural characteristics in the middle and lower reaches (albeit still often deepened) resulted in better quality aquatic habitats which supported a number of high conservation value aquatic species.

An analysis of stream power (MWP, 2024) indicated that the proposed pumped flow is still below the threshold for erosion. Further analysis indicated that the substrate of the upper reaches to be dominated by gravels and the lower reaches to have a higher silt fraction.

3.5.2 Hydrology

A high flow analysis for the Cross River was estimated along the 20 km length, with adjustments made for the influence of the Shannon River at the downstream outlet (see the MWP Engineering Report). The analysis indicated that pumped flow into Cross River would increase water levels by approximately 110 mm at the proposed outfall location. As the freeboard to bank is 2.07 m the channel can accommodate this increase. The change in flow velocity with proposed pumped flow is negligible for most of the Cross River.

A low flow analysis for the Cross River was estimated along the 20 km length downstream of discharge, with adjustments made for the influence of the Shannon River (both Qmed and Q95). With the addition of the proposed scheme, the most significant difference in flow and velocity is observed at the outfall location, with this difference becoming less substantial further downstream (see the MWP Engineering report). At the outfall location, the addition of the proposed pumped flow corresponds to an increase in water depth of 0.141 m for a 95%ile low flow and 0.101m in for the 50%ile low flow. At the confluence with the Shannon River the addition of the proposed pumped flow corresponds to a significantly smaller increase in water depth of 0.022m for a 95%ile low flow and 0.047m for the 50%ile low flow. Including the Shannon low flows had no significant effect on flows.

3.6 Groundwater

3.6.1 Regional Hydrogeology

Lough Funshinagh is underlain by Dinantian Pure Bedded Limestones which extend across much of south County Roscommon from the River Suck on the western county boundary to Lough Ree in the east. Minor isolated pockets of Dinantian Pure Unbedded Limestones are located to the north and east of Lough Funshinagh.

This region of south Roscommon is part of the Funshinagh groundwater body (GWB) (IE_SH_G_091) which extends from Roscommon town to Athlone town and includes Lough Funshinagh. Groundwater bodies have been delineated by Geological Survey Ireland as part of their protection and management under the Water Framework Directive (WFD). The Funshinagh GWB status in the 2016-2021 WFD reporting cycle is ‘Good’ and is ‘Not at risk’ of failing to achieve the WFD objectives.

The Funshinagh GWB predominately comprises Dinantian Pure Bedded Limestones which are a Regionally Important karstified bedrock aquifer dominated by conduit flow (Rkc). The GSI[36] GWB description notes that within this type of highly permeable aquifer the groundwater flows through enlarged conduits and fractures which are well connected and widespread. The bedrock is devoid of intergranular flow as the groundwater flows within the fractures and conduits resulting in highly variable aquifer permeability and transmissivity. Groundwater velocities are relatively rapid indicating sizable conduits are present within the aquifer. High yielding springs in the region further indicate the significant capacity for the groundwater network to transmit high volumes of water and the regional scale of the groundwater flow network.

[36] GSI (2003) Funshinagh GWB: Summary of Initial Characterisation, available: https://gsi.geodata.gov.ie/downloads/Groundwater/Reports/GWB/FunshinaghGWB.pdf, [accessed August 2024]

Flow paths can be several kilometres in length. This groundwater dominated system is evident on the ground surface as there are relatively few surface water features such as rivers and streams.

The karstified bedrock is evidenced by numerous karst landforms including springs, swallow holes, turloughs and enclosed depressions. These features indicate places where significant karstification of the bedrock has occurred and where there is likely to be significant water bearing conduits or fractures. Point recharge can occur at these karst features, although diffuse recharge also occurs across the GWB as the rainfall percolates through the subsoil.

The regional groundwater flow direction is east towards Lough Ree[5] and south towards the Cross River, as confirmed by dye tracing tests[37]. Local variations in the groundwater flow direction exist due to the karstified nature of the bedrock. Groundwater gradients are relatively low across the region and may not reflect the topography. Furthermore, due to the karstified nature of the bedrock the groundwater catchment boundaries may not reflect the surface water catchment boundaries.

The isolated pockets of Dinantian Pure Unbedded Limestones are classified as Locally Important aquifers where the bedrock is moderately productive only in local zones (Ll). This type of bedrock is less susceptible to karstification and therefore the permeabilities are lower than in the Rkc aquifer.

3.6.2 Lough Funshinagh Hydrogeology

Lough Funshinagh is a local topographical low where the surrounding streams combine to form the lake as there is no surface outflow and the subsurface outflow is restricted. This results in the water backing up within the topographical low and forming the lake. Two swallow holes have been identified within in the southeastern part of Lough Funshinagh and provide drainage to the aquifer[38]. A tracer test conducted in the swallow hole located in the southeast of the lake identified a connection to a spring located 4.5 km to the south of the swallow hole at Atteagh Corn Mill with a flow velocity of 70 m/hr[6].

Surface inflows to the lake include 6 surface water streams located on the northern and the western shores of the lake. The EPA operates a gauging station on the largest stream and during rainfall events over 40% of the net volume is contributed to Lough Funshinagh by this stream[39]. This indicates the lake is predominantly surface water fed and, as there are no outflowing rivers or streams, discharges to ground.

Historically Lough Funshinagh dried out 2-3 times every 10 years. However, following a flood event in 2015/2016, GSI recorded the net inflow to Lough Funshinagh was three orders of magnitude higher than the outflow recorded[36]. GSI monitoring of the water levels in Lough Funshinagh between January 2018 and August 2024 indicate a peak water level was 69.38 mOD in April 2024 and the lowest level was 65.34 in August 2019, see Figure 3-4. The levels suggested a change in the subsurface drainage network following the 2015/2016 flood event resulting in a change in the filling and draining dynamics. Figure 3-4 shows that between 2016 and 2024 the annual fluctuations in Lough Funshinagh were between 1 m and 3 m[38].

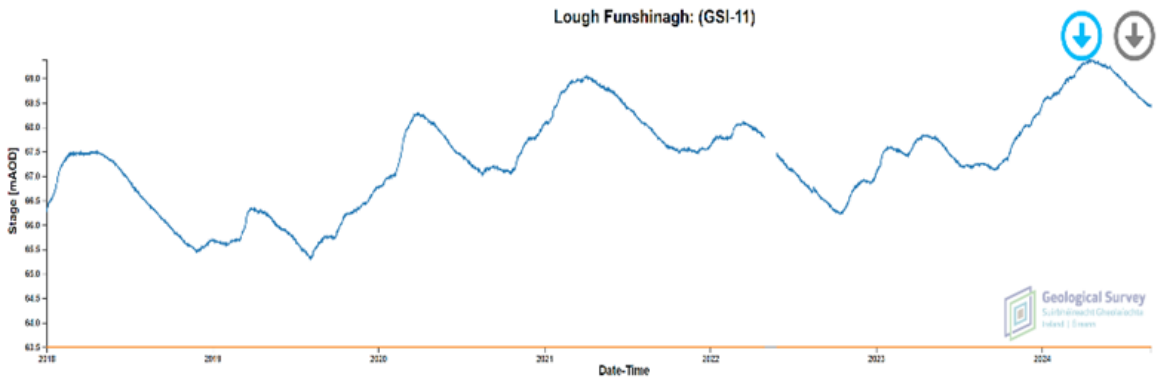

Figure 3-4 GSI monitoring water levels at Lough Funshinagh [accessed August 2024 - https://gwlevel.ie/]

[37] Drew & Burke (1996) The Disappearance of Lough Funshinagh, Co. Roscommon, September 1996, available: https://www.gsi.ie/documents/GWNewsletterNo30.pdf: [accessed August 2024]
[38] OPW, 2024 - Lough Funshinagh State of Knowledge report Draft
[39] McCormac, T et al. 2018, Karst Hydrogeology of Mid-Roscommon. Accessed at https://www.iah-ireland.org/field-guides/2018.pdf August 2024.

GSI conducted a borehole survey in September 2016 to examine the groundwater levels in relation to the water levels in the lake. A total of six domestic boreholes were measured around Lough Funshinagh and indicated the well water levels were 2-3 m below the lake level[40].

The elevated lake level, in comparison to the surrounding groundwater levels, suggest some hydraulic separation between the lake and the underlying karst aquifer, possibly due to the lake bed sediments. Therefore, the only hydraulic connection to the groundwater is provided by the swallow holes, which are presumed to provide a more direct connection to the aquifer where the rock head is close to the lake bed in the south of the lake. As a result, when the rate of inflow to the lake exceeds the outflow capacity of the swallow holes the lake level rises. The water level will lower when inflows reduce below the swallow hole discharge rate.

Hydraulic modelling of the water levels in Lough Funshinagh has been carried out by GSI to evaluate flood durations in three scenarios: the conditions pre-2015/16 (Past), the current conditions post-2015/16 (Present) and a prediction of the conditions if an artificial drainage channel was implemented at 65.8mOD (Present-altered).[41] It should be noted that the Present-altered scenario is not the design assessed within this project. The analysis shows that prior to 2015 4.6% of the SAC was flooded 90% of the time but post 2016 85% of the SAC was flooded 90% of the time. The modelling is presented spatially in Figure 3-5 and highlights the notable increase in flood duration throughout Lough Funshinagh post 2016 (A). It also illustrates that a drainage channel at 65.8 mOD would have the greatest impact at the edges of the SAC (B), and even with a drainage channel at 65.8 mOD the inner part of Lough Funshinagh will still have greater flood durations than pre-2016 (C).

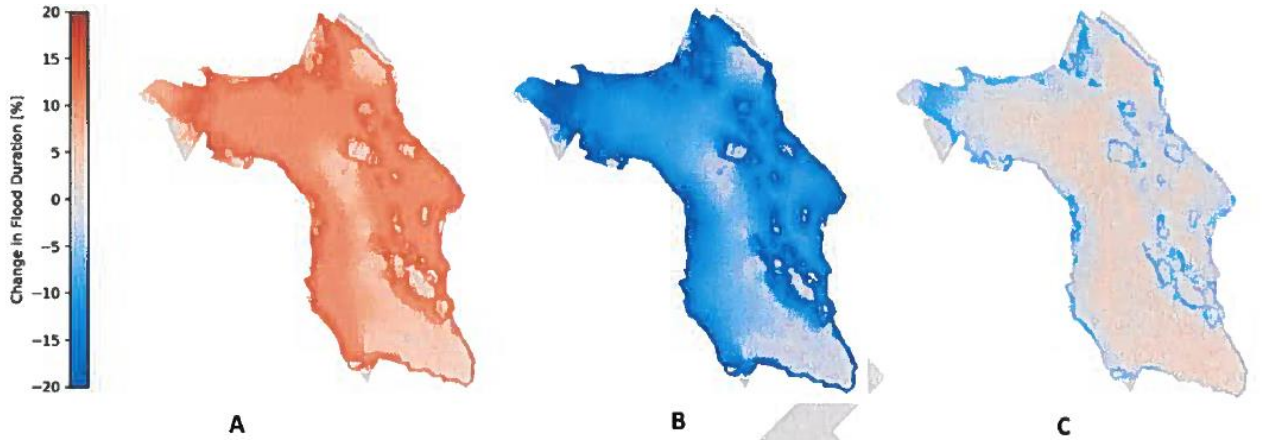

Figure 3-5 Spatial coverage of altered flood duration: A) Past vs Present Scenarios, B) Present vs Present-altered scenario and C) Past vs Present-altered scenario.

Figure 3-6 shows the cross section adopted to represent the conceptual understanding of the groundwater dynamics of Lough Funshinagh. The conceptual site model illustrates the groundwater flows primarily in a north-south direction. Water draining from the swallow holes ultimately discharges in the springs located to the south of the Cross River tributary at Atteagh Corn Mill. The alluvium and gravel deposits at the springs and Cross River present a highly permeable material through which the spring discharge can occur, see Figure 3-7.

[40] GSI, September 2016 - Preliminary Assessment of Flooding in Lough Funshinagh, Co. Roscommon.
[41] Naughton, O., McCormack, T., Regan, S. and Johnston, P. (2024) Draft Report – Modelling and Analysis of Changes to Lough Funshinagh Flood Levels

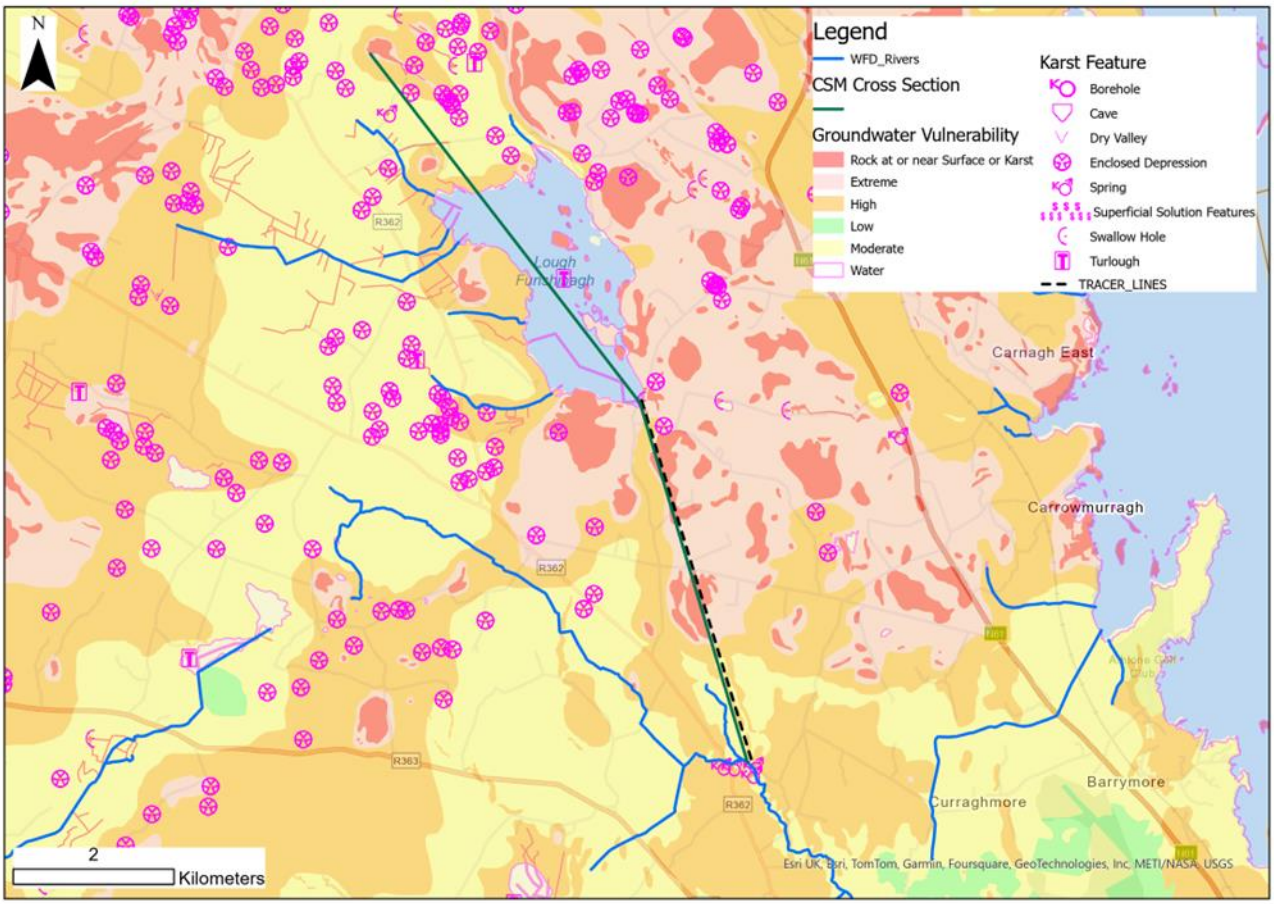

Figure 3-6 Lough Funshinagh conceptual site model cross section location

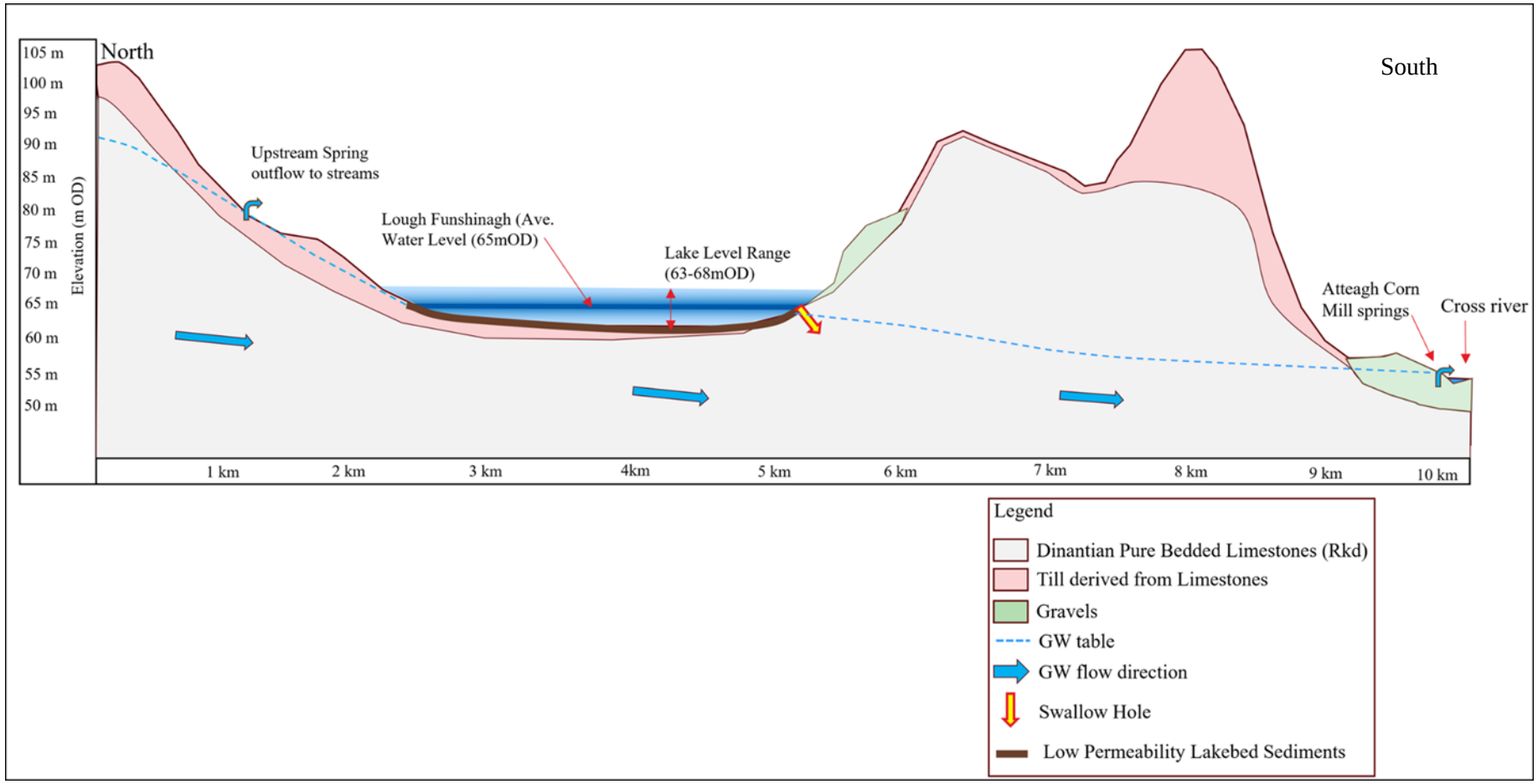

Figure 3-7 Lough Funshinagh conceptual site model

3.7 Baseline Ecological Characteristics

The below subsections describe the baseline ecological characteristics of Lough Funshinagh and the Cross River with the purpose of informing the screening assessment of the report. Information has been collated through desktop analysis and field survey of Lough Funshinagh and the Cross River by Ryan Hanley ecologists.

3.7.1 Lough Funshinagh Desk Study

3.7.1.1 Qualifying Interest Features

Vegetation ascribable to the E.U. Habitats Directive Annex I type 'rivers with muddy banks with *Chenopodion rubri p.p.* and *Bidention p.p. vegetation*' [Annex Code: 3270] occurs at Lough Funshinagh. The habitat is found on damp mineral soils, often fine, alluvial muds, but also stony substratum. This comprises vegetation of small, short-lived, fast-growing annuals that are poor competitors. Typical species of 3270 include: vernal water-starwort (*Callitriche palustris*)[42], Chenopodium rubrum (*Oxybasis rubra*), low cudweed (*Gnaphalium uliginosum*), water mudwort, pygmy smartweed (*Persicaria minor*), Iceland watercress (*Rorippa islandicasis*), orange foxtail (*Alopecurus aequalis*)[43], needle spikesedge (*Eleocharis acicularis*) cavernous crystalwort (*Riccia cavernosa*).

According to the site's Conservation Objectives[44] a large area of 3270 was recorded at Lough Funshinagh in September 2004, it was reported as abundant in northern yellow-cross with perennial aquatic species scattered over the water surface, particularly fine-leaved water-dropwort (*Oenanthe aquatica*) and water mint. The overall status for this habitat in Ireland is Favourable with a stable trend, unchanged since the 2013 assessment[25].

3.7.1.2 General Vegetation Composition

The National Biodiversity Datacentre (NBDC)[45] provides flowering plant and moss species within Lough Funshinagh and the surrounding area. The following species are indicative of the agricultural surroundings of Lough Funshinagh. Common grass species associated with dry and neutral grasslands include cock's-foot (*Dactylis glomerata*), common bent (*Agrostis capillaris*), crested dog's-tail (*Cynosurus cristatus*) and quaking-grass (*Briza media*). Common herb species associated with improved and wet grasslands were also recorded, namely cuckooflower (*Cardamine pratensis*), creeping buttercup (*Ranunculus repens*) and marsh thistle (*Cirsium palustre*). No species listed under the Flora (Protection) Order, 2022 were present in NBDC records. However, four mosses that are Near Threatened were noted. These comprise chalk hook-moss (*Drepanocladus sendtneri*), rigid beard-moss (*Didymodon rigidulus*), sessile grimmia (*Schistidium apocarpum*) and silky wall feather-moss (*Homalothecium sericeum*).

Turloughs have a range of typical floral species that can broadly be divided into wetland and aquatic species[46]. Those indicative of good condition in turloughs (positive indicator species) include the following: shrubby cinquefoil (*Potentilla fruticose*), fen violet (*Viola persicifolia*), water germander (*Teucrium scordium*), water mudwort (*Limosella aquatica*), sea plantain (*Plantago maritima*), northern yellow-cross[47] (*Rorippa islandica*) and alder buckthorn (*Frangula alnus*).

Studies on Lough Funshinagh have noted that the edges of open water are colonised by large beds of common club-rush (*Scirpus lacustris*). This grades into stands of tufted-sedge (*Carex elata*), slender sedge (*Carex lasiocarpa*) and bottle sedge (*Carex rostrata*) in some areas, and common reed (*Phragmites australis*) at the main inflow.

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[42] Regional Red List status (Lockhart et al., 2012a) Vulnerable

[43] Regional Red List status (Lockhart et al., 2012a) Near Threatened

[44] NPWS (2018) Lough Funshinagh SAC Conservation Objectives accessed at https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY000611.pdf accessed July 2024

[45] National Biodiversity Data Centre Maps Custom Polygon. Accessed at https://maps.biodiversityireland.ie/Map accessed July 2024

[46] O Connor, Á. (2017) Conservation objectives supporting document: Turloughs* and Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation. Conservation Objectives Supporting Document Series. National Parks and Wildlife Service, Dublin

[47] NPWS (2015) Lough Funshinagh SAC Site Synopsis accessed at https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY000611.pdf accessed July 2024

Previous studies from 1974[48] state that the shallower parts of the lake and shores were temporarily flooded in winter and have the typical turlough flora of terrestrial plants. These assume peculiar growth forms because of their sporadic submergence. Semi-aquatic plants such as sharp-flowered rush (*Juncus acutiflorus*), carnation sedge (*Carex panicea*) and common sedge (*Carex nigra*), with water spearwort (*Ranunculus flammula*), water mint (*Mentha aquatica*), marsh ragwort (*Senecio aquaticus*), common marsh-bedstraw (*Galium palustre*) and tufted forget-me-not (*Myosotis laxa*) are also noted in shallow areas. Marl deposits with stoneworts (*Chara spp*.) also occur in the shallow water. Internally, the vegetation shows considerable patterning, presumably related to nutrient conditions.

The lake is fringed by wet grassland, with species such as creeping bent (*Agrostis stolonifera*), marsh pennywort (*Hydrocotyle vulgaris*) and silverweed (*Potentilla anserina*), which in turn grades into pasture. A number of islands occur on the eastern side which have been experiencing higher flood levels in the past decade. They support gorse (*Ulex europaeus*) scrub, whose lower limit is controlled by the winter flooding.

On the parts of the shore inundated by high waters, species such as various-leaved pondweed (*Potamogeton gramineus*), amphibious bistort (*Polygonum amphibium*), marsh cudweed (*Gnaphalium uliginosum*), the moss *fontinalis antipyretica* and the northern yellow-cross can be found.

3.7.1.3 Birds

Lough Funshinagh (code: 0E303) is part of the South Roscommon Lakes (Site Code 0E020), a national survey site comprising various lakes. It is monitored for winter bird species through the Irish Wetland Bird Survey (IWeBS) by Bird Watch Ireland. Surveys for Lough Funshinagh have been conducted annually from 1994/95 to 2022/23, with some data gaps in 1997/98, 1998/99, 2001/02, 2003/04, 2004/05, and 2020/21. Data records were obtained from Birdwatch Ireland in relation to Lough Funshinagh and the surrounds to provide the baseline environment.

In summary, the following species have been recorded at Lough Funshinagh : black-headed gull (*Chroicocephalus ridibundus*), black-tailed godwit (*Limosa limosa*), coot (*Fulica atra*), cormorant (*Phalacrocorax carbo*), curlew (*Numenius arquata*), gadwall (*Mareca strepera*), golden plover (*Pluvialis apricaria*), great crested grebe (*Podiceps cristatus*), great white egret (*Ardea alba*), greenshank (*Tringa nebularia*), grey heron (*Ardea cinerea*), greylag goose (*Anser anser*), herring gull (*Larus argentatus*), kingfisher (*Alcedo atthis*), lapwing (*Vanellus vanellus*), lesser black-backed gull (*Larus fuscus*), little egret (*Egretta garzetta*), little grebe (*Tachybaptus ruficollis*), mallard (*Anas platyrhynchos*), moorhen (*Gallinula chloropus*), mute swan (*Cygnus olor*), pintail (*Anas acuta*), pochard (*Aythya ferina*), redshank (*Tringa totanus*), shoveler (*Spatula clypeata*), snipe (*Gallinago gallinago*), teal (*Anas crecca*), tufted duck (*Aythya fuligula*), whooper swan (*Cygnus cygnus*), and wigeon *(Mareca penelope*).

Within that list of species, eleven of those species are designated SCIs of nearby European sites.

3.7.1.4 Mammals

Mammal species records were obtained from the National Biodiversity Data Centre (NBDC) for Lough Funshinagh and the surrounding area (2 km from the turlough's shore). Species records are limited to the last ten years and to those species which are protected under the Birds and Natural Habitats Regulations and that may constitute being a QI of a SAC. Those species identified within this search area are provided within Table 3-2 below. Ryan Hanley undertook a separate data search, with results outlined within Appendix F.

Table 3-2 Protected Species records within the last ten years at Lough Funshinagh obtained from NBDC

Species name	Record count	Date of last record
Pipistrelle (*Pipistrellus pipistrellus sensu lato)*	1	23/05/2019
Soprano Pipistrelle (*Pipistrellus pygmaeus)*	1	23/05/2019

[48] Goodwillie and Fahy (1974) A preliminary report on areas of Scientific Interest in Co. Roscommon. Accessed https://www.npws.ie/sites/default/files/publications/pdf/Goodwillie_&_Fahy_1974_ASI_Roscommon.pdf

3.7.2 Lough Funshinagh Field Surveys

Walkover surveys were undertaken on 8th March 2024, 4th, 11th, 18th and 25th of July 2024 around the perimeter of Lough Funshinagh by Ryan Hanley ecologists. All habitats within the proposed scheme were classified using the Guide to Habitats in Ireland (Fossitt, 2000)[49], recording dominant species, indicator species and/or species of conservation interest. Habitats were assessed for their potential to support protected or notable species in accordance with the CIEEM guidelines[50]. The location, extent and distribution of habitats were classified and mapped based principally on vegetation. The occurrence of any invasive non-native species were recorded if identified.

A physical character (habitat) survey of each riverine survey site was undertaken by Triturus (August 2024) for instream habitats and more general ecological habitat survey by Ryan Hanley (August, 2024). Each site was described in terms of its profile, micro-habitats, naturalness, riparian composition, bordering land use patterns and the presence of threats such as invasive species. In addition, ecological appraisals of fish, macrophytes, invertebrates, and associations with Annex I habitats were undertaken.

3.7.2.1 Habitat Survey Results

A habitat map of the terrestrial environment surrounding Lough Funshinagh is provided in the Ryan Hanley 'Lough Funshinagh to Cross River Baseline Survey' report. Descriptions of the aquatic environment are provided in Section 4of the Triturus authored 'Aquatic baseline report for the Lough Funshinagh Interim Flood Relief Scheme'.

The only record of Annex I habitats were Lough Funshinagh itself, which is designated as 3180 Turlough and potential 3260 Floating River vegetation, recorded at sampling point S6 downstream on the Cross River[51]. Whilst ecology surveyors found little evidence of indicator species of '3180 Turloughs' or '3270 Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation' it should be noted that turlough extent is delineated by the extent to which the water regularly rises. The higher-than-average flood levels present in Lough Funshinagh during summer 2024 made survey for terrestrial indicator species difficult and lack of receding flood levels has meant that all of the turlough habitat at Lough Funshinagh is being negatively impacted by prolonged inundation.

Twenty-one habitats were recorded within the proposed scheme area between Lough Funshinagh and the Cross River and can be referred to within the Ryan Hanley report[23].

3.7.2.2 Aquatic Survey Results

Aquatic surveys of Lough Funshinagh were undertaken by Triturus Environmental Ltd. in June 2024. Surveys included an assessment of the aquatic vegetation community of Lough Funshinagh, sweep netting for macro-invertebrates, and assessment of fish community present via bye-catch from sweep sampling and visual observations. The surveys found Lough Funshinagh to support local representations of the Annex I habitat 'Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation [3150]'. The rich pondweed lake habitat [3150] macrophyte assemblage at Lough Funshinagh included the following species: *Potamogeton lucens, Potamogeton natans, Potamogeton crispus, Potamogeton perfoliatus, Potamogeton berchtoldii, Stuckenia pectinata* with non-Potamogeton community associates, notably *Myriophyllum spicatum* and *Lemna trisulca. Potamogeton-Myriophyllum* and *Lemna* species were often associated with more widespread *Oenanthe aquatica* and *Persicaria amphibia.* The rich pondweed habitat was restricted to shallower depositional bays on the western side of the lake basin. One invasive macrophyte species was noted within the basin- Canadian pondweed (*Elodea canadensis*). At the time of survey, no examples of Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation (3270) were visible.

No rare or protected macroinvertebrate species were recorded in sweep samples collected from Lough Funshinagh. The sweep samples recorded a high diversity of aquatic invertebrate species (71 taxa). The species communities were typical of shallow, weedy alkaline lakes and turloughs. Species recorded included *Athripsodes aterrimus, Mystacides longicornis, Oecetis furva, Triaenodes bicolor, Limnephilus marmoratus,* and *Agrypnia obsolete*.

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[49] Fossitt, J.A. (2000) Available on A Guide to Habitats in Ireland - Fossitt.pdf (npws.ie) Accessed August 2024.
[50] CIEEM (2017). Guidelines for Preliminary Ecological Appraisal, 2nd edn. CIEEM, Winchester
[51] R446 road crossing, X 601017, Y 740204

Common molluscs of lentic enriched habitats were recorded, including *Ampullacaena balthica, Bithynia tentaculata, Planorbis planorbis, and Physa fontanlis.* In addition, a high diversity of aquatic beetles were recorded, characteristic of shallow lakes and lentic waterbodies. The near threatened lipped diver (*Agabus labiatus*) which has previously been recorded in the lough was not recorded during surveys, likely due to the presence of large shoals of coarse fish. Lough Funshinagh is known to support fish species including eel (*Anguilla anguilla*), pike (*Essox lucius*), perch (*Perca fluviatilis*), roach *(Rutilus rutilus*), minnow (*Phoxinus phoxinus*), three-spined stickleback (*Gasterosteus aculeatus*) and ten-spined stickleback (*Pungitius pungitius*).

3.7.2.3 Wintering Birds

Dedicated wintering bird surveys were carried out between November 2023 and March 2024 around the entire shoreline of Lough Funshinagh. Table 3-3 below contains the results of the dedicated survey effort. Maps of the vantage points and summary of species identified on site can be found in Appendix D adjoining this report.

Table 3-3 Bird species identified on site during dedicated wintering bird survey 2023-2024 (Ryan Hanley 2024[21])

Species	Seasonality R= Resident W= Winter M= Migrant	Conservation Status BOCCI	Peak No. Recorded
Greylag goose Anser anser	W/M	Amber	105
Mute swan Cygnus olor	R	Amber	33
Whooper swan Cygnus cygnus	W/M	Amber	26
Shoveler Anas clypeata	R/W	Red	212
Wigeon Anas penelope	W/M	Amber	670
Teal Anas crecca	R/W	Amber	739
Mallard Anas platyrhynchos	R/W	Amber	157
Coot Fulica atra	R/W	Amber	5
Tufted duck Aythya fuligula	R/W	Amber	14
Moorhen Gallinula chloropus	R	Green	14
Little grebe Tachybaptus ruficollis	R	Green	8
Great crested grebe Podiceps cristatus	R	Amber	41
Lapwing Vanellus vanellus	R	Red	1485
Golden plover Pluvialis apricaria	W/M	Red	1000
Curlew Numenius arquata	W	Red	28
Snipe Gallinago gallinago	R/W	Red	14
Redshank Tringa totanus	R/W	Red	2
Black headed gull Chroicocephauls ridibundus	R/W	Amber	566
Great Black backed gull Larus marinus	R/W	Green	4

Species	Seasonality R= Resident W= Winter M= Migrant	Conservation Status BOCCI	Peak No. Recorded
Lesser black backed gull Larus fuscus	R/W	Amber	8
Cormorant Phalacrocorax carbo	R	Amber	46
Grey heron Ardea cinerea	R	Green	12
Little egret Egretta garzetta	R	Green	8
Buzzard Buteo buteo	R	Green	3
Kingfisher Alcedo atthis	R	Amber	1
Raven Corvus corax	R	Green	1

3.7.2.4 Breeding Bird Surveys

Breeding bird surveys were carried out by Ryan Hanley ecologists between April 2024 to June 2024 at Lough Funshinagh, Lough Cup and a select number of smaller wetland sub-sites within its immediate environs. Six survey visits were carried out for all terrestrial and freshwater habitats. Table 3-4 below contains the results of the dedicated survey effort in respect of species which are SCIs in SPAs surrounding the Lough Funshinagh breeding bird survey site. It must be noted that the reports denote that the table *'highlights a list (bold/shaded) of which are Qualifying interests in SPA's surrounding the Lough Funshinagh BBS site. No species identified in this breeding bird survey which occurred in numbers that were significant to national bird population trends.'*

Table 3-4 Summary of species identified during Breeding Bird Surveys that are protected within nearby SPAs surrounding the Lough Funshinagh site

Bird Species	Significant abundance in BBS	Conservation status (Red-Data, Annex 1)	Qualifying Interest in nearby SPAs
Black-headed gull	Yes	Amber	No
Cormorant	No	Amber	No
Grey heron	No	Green	No
Lapwing	**No**	**Red**	**Yes**
Mute swan	No	Amber	No
Great-crested grebe	Yes	Amber	No
Mallard	**No**	**Amber**	**Yes**
Teal	**No**	**Amber**	**Yes**
Little Egret	**No**	**Green** **Annex I**	**Yes**
Little Grebe	**No**	**Green**	**Yes**
Wigeon	**No**	**Amber**	**Yes**
Moorhen	No	Green	No
Coot	**No**	**Amber**	**Yes**
Greylag goose	No	Amber	No
Snipe	No	Red	No
Whimbrel	No	Green	No
Tufted duck	**No**	**Amber**	**Yes**
Lesser black-backed gull	No	Amber	No

Bird Species	Significant abundance in BBS	Conservation status (Red-Data, Annex 1)	Qualifying Interest in nearby SPAs
Shoveler	**No**	**Red**	**Yes**

3.7.2.5 Mammals

The presence of otter was recorded at Lough Funshinagh by a trail camera located at the south end of the turlough in shallow waters with prominent rocks (a semi submerged stone wall) approximately 400m east of the proposed scheme[23]. No bat activity surveys were carried out, however given the availability of mature trees, old stone buildings, dead trees, abundance of insects, and observations of bats during Breeding Bird Surveys, it is considered highly likely that bat roosts are present surrounding Lough Funshinagh. Two badger setts were identified surrounding Lough Funshinagh, one at the southern end (approximately 135 m east of the proposed scheme) and one at the northwestern end of the lough (approximately 3.2 km northwest of the proposed scheme). High levels of badger activity were noted south of the lough, and badger are widespread within the wider landscape surrounding the lough. In addition, pine martin (*Martes martes*) was recorded in the form of trail camera evidence within the surrounding habitats of Lough Funshinagh.

3.7.3 Cross River Desk Study

Due to the connectivity of the Cross River with the proposed scheme, this subsection provides the baseline ecological characteristics following desk study and field surveys.

3.7.3.1 Downstream European Sites

The Cross River is directly connected to the Shannon Callows SAC and Middle Shannon Callows SPA and enters the SAC/SPA at N 02733 38926 approximately 14 km downstream of the proposed scheme. These boundaries of these sites occur further west and inland from the banks of the River Shannon.

The QI features of the Shannon Callows Annex I habitats are Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) [6410]; Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*) [6510]; Alkaline fens [7230]; Limestone pavements [8240]; Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0] and *Lutra lutra* (Otter) [1355].

The SCI features of the Middle Shannon Callows are whooper swan (*Cygnus cygnus*), wigeon (*Anas penelope*), corncrake (*Crex crex*), golden plover (*Pluvialis apricaria*), lapwing (*Vanellus vanellus*) black-tailed godwit (*Limosa limosa*), black-headed gull (*Chroicocephalus ridibundus*) and Wetland and Waterbirds [A999].

The Cross River discharges into the River Shannon at N 03933 39297, approximately 22 km downstream. The River Shannon forms part of the Lower River Shannon SAC approximately 40 km downstream.

3.7.3.2 Records of QIs/SCIs

Data requests were made to NPWS[52] in respect of protected and notable species records and Birdwatch Ireland for Irish Wetland Bird Survey records (I-WeBS[53]) in August 2024. The study area submitted was given as the proposed scheme area and the length of the Cross River as it discharges into the River Shannon with a 100m buffer. I-WeBS records of peak annual and monthly counts were obtained for the Southern Roscommon Lakes, Brideswell and Shannon Callows sites[54].

There were no records within the last ten years of any protected QI species that corresponds as a designated feature of nearby SACs identified.

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[52] It must be noted that species records obtained from NPWS omit the locations of sensitive species following request by NPWS. Additionally to note 'datasets are not complete or perfect in terms of quality, so it is important to note that the absence of information in the NPWS dataset for an area, does not necessarily imply a low biodiversity value for that area'.

[53] I-WeBS data has been obtained to inform this assessment but due to the terms and conditions from acquiring this information, it has not been replicated for publication with this report. As contained within the terms and conditions adjoining the data request "*raw data are not to be given verbatim in any presentation, publication, report etc. without prior written permission from the I-WeBS office"*

[54] I-WeBS Sites, Subsites and Count Boundaries. Accessed at https://bwi.maps.arcgis.com/apps/View/index.html?appid=1043ba01fcb74c78bc75e306eda48d3a August 2024.

A summary of the I-WeBS annual counts at the respective sites is presented below in Table 3-5. For the purpose of this Screening for AA & NIS, only species which correspond as SCIs of SPA sites are presented below.

Table 3-5 Summary of I-WeBS Annual Counts (2018-2024) in respect of species which are SCIs of nearby SPAs.

Site	Species	Distance from Proposed Scheme
Southern Roscommon Lakes	Black-headed gull, black-tailed godwit, golden plover, great crested grebe, lapwing, little grebe, mallard, shoveler, teal, tufted duck, whooper swan, and wigeon	Within the footprint of the proposed scheme
Brideswell	Black-headed gull, lesser black-backed gull, whooper swan	7km south (straight line distance)
Shannon Callows	Black-headed gull, black-tailed godwit, common tern, golden plover, great crested grebe, lapwing, little grebe, mallard, shoveler, teal, tufted duck, whooper swan, and wigeon.	14km south east (straight line distance)

3.7.3.3 Geohydrology

The Cross River receives flow from Lough Funshinagh via a spring at Atteagh Corn Mill. Further downstream of the spring the Cross River discharges into the River Shannon within the River Shannon Callows SAC. This area is underlain by Dinantian Pure Unbedded Limestones which is a Locally Important bedrock aquifer which is moderately productive only in local zones (Ll). The aquifer is part of the Athlone West GWB (IE_SH_G_014) which is of Good status and 'Not at risk' of failing to achieve the WFD objectives.

Recharge to the Athlone West GWB is diffuse and karst features are less common than in the Funshinagh GWB. Groundwater flow is predominately within the top 15m of the aquifer within fractures and faults[55]. Permeabilities are typically low however local zones of enhanced permeability are expected in the vicinity of fault zones. Groundwater flow paths are generally short and localised, and discharges occur at small springs and waterbodies. The groundwater flow direction typically follows the topography and surface water catchments.

The groundwater dependant habitats within the Shannon Callows SAC include Molinia Meadows [6410], Alkaline fens [7230] and Alluvial forests [91EO]. These habitats are all downstream of the Cross River discharge point in the River Shannon. Alluvial forests [91EO] require periodic flooding along river and lake floodplains. Alkaline fens [7230] require high groundwater levels which are at or above the ground surface for a large proportion of the year. Alkaline Fens also require water with natural levels of iron, magnesium and calcium, poor in nutrients (where phosphorus is the limiting factor) and relatively rich in calcium.

3.7.4 Cross River Field Survey

A terrestrial walkover survey was conducted along 9km of the Cross River in August 2024 and at six bridging points as it flows to the River Shannon. These six bridging points were surveyed 150 meters upstream and 150 meters downstream of the bridges. The purpose of this walkover was to assess habitat suitability for key species and to record any signs or sightings, as well as key environmental factors in the surrounding areas of the Cross River. A map of the survey areas can be referred to in Figure 4.2 and 4.3 of the Ryan Hanley (2024) 'Lough Funshinagh to Cross River Baseline Survey' report.

3.7.4.1 Habitat Survey Results

The Cross River is an Order 2 river which drains into the River Shannon. Drainage ditches form several of the field boundaries and are generally shallow and well vegetated.

The Cross River is currently assigned "Moderate" WTD status and is "At Risk" of not achieving good status. The only location where Annex I quality habitat was identified on the Cross River during the walkover surveys in 2024 was 3260 Floating river vegetation at sampling point S6.

[55] GSI (2003) Athlone West Groundwater Body: Summary of Initial Characterisation, available: https://gsi.geodata.gov.ie/downloads/Groundwater/Reports/GWB/AthloneWestGWB.pdf [accessed August 2024]

3.7.4.2 Notable or Protected Species

During walkover surveys of the Cross River and its surrounding lands in 2024 several bird species were observed, however there were no observations made of species which correspond as SCIs of nearby SPA sites.

Otter spraints were identified in a number of locations on the Cross River; however, no holts or couches were identified.

Brook lamprey ammocoetes were recorded at the proposed location for discharge to the Cross River and eDNA analysis showed presence of brook lamprey likely throughout the Cross River.

eDNA analysis also identified white-clawed crayfish in the lower reaches of the Cross River, however the lack of evidence during targeted surveys in recent years means that any population in the Cross River is likely to be highly fragmented.

4. Project Description

4.1 Proposed Scheme Design

The main elements of the proposed scheme consist of:

- Intake pump system (located within the lough)
- Intake compound
- Pipeline route from the lough to the Cross River
- Pipeline outfall at the Cross River.

4.1.1 Intake Pump System

The intake pump system consists of:

- Floating pump pontoon incorporating 2 No. high capacity hydraulically driven pumps housed in a floating container with integrated fish screens
- 2 No. hydraulic power units (HPUs) (located in the bunded intake compound) to power the pumps
- 4 No. 3,000L double skinned fuel tanks (located in the bunded intake compound; and
- Floating access pontoon to provide safe access to the pontoon and support the hydraulic hoses which link the pumps to the HPUs.

Refer to scale for the layout of the intake pump system.

The intake pump system will include a facility to alter the pump flow rate as necessary, refer to Section 4.3.2 *Pumping Controls*.

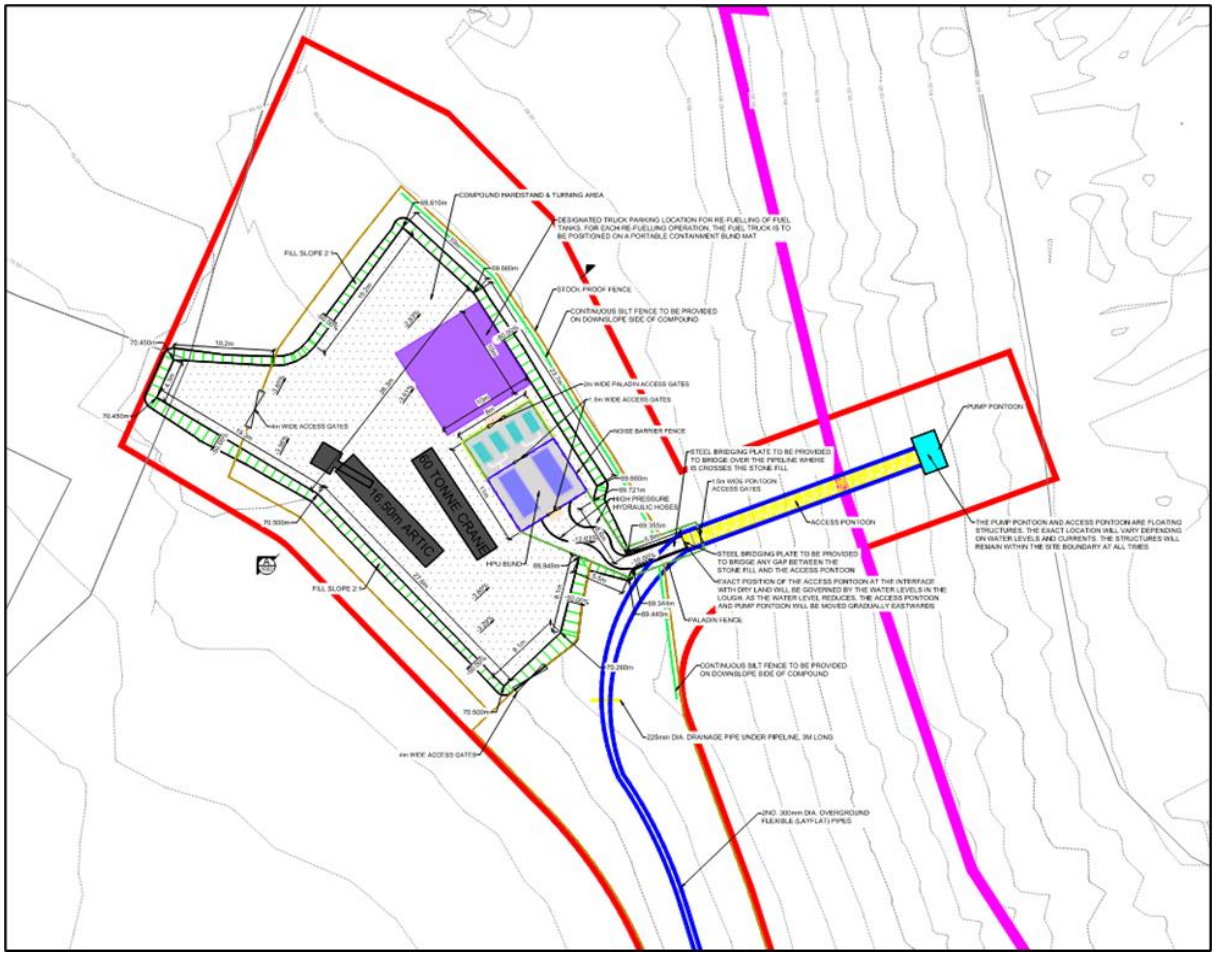

Figure 4-1 Proposed intake compound and pump layout. Source Dwg 24821-MWP-00-00-DR-C-1001 (MWP) | not to scale

4.1.1.1 Floating Pump Pontoon

The floating pump pontoon will consist of two submerged pumps enclosed in a container (2m x 1.2m x 4m), refer to Figure 4-2 below from Drawing No. 24821-MWP-00-00-DR-C-1005 (MWP).

One vertical side of the container will be fitted with a $2m^2$ mesh fish screen with a maximum opening of 10 mm. The approach velocity of the water entering through the mesh screen will be a maximum of 150 mm/second, at a total flow rate of 300 litres/second. This will ensure that juvenile fish can swim away against the current and not get entrained on the mesh.

The container will float due to the buoyancy tanks fitted and will also be stabilised in position by four 100mm diameter poles with baseplates. As the poles are not for vertical support, minimal settlement of the poles into the ground is anticipated (less than 150 mm).

The pump pontoon will be accessible from land via the floating access pontoon.

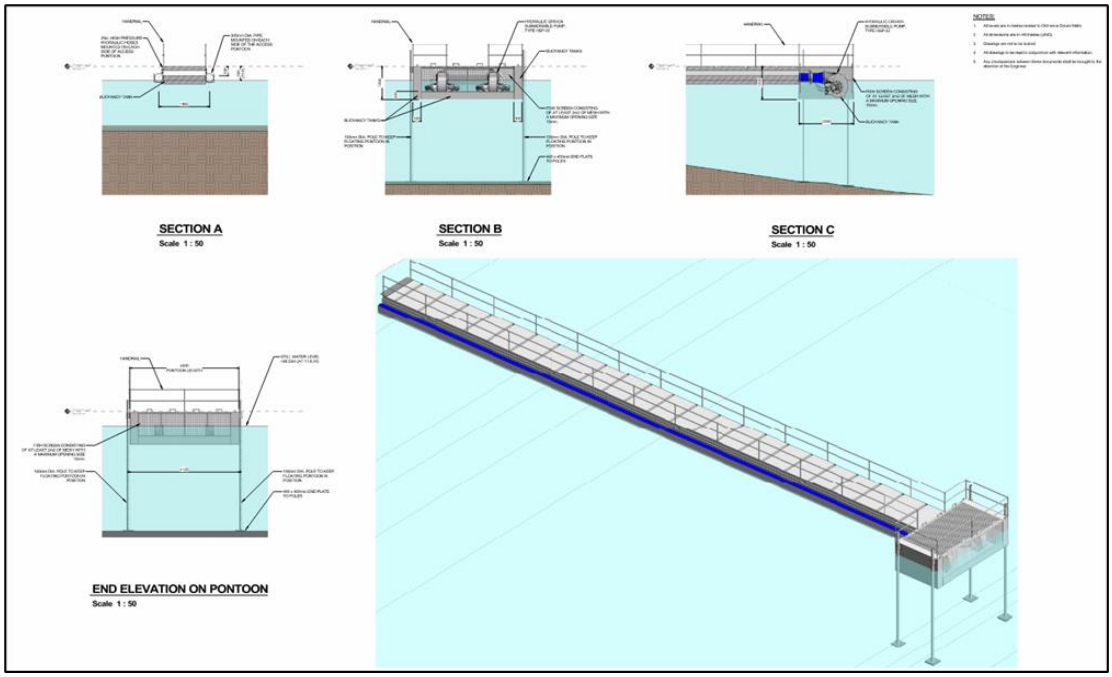

Figure 4-2 Design details of the pump pontoon (intake system). Source Dwg. 24821-MWP-00-00-DR-C-1005 (MWP) | not to scale

4.1.1.2 Floating Access Pontoon

The pump pontoon (and screen) will be accessible from land via a floating access pontoon, approximately 25.6 meters long that will extend from the lough edge, refer to Figure 4-3 below.

The access pontoon will support two pipes (305mm diameter each) mounted on either side of the pontoon that will run from the pump pontoon and will be jointed to the two 300 mm diameter flexible 'layflat' pipelines.

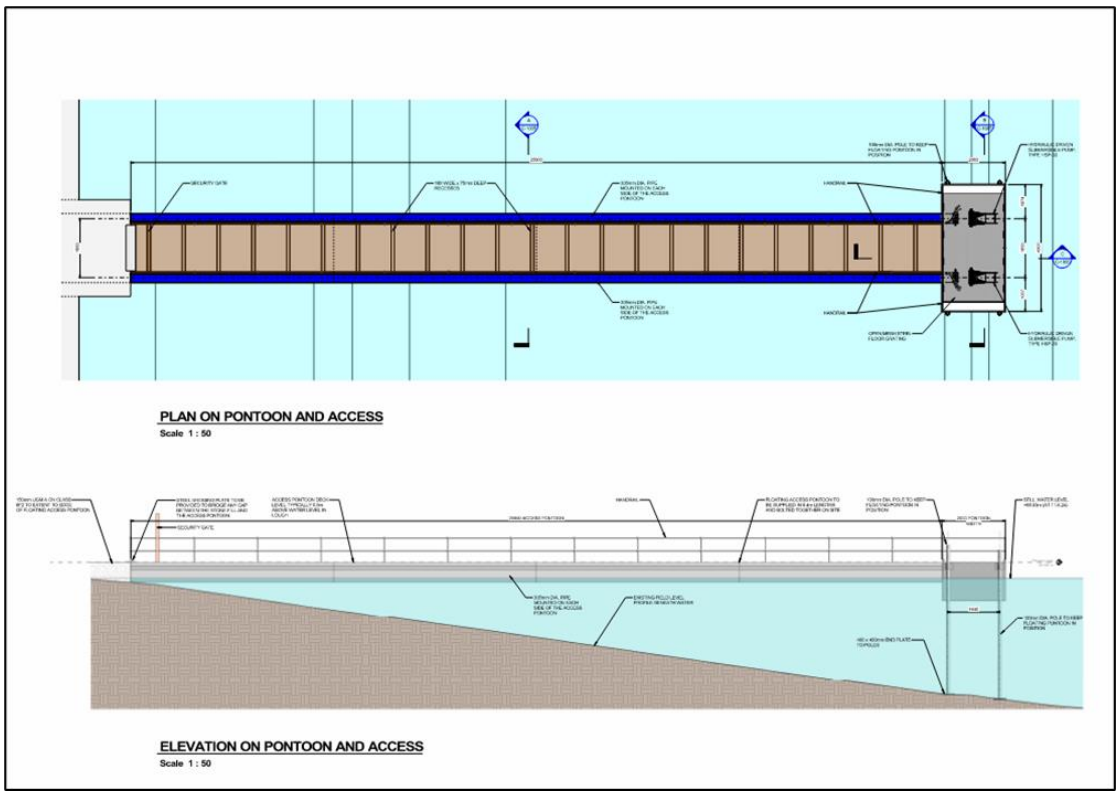

Figure 4-3 Configuration of the 2 pumps and floating pump pontoon. Source Dwg. 24821-MWP-00-00-DR-C-1004 (MWP) | not to scale

4.1.1.3 Pumping Rate and Pump Controls

The maximum flow rate has been selected taking consideration of the expected volume that needs to be removed from the lough in order to have a short-term meaningful beneficial impact and based on the flood risk assessment of the Cross River reach as well as with regard to the availability of the necessary high-capacity pumps.

Pumping will be undertaken only when the water level in the lough is above 67.5 mOD. As noted in the Engineering Report (Section 2.3, MWP 2024), the rationale for selecting a level of 67.50 mOD is that this is still above the pre-2016 "normal" maximum flood level indicated by the Lough Funshinagh Technical Subgroup (2024) and GSI (2016).

The two submersible pumps will operate in parallel with a total flow rate not exceeding 300 l/s.

The pump system together with the lake level and the flow in the Cross River will be monitored over the full duration of the scheme by Roscommon County Council.

4.1.2 Intake Compound

The overall area of the compound will be c 1,150 m^2. The intake compound is required to provide safe access for the delivery of the pump system components and to provide for safe and secure operation of the pumping system with appropriate protections in place to prevent contamination from a potential fuel spillage from the HPUs or storage tanks.

The intake compound consists of:

- 2 x 600kW hydraulic power units (HPUs)
- 4 x 3,000 litre double skinned fuel tanks, 2 for each HPU
- Concrete bund for HPUs and fuel tanks (11m x 8m) and secured with paladin fencing.

The intake compound will be located on private agricultural land located on the lough's edge. The design and location of the compound has been chosen to eliminate the risk of inundation of the tanks and pumping machinery (HPUs). The lowest elevation of the compound will be 69.22mOD. The compound will comprise a combination of a geotextile and geogrid placed directly on the grass over which a minimum thickness of 450 mm of stone will be placed as the compound base to ensure all plant and machinery will be above the peak flood height of March 2024 (69.37 mOD), refer to Figure 4-4 below.

In addition, the two 600kW hydraulic pumping units (HPUs) and four 3,000 litre diesel storage tanks will be located within a concrete bund with a minimum finished floor elevation of 70.50 mOD. The HPUs will each be placed on concrete plinths within the concrete bund, refer to Figure 4-5 below.

The HPU model to be employed will be a D600/A4VSO500 manufactured by Holland Special Pumps. Each unit measures approximately 4 m x 1.8 m x 2.35 m. The units are diesel powered with a fuel tank capacity of 100 litres housed within the HPU unit.

The HPUs will be connected to the pumps by two hydraulic hoses each via the access pontoon, refer to Figure 4-4 below.

The HPU sound level produced per unit is approximately 76 dBA at 7 meters. To provide noise mitigation a 4 m high solid noise barrier will surround the HPUs, with an acoustically absorptive material facing the power packs.

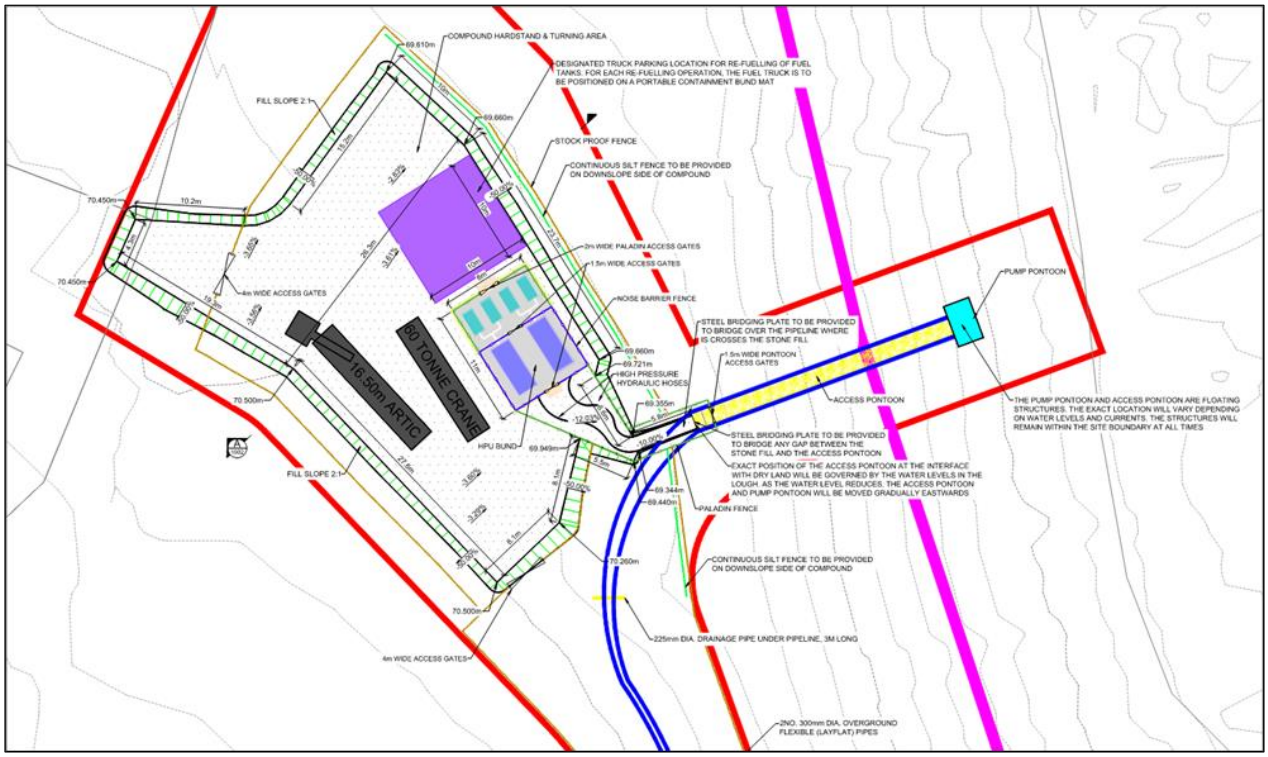

Figure 4-4 Intake compound, floating access pontoon and pump pontoon. Source Dwg. 24821-MWP-00-00-DR-C-1001 (MWP) | not to scale

4.1.2.1 Concrete Bund

As outlined above, both the HPUs and the four fuel tanks will be located within a reinforced concrete bund (11m x 8m base) with upstand walls to contain any fuel in the case of a spillage or leak. All fuel tanks are double skinned and in addition the bund will provide at least 110% storage capacity for 2 No. fuel tanks (i.e. 6,600 litres) plus an additional allowance for 75mm of rainfall accumulation.

The finished floor level of the concrete bund will be 70.58 mOD, reducing to 70.50 mOD at the sump to allow for rainwater accumulation, refer to Figure 4-5 below. The sump will be provided at the lowest corner of the bund to enable rainwater to be pumped out at regular intervals during the operational phase. The upstand walls also serve as a wheel stop to prevent vehicles accidentally impacting the fuel tanks during turning manoeuvres.

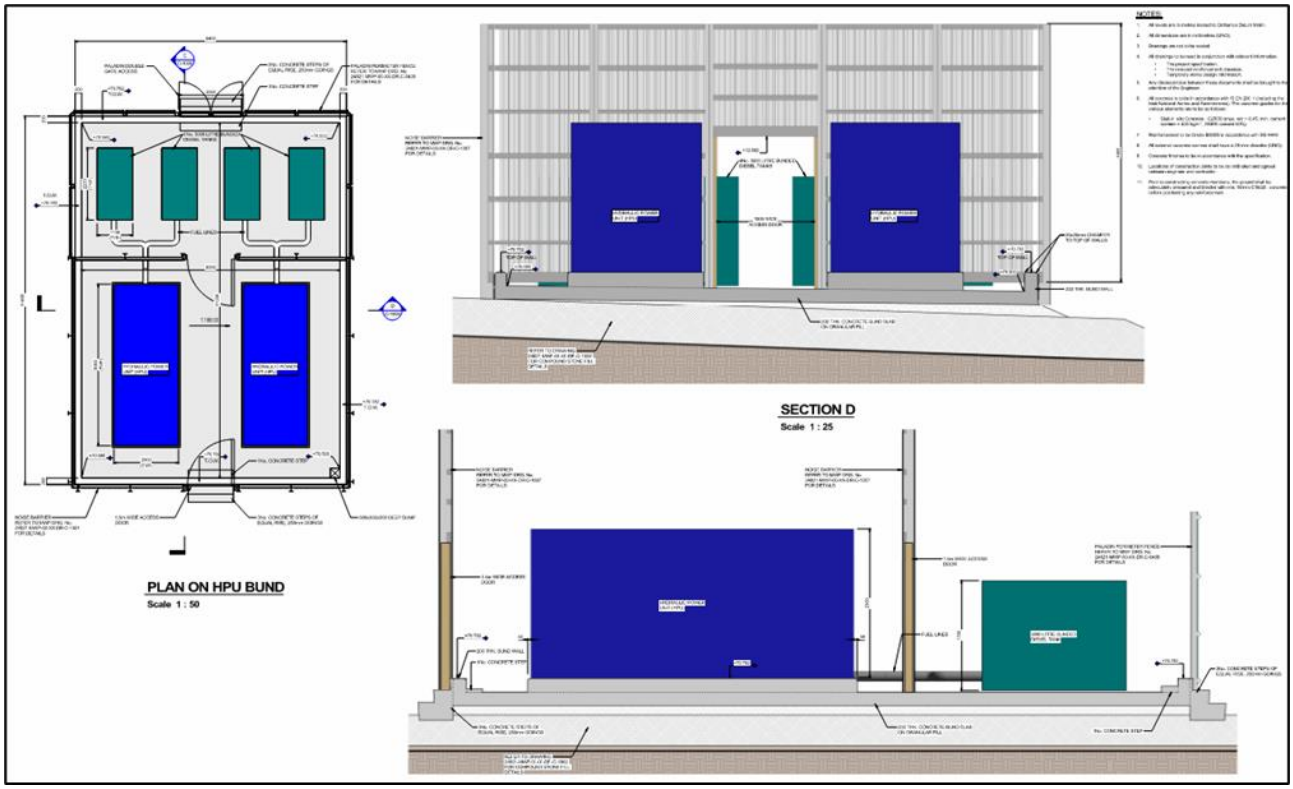

Figure 4-5 Configuration of concrete bund containing 4 no. fuel tanks and 2 no. HPUs. Source Dwg. 24821-MWP-00-00-DR-C-1006 (MWP) | not to scale

4.1.2.2 Compound Base

The compound base will be made up of a minimum thickness of 450 mm stone hardstand area suitable for vehicular traffic, including loading/unloading of delivery vehicles and fuel trucks. The total footprint of the hardstand area will be c. 1150 m^2. The hardstand area is sized to provide for safe truck turning within the compound. During construction the articulated delivery lorry (16.5 m long) and 60-tonne crane used to deliver and place the plant into position will utilise the hardstand area within the compound, refer to Figure 4-5 above.

4.1.2.3 Fencing and Security

A stock proof fence will be installed around the perimeter of the compound. An agricultural access gate (Figure 4-6) will be provided at the northern end of the compound to facilitate access. An additional gate will be provided at the southern end of the compound to enable the landowner to access the agricultural lands to the south.

For security and safety reasons, a paladin fence will be erected to secure the perimeter of the HPU/tank bund and access point to the floating access pontoon.

Access for the landowner to their lands will be maintained at all times.

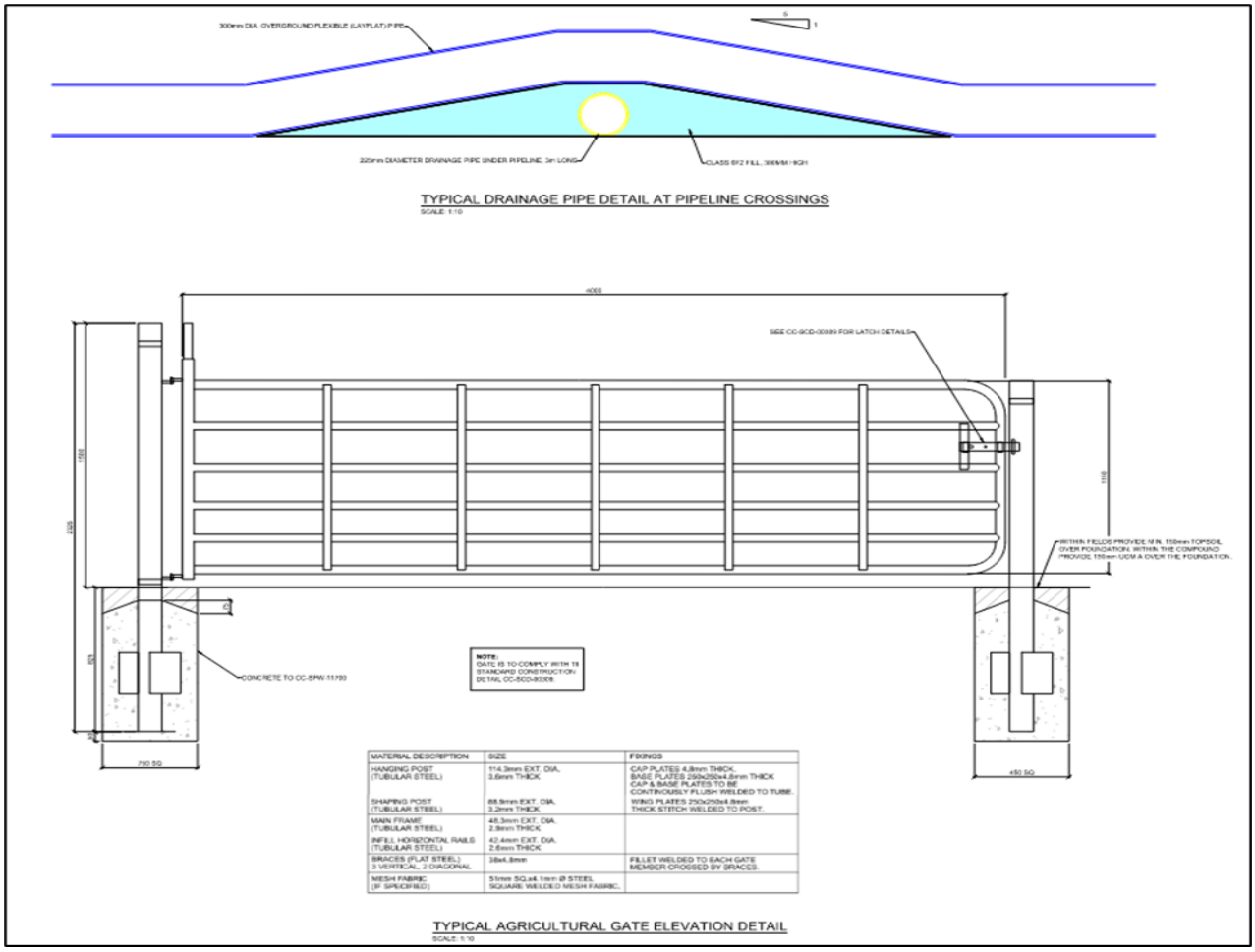

Figure 4-6 Agricultural gate design. Source Dwg. 24821-MWP-00-00-DR-C-0404 (MWP) | not to scale.

4.1.3 Pipeline Route to the Cross River

The purpose of the pipeline is to convey the water from the pump intake system to the outfall at the Cross River. The route of the pipe has been selected so that it runs along property boundaries for the majority of its length as this will minimise disruption to landowners.

The total length of the pipeline will be 2.7 km:

- From the pump pontoon to the 2 No. 300mm diameter flexible pipes – c. 0.25 km
- From the 2 No. 300mm diameter flexible pipes to the PE ribbed pipe – 2.13 km
- From PE ribbed pipe to outfall at the Cross River (500mm diameter PE ribbed pipe) – 0.32 km.

The pipe between the pump intake system and PE ribbed pipe will consist of two parallel 300 mm diameter flexible pipes covering a length of c. 2 km from the intake system to a point 160 m south of the L2013 road and will comprise 50 m to 200 m lengths (typically 200m) of flexible pipe. These flexi pipe lengths will be jointed using bolted collars and placed on the ground and will operate under pressure with full bore flow. At full capacity each flexible pipe will weigh 77kg per meter length. The pipeline will cross 10 existing hedgerows/ fences and at each crossing a 5 m gap will be cleared.

At the transition point south of the L2013, the flexible pipes will be connected via a manifold to a single PE ribbed pipe 500 mm in diameter (c.320 m long) which will terminate at the outfall to the Cross River.

The PE ribbed pipe will operate under gravity flow and will flow half full at a velocity of c. 4.10 metres/second when the pumps are discharging at a rate of 300 litres/second.

The PE ribbed pipe will consist of lengths varying between 5 m and 12 m of jointed pipe laid directly on the ground and will operate under gravity along the downhill approach to the outfall which has a gradient of approximately 3%. At full capacity the PE pipe will weigh 109 kg per meter length. Settlement is not likely to exceed 50 mm for flexi pipe and the PE ribbed pipe.

Due to badger activity in the field where the PE ribbed pipe will be placed, a provision will be made for badgers to cross the PE ribbed pipe by constructing a ramp over the pipe.

Sections of pipe will also be provided through the fencing to facilitate movement of badgers in the area across the stock proof fencing.

4.1.3.1 Fencing

The pipeline route will where possible be located parallel and adjacent to property boundaries and existing fencing and hedgerows to minimise the disruption to landowners. The route will be fenced off with wooden post and wire fencing to prevent livestock and people from interfering with the pipeline. The fencing will provide a clearway of 5 m to 7 m wide to allow for a vehicle to access the pipeline route for routine inspections.

All fencing will be removed on completion of the pumping works.

The pipeline will be inspected daily to check for leaks or damage.

4.1.3.2 Road Crossings

The pipes will run overground throughout except at road crossings, which will be required at three locations:

- Private access road adjacent to the R362 road
- R362 regional road
- L2013 local road.

These road crossings will consist of two 600 mm diameter PE ribbed carrier pipes laid under the road, through which the pair of flexible pipes can be routed. These will be installed by open excavation followed by backfilling of the trench and reinstatement of the road. A short section of open excavation will remain on both sides of each crossing. The existing hedgerow will be removed on both sides of the road over a width of approximately 5m.

The pipeline will be installed in two segments such that only partial road closure will be required for up to two days at each public road crossing location. One lane of traffic will be kept open to maintain traffic flow.

4.1.4 Outfall

The outfall at the Cross River has been designed to prevent potential erosion of the riverbanks and bed. The outfall consists of the following key features (Figure 4-7 below):

- A geotextile layer will cover the riverbed and extend up both the sides of the riverbanks
- Rock armour will be used to hold the geotextile in position, prevent erosion and dissipate energy from the pipeline
- A diffuser tee fitted will be fitted at the end of the PE ribbed pipe to dissipate energy and distribute the flow over a larger area of riverbank. The tee will have a series of 36 no. 80 mm diameter holes drilled at 120 mm spacing on the side opposite to the PE ribbed outfall pipe
- Rock armour will be built up around the ends of the diffuser tee to further dissipate the energy from water discharging from the ends of the tee.
- A 1.60 metre width of the riverbed will be covered with natural flag stones to hold the geotextile in place and to allow unhindered fish passage, as recommended by Inland Fisheries Ireland. The top of the flag stones will have an exposed aggregate finish. The leading edge and tail edge flag stones at the upstream and downstream interfaces with the existing riverbed will be level with the existing riverbed to avoid localised erosion.

At the outfall location, as detailed above, a geotextile layer will cover the riverbed and extend up the side of the riverbanks on both sides to protect the integrity of the riverbed from potential erosion from the outflow. The central part of the riverbed will remain free from rock armour so as not to impede fish passage. The geotextile will extend over a length of 10m, centred on the outflow location (5m upstream and 5m downstream of outflow).

Natural flag stones with an exposed aggregate finish will be placed over a 1.6m width of the riverbed with the leading edge and tail edge of the flags at the upstream and downstream interfaces placed level with the existing riverbed to avoid localised erosion.

The geotextile will be held in place by rock armour which consists of 200 kg rocks approximately 0.5 m in diameter. The types of rock used will be strong, inert rock, free from cracks/ joints to ensure the rock will not break down and affect the river environment.

The water from the outfall pipe will run onto the rock armour on the north (left) bank and this will dissipate the energy of the flow and allow it to enter the river in a controlled manner without causing erosion. Due to the significant depth of the channel, the diffuser tee will remain well above the water level in the river when pumping is being carried out.

The geotextiles, flags and rock armour will remain in place for the duration of the interim scheme. The geotextiles, flags and rock armour will be removed on the completion of the scheme.

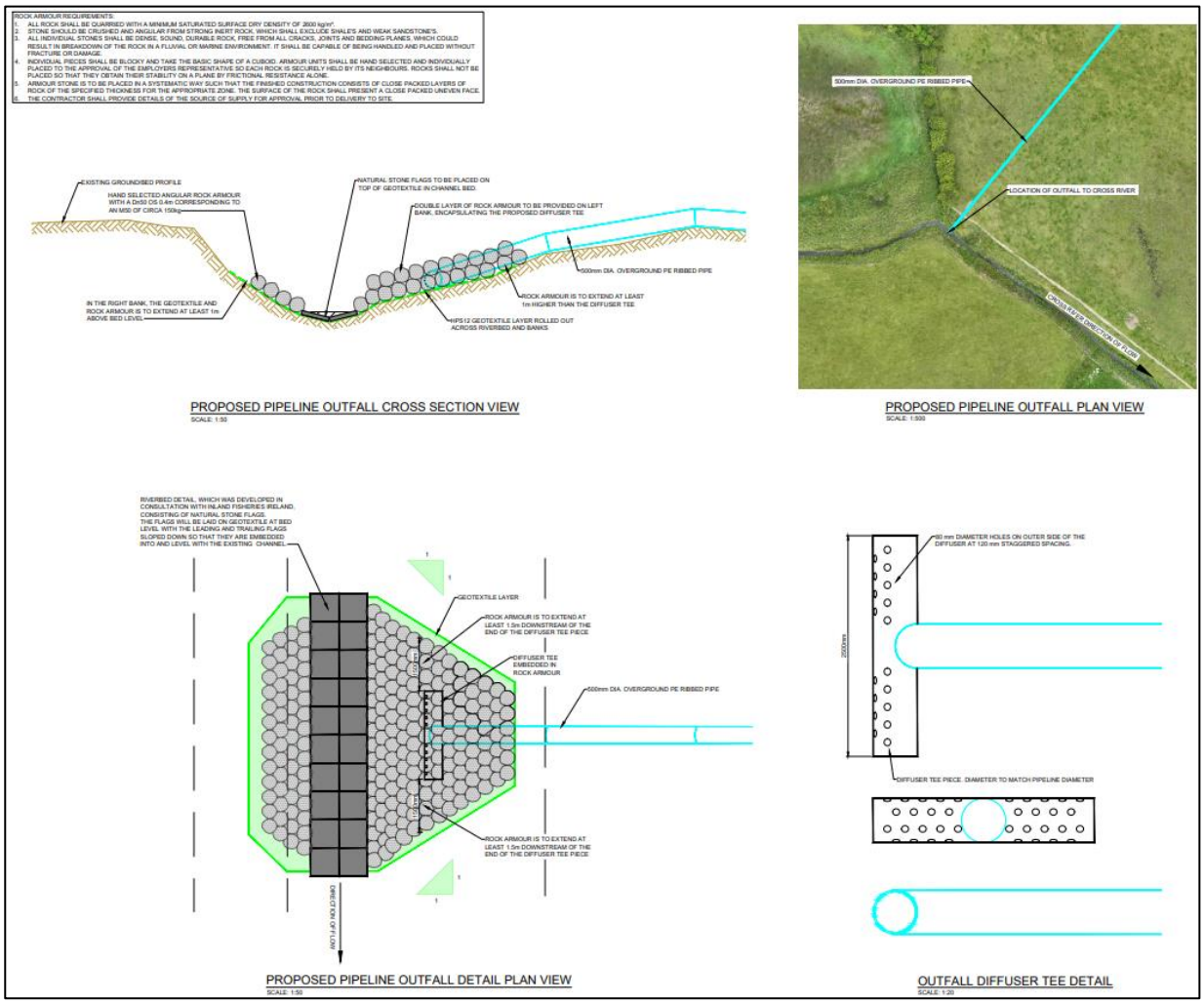

Figure 4-7 Outfall design. Source Dwg. No. 24821-MWP-00-00-DR-C-1003 (MWP) | not to scale

4.2 Construction of the Proposed Works

This section describes the works required to construct, install and commission the proposed scheme.

4.2.1 Phasing of works

Some works may be carried out concurrently where possible however the overall phasing of the works will likely be as follows:

- Construction of the intake compound
- Installation of the pump intake system i.e. HPUs, pump pontoon and floating access pontoon
- Laying of pipeline along the pipeline route including road crossings and fencing
- Installation of outfall; and
- Equipment installation and setup.

It is anticipated that the construction works will take approximately one month to complete. It is expected that the civil works will be completed in 3-4 weeks and that the installation and setting up of equipment will take one week.

4.2.2 Intake Compound

The compound will be constructed without excavating the existing ground. A combination of geogrid and geotextile will be placed over the vegetation on the existing surface within the footprint of the compound. A minimum thickness of 450mm of imported stone (Class 6F or similar) will be placed on top of the geogrid and geotextile. The total footprint of the hardstand area at the will be c. 1,150 m^2.

A site inspection by the design engineering team and landowner knowledge of the land have determined the ground conditions to be suitable for the size and nature of compound designed for the proposed scheme.

4.2.2.1 Intake Compound

The construction of the intake compound will involve the following sequence:

- The appointed contractor will mark out the line of the proposed compound using a GPS / total station
- A layer of geogrid / geotextile will be rolled out by hand along the line of the proposed compound
- The stone aggregate used to construct the compound will be imported from a local quarry using trucks. The trucks will reverse tip the stone onto the geogrid / geotextile and an excavator will be used to spread the stone before compaction. Compaction of the stone material will be completed using the Transport Infrastructure Ireland (TII) Specification for Roadworks. This is typically completed in layers with the use of a vibratory roller or similar
- The compound will be constructed with a minimum crossfall of 3% to ensure that water can flow off the surfaces and to reduce the risk of rutting / potholes occurring
- Surface water runoff from the compound will be discharged directly over the edge of the stone embankment and a continuous silt fence will be constructed on the downslope side to capture any sediment that may run off the surfaces
- The timber posts in the stockproof fence will be driven into the existing soil without any excavation.

4.2.2.2 Concrete Bund

- A concrete bund measuring 11m x 8m will be constructed inside the compound to support the HPUs and fuel tanks and to contain any fuel in the event of a spillage. The slab will be cast directly onto the imported stone used to construct the compound. The slab will include reinforcement to prevent leakage. The upstand walls will be cast in-situ using conventional formwork
- The acoustic barrier, 4 m in height, will be fixed directly to the HPU bund upstand walls or slab

- The paladin fence posts will be secured to concrete blocks (Kelley Blocks or equivalent) so as to avoid disturbance of the underlying ground. Refer to the drawing in Figure 4-8 for details of fences.

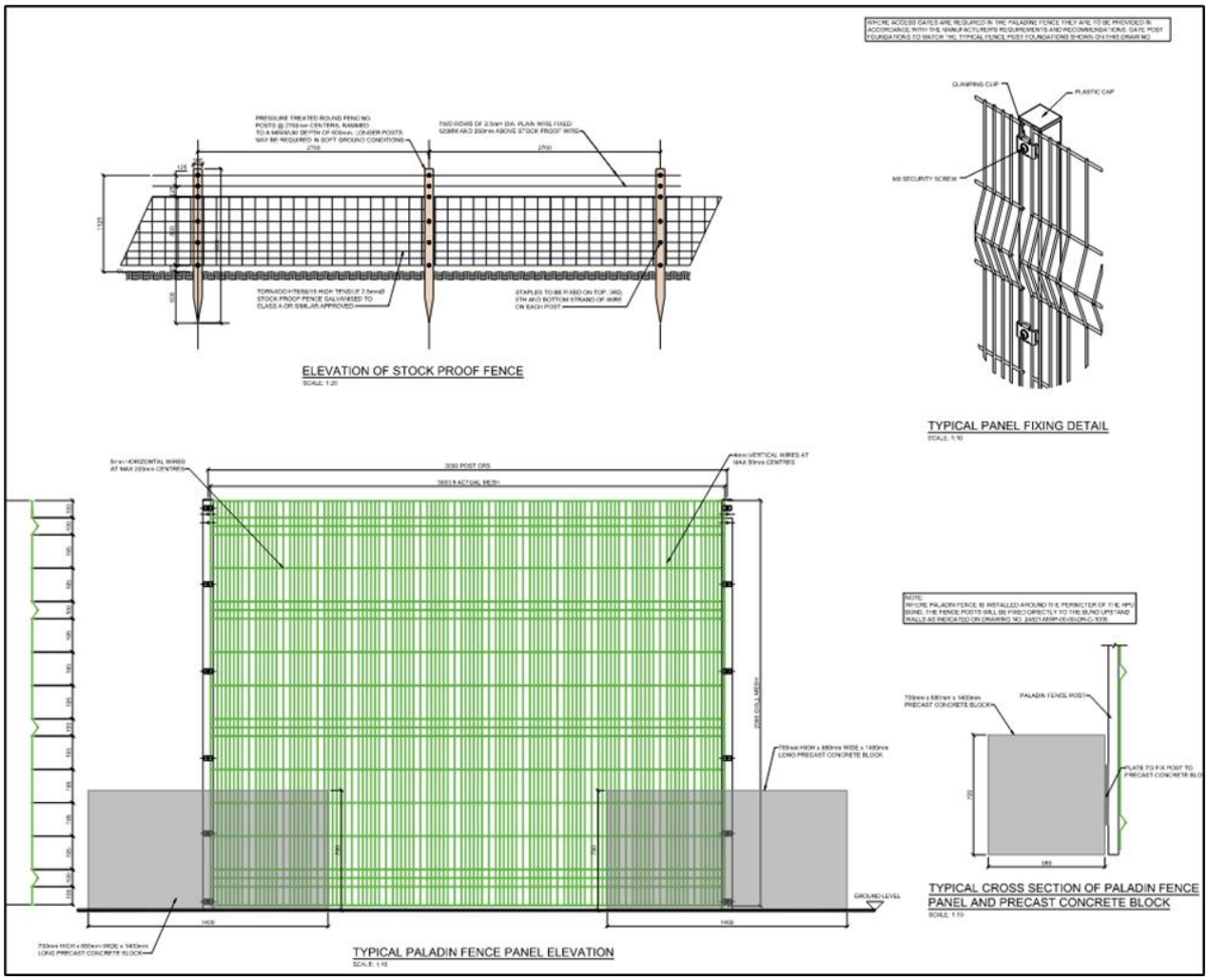

Figure 4-8 Design detail of paladin fence installation. Source Dwg. 24821-MWP-00-00-DR-C-0403 (MWP) | not to scale.

4.2.3 Pump Intake System

The construction of the pump intake system will involve the following sequence:

- The pump pontoon and access pontoons will be manufactured in the Netherlands and will be transported to site on an articulated truck. The HPUs and fuel tanks will also be transported from the Netherlands on an articulated truck. The trucks will deliver all these components to the intake compound.
- A 60-tonne mobile crane will be used to lift the pump pontoon (with the pumps already installed within it) from the truck in the compound to the lough. The pump pontoon will be floated into its final position and held in place horizontally using 4 no. spud legs (100 mm diameter) fixed with end plates, which will rest on the ground beneath the water. A small boat will be in the water to assist with positioning.
- The same crane will lift the HPUs and fuel tanks into position within the HPU bund.
- The floating access pontoons will be transported to the site in 5 no. 6.4m lengths. Each section will be lifted into position in the lough using the crane and bolted together.
- The hydraulic hoses and 2 no. c.300 mm diameter pipes will be mounted on the sides of the floating pontoons using brackets.
- The fuel tanks will be filled with diesel using a fuel truck.
- The pump system will be tested and, after installing the remainder of the pipeline, it will be commissioned.

4.2.4 Pipeline Route to the Cross River

4.2.4.1 Laying of Pipeline

Vegetation clearance will be required where the pipes must cross ditches however only space for the two pipes will be required and these locations will be replanted on removal of the temporary pipeline. Similarly, it may be necessary to cut through concrete walls or dismantle stone walls to allow the pipeline through such boundaries. All such boundaries will be reinstated once the pipeline is removed.

The construction of the pipeline will involve the following sequence:

- The flexible layflat hose and PE ribbed pipe system will be supplied from the Netherlands and will be transported to site on articulated lorries
- The layflat hose will be supplied in 50 m to 200 m lengths (typically 200 m) and will be housed in a container for transport. The container will be lifted off the trucks and onto a flatbed trailer which will be attached to a tractor or excavator. The tractor or excavator will drive along the route of the pipeline and deploy the hose directly onto the ground surface. The final positioning of the hose will be done by hand
- The pipeline will need to pass through a number of field boundary fences/hedgerows, as shown on the engineering report drawings (24821-MWP-00-00-DR-C-0100, 24821-MWP-00-00-DR-C-0101, 24821-MWP-00-00-DR-C-0102, 24821-MWP-00-00-DR-C-0103). At each location, the existing boundary fence/hedgerows will be removed over a width of 5 m which is required to allow both the pipeline and a tractor/excavator to pass through
- Cross drains consisting of HDPE drainage pipes will be laid directly on the ground beneath the layflat hose at appropriate intervals to maintain the existing drainage regime on the site. This approach eliminates the need to excavate new drainage channels or alter the existing flow regime
- The PE ribbed pipeline will be supplied in lengths varying between 5 m and 12 m and will be connected using rigid joints. The pipe sections will be loaded from the articulated lorry to a flatbed trailer attached to a tractor or excavator. The tractor or excavator will drive along the route of the PE ribbed pipe and will be followed by an excavator which will be used to lift the pipes from the trailer to the required position on the ground
- Due to the existing surface condition, which has a number of localised humps and depressions, the line of the 500mm diameter PE ribbed rigid pipe will be smoothened out. This will be achieved using an excavator to compact and level out any localised humps/depressions. The maximum depth change will be 150mm which is less that the depth of influence in conventional agricultural tilling
- The layflat flexible pipe will be connected to the PE ribbed pipe using a bespoke fabricated manifold section
- A provision will be made for badgers to cross the PE ribbed pipe by installing ‘Badger Gates’ in the fencing. This consists of sections 300mm diameter pipe placed through and perpendicular to the wire fencing to allow badgers to travel through.

4.2.4.2 Fencing Installation

A stock proof fence will be provided both sides of the pipeline along the full length of the route and will incorporate timber posts which will be driven into the existing soil without any excavation. The stock-proof fence will consist of wooden post and wire fencing. Refer to Figure 4-8.

4.2.4.3 Road Crossings

There will be two public road crossings along the route (the R362 and L2013) and one crossing of a private road. A shallow trench will be excavated across each road and a concrete pipe installed through which the flexible pipes will subsequently be pulled. It is anticipated that the trenching works will take up to two days for each installation and one lane of traffic will be kept open to maintain traffic flow. It is known that an existing Uisce Éireann watermain and a fibre optic cable are present in the roads.

The construction of road crossings will involve the following sequence:

- On the public roads, in order to allow traffic to continue to use the roads, the pipe will be installed in two segments such that at least one traffic lane remains open at all times
- Prior to undertaking any works, a CAT scan will be undertaken to identify any services in the road
- An 1800 mm wide trench will be excavated across the road to accommodate 2 no. 600 mm diameter HDPE carrier pipes. The overall trench depth will be approximately 2,000 mm to provide sufficient cover to the pipe and to ensure that the existing services can be avoided
- The HDPE carrier pipe will be positioned onto a 100 mm thick layer of pipe bedding material placed at the bottom of the trench. Once the carrier pipe is in position the trench will be backfilled and the road will be reinstated
- The existing hedgerow will be removed on both sides of the road over a width of approximately 3 m. These will be reinstated following installation of the carrier pipes
- At each side of the road, the trench will extend past the pipe into the field and will be sloped upwards to meeting the existing field level as shown Figure 4-9 and Figure 4-10. A handrail will be erected around the trench in the field
- The flexible pipes will be placed through the carrier pipe.

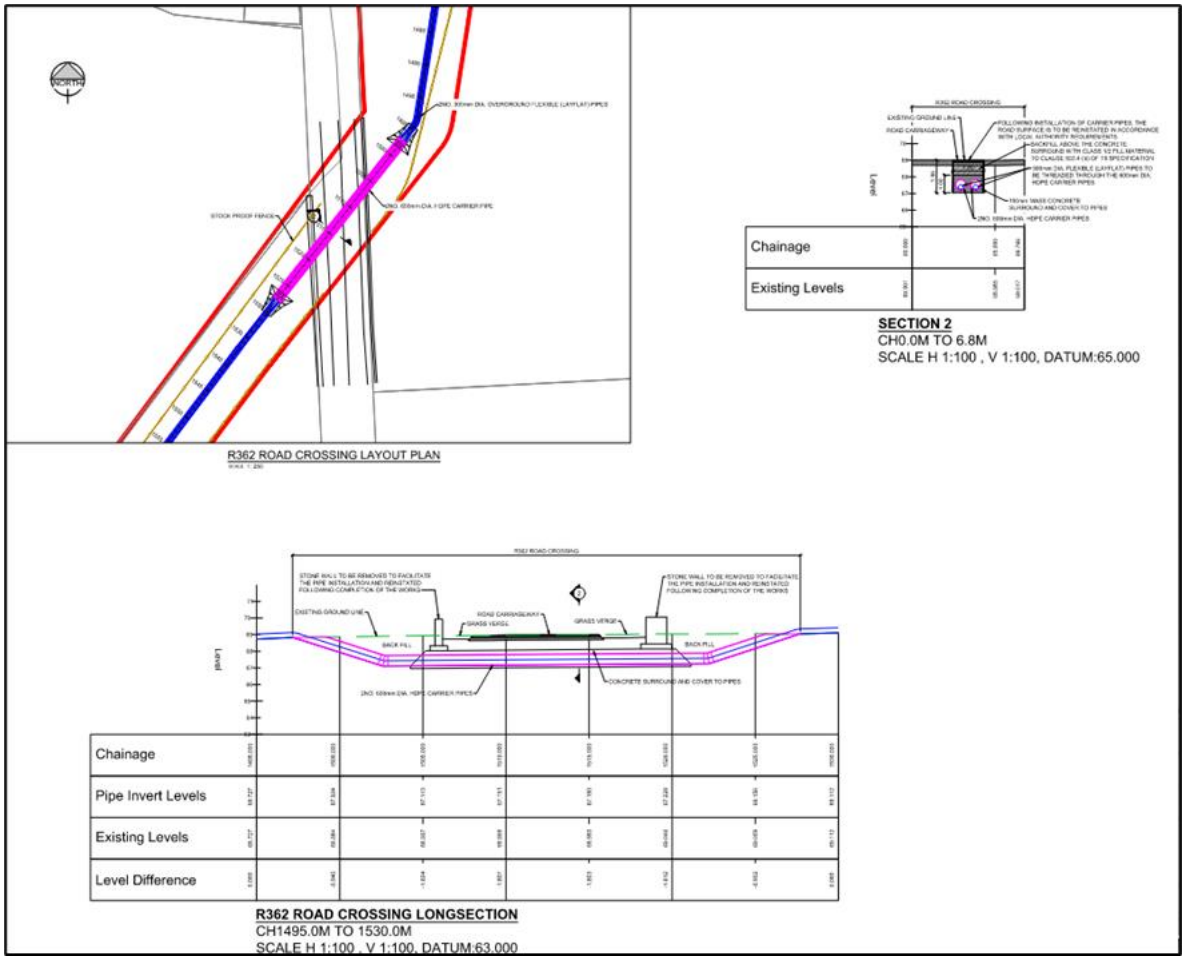

Figure 4-9 Proposed R362 road crossing detail. Source Dwg. 24821-MWP-00-00-DR-C-0401 (MWP) | not to scale

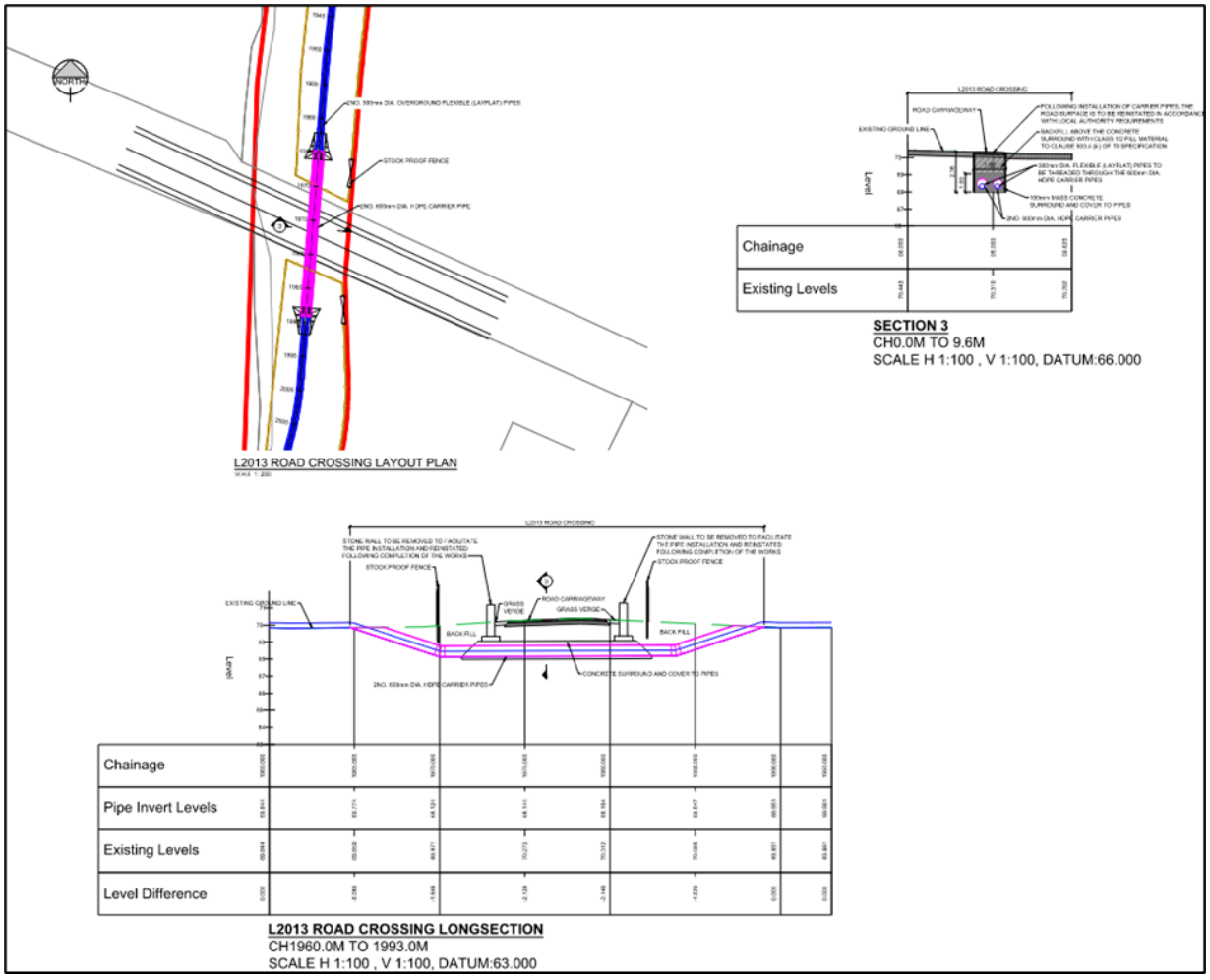

Figure 4-10 Proposed L2013 road crossing detail. Source Dwg. 24821-MWP-00-00-DR-C-0402 (MWP) | not to scale

4.2.5 Outfall

No excavation works or vegetation removal will be required at the outfall location.

The construction of the outfall will involve the following sequence:

- The geotextile will be supplied in a roll and transported to the outfall location by an excavator
- The rock armour and natural flag stones will be transported to the outfall location using a tipper truck or tracked dumper
- As noted on drawing 24821-MWP-00-00-DR-C-1003:
  - All rock shall be quarried with a minimum saturated surface dry density of 2600 kg/m³
  - Stone should be crushed and angular from strong inert rock, which shall exclude shales and weak sandstones
  - All individual stones shall be dense, sound, durable rock, free from all cracks, joints and bedding planes, which could result in breakdown of the rock in a fluvial or marine environment. It shall be capable of being handled and placed without fracture or damage
  - Individual pieces shall be blocky and take the basic shape of a cuboid. Armour units shall be hand selected and individually placed to the approval of the Employers Representative so each rock is securely held by its neighbours. Rocks shall not be placed so that they obtain their stability on a plane by frictional resistance alone

  - Armour stone is to be placed in a systematic way such that the finished construction consists of close packed layers of rock of the specified thickness for the appropriate zone. The surface of the rock shall present a close packed uneven face
  - The contractor shall provide details of the source of supply for approval prior to delivery to site.
- The geotextile will be rolled out across the full width of the channel from top of bank to top of bank
- An excavator will be used to systematically position rock armour and natural flag stones onto the geotextile, starting at the bottom and working upwards to ensure stability is maintained. The finished construction consists of close packed layers of rock of the specified thickness for the appropriate zone
- The PE ribbed pipe will be laid as far as the top of the channel bank using the method outlined in the previous sub-section. The pipe will be mitre cut and jointed to another pipe section by fusion welding a coupler so that the jointed section will be oriented downwards following the riverbank gradient
- The diffuser tee will have been pre-fabricated and will be fixed to the end of the pipe with a rigid joint
- Additional rock armour will be placed around the ends of the diffuser tee to ensure that water discharging from the ends must flow around and through the rock armour before entering the river.

4.2.6 Service Diversions

Services will potentially be encountered during the road crossing works. As noted above in Section 4.2.4.3, the overall trench depth will be approximately 2,000 mm to provide sufficient cover to the pipe and to ensure that the existing services can be avoided.

4.2.7 Traffic Management

As noted in Section 4.2.4.3, traffic management measures will be required during the installation of the pipeline under the public roads. One lane of traffic on the public roads will be maintained at all times.

4.2.8 Environmental Management During Construction

4.2.8.1 General

A construction environmental management plan (CEMP) has been prepared and will be updated throughout the duration of the proposed scheme.

Every effort will be made to ensure that any detrimental environmental effects will be avoided, prevented or reduced during the construction phase of this project.

The CEMP comprises all of the construction mitigation measures, which are set out in this report and the following reports submitted with the statutory approval application:

- Screening for Appropriate Assessment (AA) and Natura Impact Statement (NIS) Report
- Ecological Impact Assessment Report
- Archaeological Impact Assessment Report
- Water Framework Directive Assessment.

The CEMP will be updated by RCC with any additional measures which are required by the statutory consent conditions and will be provided to the appointed contractor.

Implementation of the CEMP will ensure disruption and nuisance are kept to a minimum. The plan will have regard to the guidance contained in the handbook published by Construction Industry Research and Information Association (CIRIA) in the UK, Environmental Good Practice on Site Guide, 4th Edition (CIRIA 2015).

4.2.8.2 Waste Arising

All waste arisings during construction will be managed in accordance with the waste hierarchy, in compliance with the provisions of the Waste Management Acts, 1996, as amended, and to contribute to achieving the objectives set out in the Waste Action Plan for a Circular Economy (DECC, 2020).

4.2.9 Landowner and Community Liaison

Roscommon County Council (RCC) will coordinate communications and liaise with affected landowners and the local community during all phases of the proposed scheme. RCC will liaise with residents and the general community during the construction phase to ensure that any disturbance is kept to a minimum and to ensure that all anticipated nuisances are minimised and that the construction activity will have the lowest possible impacts on the residents and other properties.

4.2.10 Construction Management

RCC will have a construction management team on site for the duration of the construction phase. This team will supervise the construction of the scheme including monitoring the contractors' performance to ensure that the proposed construction phase mitigation measures are implemented and that construction impacts and nuisance are minimised.

4.2.11 Construction Safety

All contractors and subcontractors must progress their works with reasonable skill, care and diligence and, at all times, proactively manage the works in a manner most likely to ensure the safety, health and welfare of those carrying out construction works, pedestrians, road users and other interacting stakeholders. Measures related to construction health and safety are detailed in the CEMP.

A Project Supervisor Design Process (PSDP) has been appointed by RCC.

RCC will appoint the Project Supervisor Construction Stage (PSCS) for the construction stage of the project to manage and co-ordinate health and safety matters during the construction stage. The PSCS will be appointed before the construction work begins and remains in that position until all construction work on the project is completed.

4.3 Operations & Maintenance Activities

RCC will appoint an operations contractor to oversee all operations and maintenance activities.

4.3.1 Maintenance Activities

During the operation of the proposed scheme, the following maintenance activities will be required:

- Daily inspection of pumps and fish screen
- Daily inspection of pipeline route and fencing
- Daily inspection of outfall location
- Regular refuelling
- Periodic service of pumps and HPUs
- Weekly check of compound drainage; and
- Daily emptying of rainwater from dry sump.

The pump intake screen will be inspected daily to ensure proper operation of the pumps and to check for any blockages or damage to the fish screens. If the fish screens become blocked, they can be cleared by an operative who can safely reach the screens from the access walkways as required.

4.3.2 Pumping Controls and Monitoring

4.3.2.1 Pumping Duration

It is anticipated that the pumps will operate 24 hours a day at a combined flow rate not exceeding 300 l/s, as necessary to meet the scheme objectives for a period of up to 24 months.

Pumping will also depend on the flow rates of the Cross River which will be continuously monitored. Pumping will be reduced/halted as needed to eliminate any risk of downstream flooding of the Cross River.

4.3.2.2 Monitoring

The following aspects of the proposed scheme will be continuously monitored by RCC and data will be accessible remotely:

- The level of Lough Funshinagh
- Pumping rate of the HPUs; and
- Flow rate of the Cross River.

Currently, hourly readings of the lough's water level are being recorded and monitored daily by GSI[56]. Lake levels will be monitored daily as it is expected that the change in lake level as a result of pumping will be relatively slow.

The pumping control system will be remotely monitored by RCC and if required the pumping flow rates will be adjusted or shut off. The pumping controls will not be automatically regulated based on monitoring data.

The flow in the Cross River will be monitored at three locations by OPW hydrometric gauges at 15-minute intervals for the duration of the interim scheme. One location is an existing EPA flow gauge, Summerhill Station (26221), located approximately 13.7 km downstream from the pipeline outfall.

An additional two hydrometric gauges will be installed and operated by the OPW, one at Curraghboy approximately 0.9 km downstream of the pipeline outfall and one at Atteagh approximately 5.2 km downstream of the pipeline outfall.

The Cross River flow rate will be monitored continuously to assess if the trigger flows have been reached. The details of trigger flows are provided in the MWP engineering report. Regional flood warnings will be checked daily

OPW installations of hydrometric gauges

Two new hydrometric gauges will be installed and operated by the OPW under its own statutory powers, at Curraghboy & Atteagh, Co. Roscommon. Both gauges will be installed on the left bank of the Cross River upstream of the adjacent road bridges. All installation works will be undertaken by the OPW according to their standard procedures (e.g. Activity Risk Assessments, Safe Operating Procedures Preliminary, Safety & Health Plan, and Job Safety Plans.). All installation works will be supervised on site by a OPW Project Supervisor Construction Stage following agreement and planning of works prepared by the OPW Project Supervisor Design Process.

OPW Installation Methodology

The installation of the hydrometric gauges will follow the methodology set by the OPW:

- The location of the station enclosure plinth will be scanned with a Cable Avoidance Tool prior to any excavation taking place
- A small excavation (maximum depth of 0.15m) will be required to facilitate the construction of the concrete plinth (~0.6 m^2)

[56]Available at: https://gwlevel.ie/?place=00011_001_tl_gs

- A prefabricated timber shutter (~ 0.8 m x 0.8 m x 0.15m) will be positioned and pinned where the concrete plinth is to be cast. The shutter will then be lined with polythene on the base and sides to prevent any cement paste from escaping. Sandbags to be positioned on the riverside of the shutter to contain any residual spillage
- Concrete will be transported from the designated mixing location via barrow on a route protected with polythene. Approximately 0.1m^3 of concrete will be required for the plinth. The concrete is then placed, screed and finished with a steel trowel. Once the concrete is cured shutters are removed
- A staff gauge (~1.2 m high) will be attached to the existing rock armour (Curraghboy) or bridge abutment (Atteagh) using proprietary fittings and mechanical fixings. The staff board itself will be 150 mm x 44 mm untreated timber with staff plates fitted using stainless steel screws or galvanized nails
- The sensor ducting will be extended the river channel and connected the station
- A solar panel will be installed to provide power to the station
- Once all installation works are completed, a final check will be carried out to ensure any excess materials or equipment are removed off site.

OPW Maintenance and Calibration

The gauges transmit the data every 15 minutes to a central server that is available to the public to view on OPW's waterlevel.ie. The gauges are typically visited on a six-weekly cycle by a regional team consisting of a Technician and Driver. This team is assigned to the station and carries out all maintenance and calibration duties at the site.

4.3.3 Intake Compound

4.3.3.1 Fuel Storage Tanks

A maintenance contractor will be appointed by RCC who will oversee the maintenance of all aspects of the pumping operation.

It is anticipated that the four fuel storage tanks will need to be refilled every fourth day with a fuel tanker making deliveries to the compound. The following maintenance activities will be required during the operational phase at the intake compound:

- **Refuelling**- The hydraulic pumps will each have a running time of about 100 hours on full fuel tanks therefore refuelling will be required every fourth day while pumping is ongoing. This will involve a fuel tanker driving into the Intake Compound and delivering fuel to the tanks which are located within the bunds. Appropriate mitigation measures to manage spill risks are detailed in Section 4.3.5.2 and the CEMP.
- **Emptying of rainwater** - Rainwater from the HPU bund will need to be emptied daily by pumping the rainwater from a dry sump using a light duty puddle pump and discharging the water in a distributed manner onto the grassed surface at a location where the buffer distance is at least 15m to the lough edge.
- **HPU Service** - The HPUs will need to be serviced every 500 running hours. A typical service will consist of changing filters and oil. A spill kit will be used to ensure that any spillage is contained.
- **Drainage inspection** - The local drainage around the compound and the silt fence on the downslope side of the compound will be checked once per week to ensure adequate function and that there are no signs of blockage.

4.3.4 Pipeline Route

The entire pipeline route will be visually inspected every day by driving the route to identify any signs of damage or distress to the pipeline and to ensure all stock proof fencing remains intact.

The Cross River outfall will be inspected once per day. The purpose of the inspection will be to ensure that the diffuser is working properly and is not blocked, to ensure the rock armour and geotextile has not become dislodged or unstable. The pumps will be shut down immediately in the unlikely event that there is a concern with regard to the integrity of the outfall.

4.3.5 Environmental Management and Monitoring

4.3.5.1 Water Quality Monitoring

A specialist contractor will be appointed by RCC to carry out monthly water quality sampling of the Lough Funshinagh and the Cross River.

A water quality monitoring programme is planned for both Lough Funshinagh and the Cross River for the duration of the interim scheme.

4.3.5.2 Refuelling

Refuelling will take place at the intake compound with the truck parked over a portable PVC containment bund mat. This is designed for use under vehicles and shall act as a containment system to catch any spills which may occur during refuelling. The mat is manufactured from 900 grams per square metere (gsm) PVC-coated hydrocarbon and shall be placed on top of a geotextile layer.

The following measures will be in place during refuelling operations to mitigate the risk of accidental spills:

- Refuelling shall take place with the vehicle parked over a portable PVC containment bund mat. This is designed for use under vehicles and shall act as a containment system to catch any spills which may occur during refuelling. The mat is manufactured from 900 gsm PVC-coated hydrocarbon and shall be placed on top of a geotextile layer
- Only designated trained and competent operatives will be authorised carry out refuelling operations
- Spill kits will be kept on site in case of accidental spillages and all designated operatives will be trained in using them
- Fuel tanks will only be filled from transportation tankers under the use of automatic shut off overfill protection
- The fuel tanks shall not be left unattended during refuelling
- Oil booms will be kept on site to deal with any accidental spillage
- Strict procedures for fuel tank and plant inspection, maintenance and repairs shall be detailed in the contractor's method statements and construction machinery shall be checked for leaks before arrival on site
- The plant refuelling procedures described above shall be detailed in the contractor's method statements.

4.3.5.3 Spill Management

A spill kit will be available at the intake compound in case of leaks and spills. All operational staff will be trained on how to use spill kits. In the event of a spill incident, immediate action will be taken to identify and stop the source of the spill.

The appointed operations contractor will be immediately given information on the location, type, and extent of the spill so that they can take appropriate action. If possible, efforts will be made to clean up as much as possible using the spill control materials. The disposal of any used spill control material will be done using a fully licensed waste contractor with the appropriate permits so that further contamination is limited.

4.3.5.4 Waste Arising

Waste may be generated during the operation of the proposed scheme as a result of the screens being cleared and the maintenance of the hydraulic pumping units (old filters, used hydraulic filters etc.). The provision of appropriate waste management at each working area and regular collections as per the existing arrangements on site.

4.3.6 Health and Safety

All operational staff will progress their works with reasonable skill, care and diligence and, at all times, proactively manage the works in a manner most likely to ensure the safety, health and welfare of those carrying out operational works, pedestrians, road users and other interacting stakeholders.

A set of standardised emergency response procedures will govern the management of emergency incidents such as spill management, pipeline leaks, flooding and fire.

An emergency contact list will be established and made available to all operational staff employed. The contact list will include key RCC and other personnel that may need to be contacted in the event of an incident.

4.4 Decommissioning

4.4.1 Pump Intake System

Decommissioning of the pump intake system will involve the following:

- The pumps will be shut down and disconnected from the pipeline and hydraulic hoses
- A 60-tonne mobile crane will be used to lift the pump pontoon (with the pumps inside) from the lough to an articulated truck parked in the intake compound. A small boat will be in the water to assist
- The floating access pontoons will be dismantled (unbolted) and lifted from the edge of the lough to a truck parked in compound using the 60-tonne crane
- The same crane will lift the HPUs and fuel tanks onto the truck.

4.4.2 Intake Compound

Decommissioning of the intake compound will involve the following sequence:

- The stock proof fence and paladin fence will be taken up and loaded onto a flatbed truck for reuse
- The concrete HPU bund will be demolished using an excavator with a rock breaker and removed to a licensed facility
- The Class 6F stone (compound) as well as the geogrid / geotextile used to construct the compound will be taken up and brought to a licensed facility. A reuse for the stone aggregate will be sought where possible following confirmation of acceptability
- The ground beneath the footprint of the compound will be rotovated and tilled to reinstate the area to agricultural usage, similar to the surrounding lands.

4.4.3 Pipeline Route

Decommissioning of the pipeline will involve complete removal of all rigid PE pipe and flexible ‘layflat’ pipe.

4.4.3.1 Road Crossing

Decommissioning of the road crossings will involve the following sequence:

- The HDPE carrier pipes will remain in place after the pipeline has been removed

- Each end of the pipe will be blocked by filling in the trench at the ends. The redundant pipe beneath the road will not be of concern
- The existing hedgerow which was removed will be replanted using native hedge species and/ or walls/ fences will be restored.

4.4.4 Outfall

Decommissioning of the outfall will involve the following sequence:

- The PE ribbed pipe and diffuser tee will have been removed in conjunction with the remainder of the pipeline
- The rock armour and natural flag stones will be carefully removed from the surface of the geotextile using an excavator and placed into a tipper truck or tracked dumper
- The geotextile will be pulled across the river and removed by hand without entering the water.

4.4.5 Waste Arising

All waste arising will be managed in accordance with the waste hierarchy, in compliance with the provisions of the Waste Management Act, 1996, as amended, and to contribute to achieving the objectives set out in the Waste Action Plan for a Circular Economy (DECC, 2020).

Opportunities for reuse of materials, by-products and wastes will be sought throughout the decommissioning phase. Where possible, metal, timber, glass and other recyclable material will be segregated and removed off site to a permitted / licensed facility for recycling.

The contractor appointed for the decommissioning of the scheme will record the quantity in tonnes and types of waste and materials leaving the site. The name, address and authorisation details of all facilities and locations to which waste and materials are delivered will be recorded along with the quantity of waste in tonnes delivered to each facility. Records will show the type of material, specifying those that are recovered, recycled, and disposed of. The relevant appropriate waste authorisation will be in place for all facilities that wastes are delivered to (i.e., EPA Licence, Waste Facility Permit or Certificate of Registration).

The following are the expected wastes to be generated during the decommissioning phase:

- Concrete from HPU bund and Paladin post bases to be removed to a licensed facility
- Geotextiles/ geogrid to be taken to licensed facility and reused following confirmation of acceptability
- Stone aggregate to be taken to licensed facility and reused following confirmation of acceptability
- Fencing (posts, wire and paladin) to be gather for re-use
- Rock amour to be taken to licensed facility
- Pipeline to be gather and re-used where possible.

4.4.6 Nature of any Associated Demolition Works

No demolition works are associated with the proposed scheme. Limited ground works and excavations are required (restricted to the road crossings).

5. Screening Assessment

5.1 Overview

As per the methodology stated in Section 2.4, the potential connectivity between the proposed scheme and European sites and their respective QIs/SCIs is identified via the SPR method. This identifies the potential impact pathways such as land, air, hydrological pathways etc which may support direct or indirect connectivity. Where connectivity exists between the proposed scheme and receptors, these receptors are taken forward to the screening assessment of likely significant effects.

This section of the report establishes the ZoI of the proposed scheme, and the potential effects of its implementation with respect to relevant European sites and their QIs/SCIs, considering the CO. Where likely significant effects (LSE) cannot be ruled out at screening stage, they are assessed in more detail as part of an AA.

The information to carry out AA is provided in Section 6.

5.2 Screening Criteria

The European sites which are identified for consideration within the screening assessment have been identified following the below criteria:

- Projects within, or within 2 km of a European site or functionally linked land i.e. land that is used by mobile QI/SCI species[4];
- Hydrological linkage - crosses or lies adjacent to, upstream of, or downstream of, a watercourse which is designated in part or wholly as a European site;
- Has a potential hydrogeological linkage to a European site; and
- Air Quality - any European sites within 200m of the proposed scheme with relevant QIs/SCIs which may be impacted by changes in air quality.

Following the above criteria, European sites have been identified and are presented in Table 5-1. The SPR method is utilised to assess whether the potential for likely significant effects[4] upon those European sites exists. The SPR method establishes the ZoI for the proposed scheme and focuses the assessment to identify those relevant QIs and/or SCIs which are at risk of likely significant effects following the screening assessment. A figure of the identified sites is provided in Appendix B.

Table 5-1 List of European sites identified for Screening Assessment

European site	Distance from proposed scheme	Potential Linkage between proposed scheme and European site / screening criteria met
Lough Funshinagh SAC	Within proposed scheme	Within footprint of proposed scheme Air quality
River Shannon Callows SAC	14km downstream	Project lies within functionally linked habitat (Cross River) for otter Hydrologically linked
Lower River Shannon SAC	76km downstream	Project lies within functionally linked habitat (Cross River) for otter and brook lamprey Hydrologically linked
Lough Ree SAC	5km east	Functionally linked for otter
Lough Ree SPA (All SCIs) Four Roads Turlough SPA (All SCIs)	5km east 8km west	Functionally linked for birds

European site	Distance from proposed scheme	Potential Linkage between proposed scheme and European site / screening criteria met
Lough Croan Turlough SPA (All SCIs) Middle Shannon Callows SPA (All SCIs) Mongan Bog SPA (All SCIs)	4km west 15km south east 20km south east	

5.3 Identification of Potential Sources of Impacts

In identifying the potential impacts of the implementation of the proposed scheme, it is important to note that this risk is an estimation based on scientific evidence and best practice with the application of the precautionary principle. It presents a worst-case scenario but does not constitute that any impact will occur or that it will result in ecological or environmental damage resulting in significant effects on European sites within the ZoI. The significance of the effect is dependent upon factors such as duration, magnitude and intensity of the project/plan in question and the existence of a credible SPR link. It is also determined by the extent of the exposure to the risk and the characteristics of the receptor.

By establishing a credible source and pathway, the receptors i.e. the QI habitats and QI/SCI species, are only considered where links are identified to be credible. Factors include distance between receptors and sources and the means by which the pathway through air, water, ground etc., occurs.

The elements of the proposed scheme are examined in this scenario to account for any potential for impacts that may arise following their implementation. Identified impacts are incorporated within the screening assessment to determine whether they result in an LSE upon identified receptors (i.e. European sites), wherein there exists the possibility that the COs of those receptors may be undermined[4]. This factors in the viability of pathways for effect (Section 5.4) The impacts are identified following the methodology presented in Section 2.4 and the guidance referenced in Section 2.2.

As a result, and following the precautionary principle, the potential direct and indirect impacts as a result of the proposed scheme are identified and discussed in the below subsections. The potential impact pathways have been identified following review of the COs and specifically, the attributes required to maintain/restore (as appropriate) a QI/SCI.

5.3.1 Changes to Water Quality /Water Quality Degradation

Changes in water quality in rivers and lakes can pose a threat to local ecosystems and biodiversity where the level of change begins to directly or indirectly affect a dependent habitat and/or species. Arising from point source pollution or through the accumulation of nutrients over time, water quality degradation can originate[57] from agricultural run-off, industrial discharges, urban wastewater and from isolated incidents/accidents such as an accidental leakage or spill from a hydrocarbon source. The transfer of water from one waterbody to another can lead to changes in water quality as the differing chemical compositions, temperatures and biological communities can disrupt the ecological balance of the receiving waterbody. In its worse-case scenario, water transfer could transfer higher nutrient content and lead to eutrophication in the receiving waterbody, or risk an introduction of an invasive species, pathogens or pollutants that were previously not present. On balance, the transference of water could improve water quality within a receiving waterbody, where changes in dissolved oxygen content, increased water flow etc., may contribute to an improvement in ecological conditions[58].

Construction activities pertaining to the proposed scheme that could give rise to changes in water quality will include the movement of machinery adjacent to Lough Funshinagh. From both the movement of machinery and the installation of stone aggregate for the access road, there is a risk of minor water quality degradation should this be intercepted by surface water run-off and enter Lough Funshinagh.

[57] EPA (2022) Water Quality in Ireland 2016-2021. Accessed at https://www.epa.ie/publications/monitoring--assessment/freshwater--marine/EPA_WaterQualityReport2016_2021.pdf August 2024

[58] Deng, Feng et al. "Effects of water transfer on improving water quality in Huancheng River, Chaohu City, China." (2020).

An accidental leak of fuels/oils from machinery in combination with the dust generated from laying stone aggregate could give rise to changes in water quality in the immediate surrounds i.e. Lough Funshinagh. Any such event would be highly localised and short-term. It is anticipated that decommissioning activities may give rise to similar minor, temporary and localised events.

During operation, the transfer of water from Lough Funshinagh to the Cross River may give rise to changes in water quality in the receiving waterbody. Where water quality parameters differ greatly from Lough Funshinagh to the Cross River (which is hydrologically connected 14km downstream to other European sites) this can introduce the potential for water quality change. The rate of flow of 300l/s has the potential to increase the dissolved oxygen content within the Cross River, and thereby indirectly the receiving downstream European sites. The potential risk of nutrient enrichment and corresponding changes in water quality must be assessed.

European sites located in proximity to the construction and decommissioning activities and the sites located downstream during operation sit within the ZoI of this potential impact.

In consideration of the above information, the potential for changes in water quality has the potential to occur during the construction, operation or decommissioning stages of the proposed scheme. The potential for changes in water quality exists with potential impacts on habitats within the Lough Funshinagh SAC, QI habitats located downstream and QI/SCI species which are functionally linked.

5.3.2 Habitat Loss

Any direct habitat loss in a European site would reduce the extent of habitat, some of which could be QI habitat and some of which could be habitat which supports QI/SCI species. Effects which result in the long-term irreversible deterioration of QI habitat could also lead to loss of habitat. Habitat loss can occur through construction, operation and decommissioning of certain project types.

Construction activities pertaining to the proposed scheme will include the installation of a modified steel pump pontoon with four support posts at 100mm diameter driven into the ground and access pontoon via crane within Lough Funshinagh SAC. The total combined area of impact of posts would be approximately 300cm^2 however, this habitat will contain improved agricultural grassland, despite being within the boundary of the flooded SAC turlough extent, and the effects would be temporary and reversible and insignificant in scale and would be returned to agricultural grassland when the proposed scheme is decommissioned. Improved agricultural grassland on agricultural land to the east of Lough Funshinagh SAC boundary will be impacted temporarily during the operation of the scheme. This land does not contain any Annex I habitat or habitat of significant ecological importance.

The proposed scheme is anticipated to pump 300 l/s of water on a 24/7 basis out of Lough Funshinagh to limit the peak water level for periods of time to meet the scheme objectives, up to 24 months.

Habitat loss is not anticipated downstream on the Cross River either directly or indirectly as the potential for impacts in the catchment downstream is anticipated to diminish with the distance from the discharge. Embedded within the design of the outfall is the provision of a combination of rock armour, geotextile matting and natural flag stones. This shall dissipate the energy of the incoming pumped water thereby reducing impacts further downstream. As per the engineering report[11], the Cross River has ample capacity to support the additional water from the proposed scheme, the pumped flows would have an insignificant impact on flood levels and would not increase the frequency or severity of natural flood conditions downstream. Therefore, habitats downstream are not considered to be at risk of habitat loss, directly or indirectly from the proposed scheme either during construction, operation or decommissioning stages.

The one-month long decommissioning stage will include two weeks in-situ works and is anticipated to have sufficiently similar effects to that of the construction stage of the proposed scheme that the same assessment applies as per above.

In consideration of the above information, the potential for habitat loss is not anticipated to give rise to a likely significant effect in respect of the COs of Lough Funshinagh SAC or any other European site due to the temporary nature, reversibility of effects and minor scale in area of the proposed scheme for any QI habitats.

5.3.3 Habitat fragmentation

Habitat fragmentation can occur when areas of continuous habitat are divided into smaller, isolated patches. This can occur through human activities including construction and can contribute to biodiversity loss and ecosystem degradation. The reduction in habitat area can limit resources to dependent species whilst the isolation of habitat areas can make it difficult for species to move between them, potentially having a knock-on effect on genetic diversity and population viability. Additionally, it can result in an 'edge effect' where there are changes in population or community structure.

The construction of the proposed scheme will not result in any habitat fragmentation to the QI habitat at Lough Funshinagh SAC or any other European site. The total construction period is anticipated to be up to a month and Lough Funshinagh SAC shall only be directly accessed for the placement of the floating pump and access pontoon in the turlough. The installation of the pump and HPUs is anticipated to take one week. All other elements of construction shall take place outside Lough Funshinagh SAC and shall not result in any activities which may fragment the habitats within Lough Funshinagh SAC or any other European site.

The operation of the proposed scheme is not anticipated to result in any habitat fragmentation either within Lough Funshinagh or within any downstream habitats. Hydraulic modelling to inform the proposed scheme has concluded that no significant impacts shall occur within the existing flood levels within the Shannon Callows[11] and downstream within the River Shannon. Increases in velocity and flow have also been modelled to be negligible downstream.

The proposed scheme aims to limit the peak water levels of Lough Funshinagh closer to the pre-2016 historic high levels when the turlough would have been in flood and therefore there will be no habitat fragmentation to Lough Funshinagh arising from operation of the scheme. Therefore, there is no risk of habitat fragmentation occurring through the operation of the proposed scheme to any European sites including Lough Funshinagh and those downstream.

The decommissioning stage will consist of one month in total, with the removal of the HPUs, floating pump and access pontoon to be complete within one week and is anticipated to have sufficiently similar effects to that of the construction stage of the proposed scheme that the same assessment applies as per above.

In consideration of the above information, the potential for habitat fragmentation shall not occur through the construction, operation or decommissioning stages of the proposed scheme. Therefore, habitat fragmentation is not considered further within this report.

5.3.4 Habitat degradation

Habitat degradation refers to the process whereby habitat condition declines due to external factors mostly arising from human activities. Construction, operation, and decommissioning of infrastructure can cause habitat degradation by altering landforms, introducing pollutants, and disrupting ecosystems.

Habitat degradation may occur where the vegetation composition, zonation or structure is affected by the placement and the operation of the proposed scheme both in-situ at Lough Funshinagh and to habitats located downstream.

During the construction stage, habitat degradation could occur to QI habitats within and on the fringe of Lough Funshinagh. The movement of any machinery will be outside the SAC boundary and the pontoon units are proposed to be craned into place from outside the SAC. Units shall be secured in place from the landward side of Lough Funshinagh. Considering the time for construction (one month) the floating nature of the intake structure, in combination with the area of the SAC occupied ($25m^2$) and considering the site's COs, the risk of habitat degradation to Lough Funshinagh SAC through either construction, operation or decommissioning is negligible.

It is not anticipated that the operation of the proposed scheme will give rise to habitat degradation upstream or downstream. The amount of water to be pumped from the Lough shall only reduce its level closer to the pre-2016 historic high levels when the turlough would have been in flood. The turlough itself cannot therefore be degraded by operation of the proposed scheme. Hydraulic modelling of high and low flow estimations in the Cross River concluded that no significant impacts shall occur within the existing flood levels within the Shannon Callows[11] and downstream within the River Shannon. Increases in velocity are also determined to be negligible downstream. Therefore, there is no risk of habitat degradation occurring to European sites downstream through the operation of the proposed scheme.

The decommissioning stage will consist of one week for in-situ works (i.e. removal of the floating pump and access pontoon) and is anticipated to have sufficiently similar effects to that of the construction stage of the proposed scheme that the same assessment applies as per above.

In consideration of the above information, the potential for habitat degradation shall not occur through the construction, operation or decommissioning stages of the proposed scheme. Therefore, habitat degradation is not considered further in this report.

5.3.5 Accidental Pollution Event

An accidental pollution event occurs when unforeseen incidents result in the release of harmful substances into the environment, posing significant risks to ecosystems, species and habitats. The temporal and spatial scale of the pollution event is directly connected to the magnitude of the source in addition to the type of pollution emitted to the environment. Direct and indirect sources of pollution may disperse via aerial or hydrological means, from the release of chemicals and aerial emissions, fuels, oils and wastewater sources, amongst others.

Potential impacts on aquatic habitats which can arise from surface water emissions associated with the construction phase of the proposed scheme may occur during construction through the movement of personnel and machinery. The risk of increased siltation within Lough Funshinagh SAC through surface water run off may occur during heavy rainfall. It is not anticipated that these levels would be excessive given the footprint of the intake compound (c. 1,150 m^2).

The potential for an accidental release of hydrocarbons, oils and/or fuels from construction machinery may occur during the construction stage should there be a failure within machinery integrity. Surface water run-off during the construction phase could potentially be contaminated with silt, hydrocarbons or other chemicals. The use of boats and their associated equipment during the construction and decommissioning stages introduces the risk of a direct oil/fuel spill into the waters of Lough Funshinagh during the installation of the floating pontoon infrastructure. Given the scale of Lough Funshinagh and the projected size of the boats intended for use (< 5 m RIB or similar) an accidental spill is likely to only be temporary and localised.

During the operational phase, fuel tankers are required every fourth day to refuel the diesel generators. As the proposed timeline of operation could be up to two years from construction, there is the potential that an accidental pollution event could occur over this timeline during refuelling if machinery becomes faulty or experiences a leak. The accidental leak of hydrocarbons, diesel or oils released into Lough Funshinagh could result in a pollution event directly impacting Lough Funshinagh SAC habitat or indirectly affecting QI or SCI species which are dependent upon affected habitats as functionally linked land. This has the potential to impact on water quality which may cause an indirect effect upon functionally linked species or result in habitat degradation to QI habitats downstream.

The decommissioning stage will consist of two weeks in-situ works and is anticipated to have sufficiently similar effects to that of the construction stage of the proposed scheme that the same assessment applies as per above.

In consideration of the above information, the potential for an accidental pollution event exists with potential impacts on habitats within the Lough Funshinagh SAC, QI habitats located downstream and QI/SCI species which are functionally linked. Relevant QIs and SCIs are identified in Section 5.5 that have the potential to be impacted via an accidental pollution event.

5.3.6 Species Disturbance/Displacement

Habitat disturbance can occur though natural or human induced means, where the natural regime or conditions of an ecosystem is disturbed. This can lead to changes in spatial distribution of species and impact the structure of populations, composition, behaviour and abundance. The only potential QIs/SCIs which could potentially be impacted during construction in proximity to the proposed scheme are described and discussed in Section 5.5 but include otter, birds and brook lamprey.

The construction of the proposed scheme will involve the movement of machinery and personnel to construct the intake compound and placement of the pumping infrastructure, laying of the pipeline and associated fencing overland between Lough Funshinagh and the Cross River and construction of the discharge on the Cross River. Construction is anticipated to be temporary and up to one month.

Visual and noise related disturbance is anticipated through construction, which may have a direct effect upon relevant QI and/or SCI species which may be located within a zone of influence of the site e.g. waterfowl within proximity to the proposed scheme may be temporarily displaced during the movement of machinery. The noise and vibrations from machinery can disrupt communication calls and feeding patterns of species, potentially contributing to stress and displacement. Where species have to travel further for foraging, this can have a direct impact on a species energy level. Repeated and prolonged instances of disturbance can have an impact upon population dynamics. The construction of the proposed scheme is anticipated to begin and conclude within one month thereby limiting the risk of a significant effect upon the populations of any QIs/SCIs that may be present within a zone of influence of the construction site.

The effect of construction noise on sensitive receptors in the immediate vicinity of the site will be temporary due to the limited nature of the construction works. Construction hours will be limited to the hours of 07:00 and 19:00, Monday to Friday, and 07:00 to 16:00 on Saturdays. Similarly, deliveries of materials to site will generally be between the hours of 07:00 and 19:00, Monday to Friday, and 08:00 to 16:00 on Saturdays and will be scheduled to avoid peak times. No significant night-time works or works at the weekend or bank holidays are envisaged. Any works which are required to be carried out during these times will be agreed with the planning authority in advance.

The operation of the proposed scheme shall involve the use of diesel generators adjacent to the shores of Lough Funshinagh SAC and is anticipated to generate noise levels of up to 76 dBA (at 7 m from the pump infrastructure).

For any QI/SCI species that forage, rest or breed within this area and therefore are functionally linked to the land surrounding the generators, this may potentially cause displacement, however species are likely to become habituated. The visitation of fuel tankers every fourth day is not anticipated to generate any significant disturbance as it shall emulate background levels of the agricultural machinery that operate daily around Lough Funshinagh. It is anticipated species would be habituated to the movement of machinery such as tractors and excavators for short term periods.

The decommissioning stage will consist of one month in total with no more than two-weeks in-situ works for the removal of the HPUs, floating pump and access pontoon, and is anticipated to have sufficiently similar effects to that of the construction stage of the proposed scheme that the same assessment applies as per above.

In consideration of the above information, the potential for habitats and species disturbance exists to habitats within the SAC of Lough Funshinagh and QI/SCI species which are functionally linked to Lough Funshinagh. Relevant QIs and SCIs shall be identified in Section 5.5 that have the potential to be impacted via disturbance.

5.3.7 Introduction and/or spread of Invasive Non-Native Species (INNS)

Non-native plants and animals are those introduced to areas outside their natural range by human activities, either intentionally or accidentally. These species can outcompete native species and cause significant effects on semi-natural habitats.

The Birds and Natural Habitats Regulations 2011 (SI 477 of 2011), Section 49(2) prohibits the introduction and dispersal of species listed in the Third Schedule as follows: “any person who plants, disperses, allows or causes to disperse, spreads or otherwise causes to grow [….] shall be guilty of an offence.”

Construction works have the potential to spread invasive species outside a works area, particularly in the vicinity of a waterbody. Introduction of invasive species within the proposed scheme area could lead to the dispersal of scheduled invasive species either via machinery, materials, clothing or wild animals. Invasive species can be easily transported into freshwater bodies through boats and associated equipment. Water can be trapped in bilges, livewells, and other compartments, providing a suitable environment for the survival of aquatic plants, animals, and their eggs. Additionally, invasive species can attach to boats and trailers, being unintentionally transported to new locations. As boats are proposed for use in the construction and decommissioning phases, associated risks of introduction of an INNS exists.

Both the construction and decommissioning stages have the potential to introduce INNS to Lough Funshinagh SAC and potentially to European sites downstream through the Cross River through the installation of the pumping infrastructure and construction of discharge location with associated plant and equipment etc. used which could transport INNS into the construction site. This could be introduced through machinery, tyres, footwear or through the introduction of materials such as crushed stone intake compound.

Pump operations have the potential to spread INNS to downstream habitats through the Cross River, with aquatic surveys of Lough Funshinagh recording presence of Canadian pondweed. If INNS already exists within the Cross River or along its banks, this may be swept downstream during the cumulative effect of heavy rainfall plus the proposed pumped water from Lough Funshinagh. This can risk the colonisation of INNS to downstream habitats such as the Shannon Callows, directly impacting the QIs and SCIs downstream by outcompeting and replacing native species.

In consideration of the above information, the potential for the introduction or spread of INNS, during construction, exists to habitats within Lough Funshinagh SAC, QI habitats located downstream and QI/SCI species which are functionally linked. Relevant QIs and SCIs that have the potential to be impacted via the introduction or spread of INNS are identified in Section 5.5.

5.4 Identification of Potential Pathways

Establishing the potential pathways for effect involved considering the geographical and topographical elements of the proposed scheme at Lough Funshinagh in addition to any in-situ features which may act as a pathway or barrier between the sources of impact and European sites and their QIs/SCIs.

5.4.1 Characteristics of the proposed scheme

A full description of the Lough Funshinagh site can be found in Section 4. The proposed scheme is situated at the southwest shoreline area of Lough Funshinagh, bounded by agricultural fields, hedgerow and treelines. The floating pontoons (submersible pump and access pontoons) shall be craned into place from privately owned agricultural land to the west of the pontoons. All other construction infrastructure shall be located within the agricultural field to the west.

The overland pipelines will cross through agricultural fields, hedgerow and treelines before discharging into the Cross River. The pipelines cross underneath two roadways within this ~2 km distance. Between Lough Funshinagh and the Cross River, there are no other known streams or rivers within proximity to the proposed pipeline route. The Cross River ranges in size between 2m wide and 0.05-0.15 m deep at the discharge location and then 8-10 m wide and >1.5 m deep in proximity to its discharge to the River Shannon. Six smaller tributaries and a number of drainage ditches feed into the Cross River downstream of the proposed discharge location, prior to its outfall at the River Shannon.

The Cross River lies adjacent to twenty habitat types[59] however none of these habitats were noted to be Annex I habitat. Lough Funshinagh itself is classified as 3180 Turlough habitat and the Cross River was identified as supporting 3260 Floating River vegetation.

5.4.2 Pathway: Hydrological Connectivity

5.4.2.1 Surface Water

The identification of any surface water connectivity considers the potential for any surface water to act as a viable pathway for effect. Surface water pathways may originate from:

- flooding events at Lough Funshinagh wherein floodwaters extend beyond the shoreline and into surrounding lands, potentially entering drainage ditches and flowing downstream within.
- rainfall events generating surface water run-off from the lands adjacent to Lough Funshinagh into the turlough.

[59] Tailte Eireann landcover mapping was accessed to determine the habitats within which the River Cross traverses through. Habitats are classified to Fossitt Level 2+.

As per Section 3.3 Lough Funshinagh has no outflowing rivers or streams.

During the construction stage of the proposed scheme no ground excavation or topsoil stripping will be required prior to constructing the intake compound. No vegetation clearance works are anticipated to construct the intake compound. Stone aggregate shall be used to construct the compound and placed onto geogrid/geotextile and compacted by vibratory roller or similar. Should a heavy rainfall event occur during the time of construction, surface waters may intercept the newly laid aggregate stone, which may result in construction dust entering Lough Funshinagh. The accidental spill or leakage of hydrocarbons, oils or fuel from any of the construction machinery may also enter Lough Funshinagh through surface water. Construction shall also include the installation of a concrete bund inside the compound to contain any fuel in the event of a spillage in adherence with best practice in construction.

The movement of construction machinery, personnel and the introduction of materials from off-site could also cause an accidental introduction/spread of INNS to Lough Funshinagh if intercepted by surface water pathways following rainfall.

Surface water pathways interacting with the installation of the overland pipelines are not anticipated to result in any impact as no excavation works are required for the installation of the overland pipelines and any vegetation clearance will be limited to areas where pipelines must cross hedgerows. The presence of machinery and personnel is limited to the construction and decommissioning stages (one month total each) and it is anticipated that the pipeline installation will be completed within a matter of days.

During operation, diesel tankers will be in-situ every four days to refill the generators. Adhering to best practice construction guidelines the concrete bund shall be inside the compound to support the HPUs and fuel tanks as this would contain any fuel in the event of a spillage.

Should any INNS species be tracked to site through material, machinery or personnel, these surface water pathways may also introduce INNS to Lough Funshinagh during operation and construction.

The decommissioning stage of the proposed scheme may also interact with surface water pathways via the accidental spill/leakage of hydrocarbons, oils and fuels from machinery and/or from the accidental introduction/spread of INNS.

Surface water pathways are anticipated to be a pathway for effect during construction, operation and decommissioning stages.

5.4.2.2 Instream Flow

Instream flow considers the potential for any watercourses to act as a viable pathway for effect. During construction, operation and decommissioning stages, potential pathways for effect through instream flow may occur through:

- Watercourses directly connected to the proposed scheme; and
- Watercourses within the zone of influence of any surface water run-off.

At the intake compound, there is one watercourse (Cross (Roscommon)_010) which flows into Lough Funshinagh. It is sited approximately 140m south of the intake compound. Surface water may mix with construction related material (as described in Section 5.5.1) and enter Lough Funshinagh through the tributary.

There are field drains that border the numerous agricultural fields upon through which the pipeline is routed. In addition, road drainage is likely present at the two road crossings. It is not anticipated that these drains would act as a pathway for effect given they share no pathway to a European site as they flow away from Lough Funshinagh.

The Cross River may function as a viable pathway for effect for downstream European sites as it connects the waterbodies of Lough Funshinagh and the River Shannon via the overland pipeline. As a result, water contained within Lough Funshinagh is to be transported downstream, thereby introducing the potential for changes in water quality, water levels, and pollution transfer. However, this is isolated to the operation stage only, as the construction and decommissioning stages shall not include the pumping of water between waterbodies.

No other known instream pathways for effect are identified, thereby limiting the pathway for effect via instream flow. **Therefore, instream flow pathways are anticipated to be a pathway for effect via the Cross River during the operation stage of the proposed scheme.**

5.4.2.3 Groundwater

Groundwater pathways for effect considers the potential groundwater connection between the proposed scheme and European sites.

The proposed scheme is located in the groundwater body of Funshinagh (IE_SH_G_091) with Lough Funshinagh discharging to the ground. The sole hydraulic connection to groundwater at Lough Funshinagh is via swallow holes, which are presumed to provide a more direct connection to the aquifer where the rock head is close to the lake bed in the south of the lake. An analysis of the groundwater connections to the identified European sites has been carried out and is presented below in Table 5-2.

Table 5-2 Potential Groundwater Pathways

Designated Sites	Potential Groundwater Pathway
Lough Funshinagh SAC	The proposed scheme site compound is located adjacent to Lough Funshinagh SAC. Therefore, a potential direct groundwater pathway exists between the proposed scheme and Lough Funshinagh SAC.
Lough Ree SAC/SPA	Lough Funshinagh may be hydraulically connected to Lough Ree SAC/SPA via groundwater pathways. While dye tracing tests have not confirmed this pathway Lough Ree SAC/SPA lies within the same GWB as Lough Funshinagh and at a lower elevation and therefore it is feasible that a flow path between the two exists.
River Shannon Callows SAC & Middle Shannon Callows SPA	The Shannon Callows is located in a different groundwater body than Lough Funshinagh. However, the Cross River provides a surface water connection between the proposed scheme discharge location and the Shannon Callows. Elevated water levels in the Cross River higher than the surrounding groundwater levels may cause water to discharge into the groundwater supporting the Shannon Callows.
Lough Croan Turlough SAC and SPA	Lough Croan Turlough SAC and SPA is located in a different groundwater body and there is no hydrogeological connection to the Proposed scheme.
Ballynamona Bog and Corkip Lough SAC	There is no hydrogeological pathway between the Proposed scheme and the Ballynamona Bog and Corkip Lough SAC. Although the SAC is located within the same GWB it is located to the south of the Cross River and the local flow from the SAC is towards the Cross River to the north and east.
Four Roads Turlough SAC and SPA	The Four Roads Turlough SAC and SPA is located in a different groundwater body and there is no hydrogeological connection to the Proposed scheme.
River Suck Callows SPA	The River Suck Callows SPA is located in a different groundwater body and there is no hydrogeological connection to the Proposed scheme.

There is potential groundwater connection between the proposed scheme and Lough Funshinagh SAC, Lough Ree SAC/SPA and the River Shannon Callows SAC/Middle Shannon Callows SPA.

5.4.3 Pathway: Aerial Connectivity

Aerial pathways for effect considers the potential connection for both noise and air quality emissions from the proposed scheme to European sites. This considers:

- The proximity of the proposed scheme (construction/decommissioning and operation areas) to any European sites (200 m);
- The potential for aerial air quality emissions arising from construction, operation and decommissioning to be dispersed and affect European sites; and
- The potential for noise to be emanated from the proposed scheme and affect receptors of European sites.

Construction and decommissioning works are anticipated to be up to a month for each stage, respectively. With excavation works limited to road crossings very limited aerial emissions are anticipated from construction other than stone aggregate generated dust from those road crossings and construction of the intake compound and the emissions from machinery which shall be confined to the construction timeline. It is anticipated that any dust arising from construction would be intercepted by prevailing winds (predominantly from the southwest and west spreading northeast and east) and spread over a large area.

However, due to the proximity to Lough Funshinagh there is potential for dust to settle over the surface water of the lough. Given the temporal scale for such an event, it is not considered that this would result in significant amounts of dust. Noise originating from construction (machinery, personnel) and operation (pumps and generators) has the potential to affect sensitive ecological receptors e.g. bird species within a zone of influence of construction and operation. Noise will be confined to that from the generators at the intake compound where all vehicle movements will occur. Noise is not anticipated along the pipeline route during operation.

Given that construction and decommissioning stages are limited to one month each, it is considered that these would not give rise to any significant effects upon surrounding ecological receptors and any behavioural responses to noise or aerial emissions would temporary and reversible. The operation of the pump infrastructure is estimated to be 76 dBA at 7m, for up to two years which may give rise to effects upon ecological receptors within a zone of influence of the sound source.

Lough Funshinagh SAC is located within the footprint of the proposed scheme and as such sits within the 200 m criteria and aerial/noise pathways for effect will be investigated in Section 5.5.1

Therefore, noise is a viable pathway for effect within 200 m of the operation of the pumps and generators of the proposed scheme and any functionally linked species within that zone may be affected.

5.4.4 Pathway: Functionally Linked Land

Functionally linked land is described as '*areas of land or sea occurring outside a designated site which is considered to be critical to, or necessary for, the ecological behavioural functions in a relevant season or qualifying feature for which an SAC/SPA/Ramsar site has been designated*'[60]. A review of the desk study information and field survey data establishes the baseline of the proposed scheme acting as functionally linked land to QIs or SCIs.

Lough Funshinagh supports several bird species which are designated Annex I bird species as per the Birds Directive according to the dedicated wintering bird surveys carried out in winter 2023-2024[21]. Wigeon, teal, shoveler and lapwing are all recorded within 500 m of the proposed scheme, either within the lake itself or using the fields immediately adjacent to the shoreline. According to I-WeBS data[21], there are significant long-term declines for wigeon, shoveler, mallard and pintail at Lough Funshinagh which correspond with the all-Ireland 25-50% declines for these species over the 2011/12 – 2015/16 period[61]. The site is of national importance to shoveler, wigeon, teal, golden plover and lapwing[21] and given the above information it must be considered that these species are functionally linked to Lough Funshinagh.

Identification of mammals and/or mammal signs were assessed for potential for functionally linked land. Data from site surveys and desk study records were reviewed for this identification. Otter were noted as being present within 400 m east of the proposed scheme. Given that the species has a range of up to 18 km they shall be considered as a potentially functionally linked QI species during the identification of receptors. No other Annex II or Annex IV species were identified within the ZoI of the proposed scheme.

Therefore, functionally linked land is a viable pathway for effect for SCI species of surrounding SPAs and for otter. Relevant receptors of European sites will be identified in Section 5.5 .

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[60] Natural England (2021) Identification of Functionally linked land supporting Special Protection Areas (SPAs) of waterbirds in the North West of England. October 2021. Accessed at https://publications.naturalengland.org.uk/publication/6303434392469504#:~:text='Functionally%20linked%20land'%20(FLL,Areas%20of%20Conservation%20(SAC)%2F August 2024.

[61] Lewis, L. J., Burke, B., Fitzgerald, N., Tierney, T. D. & Kelly, S. (2019) Irish Wetland Bird Survey: Waterbird Status and Distribution 2009/10-2015/16. Irish Wildlife Manuals, No. 106. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland

5.5 Identification of Potential Receptors

The identification of potential receptors associated with the proposed scheme are provided in the subsections below. European sites which share the potential for a pathway for effect were analysed for the potential for likely significant effects. The receptors which have a pathway for effect i.e. the ZoI, and potential for likely significant effects are identified at the end of each subsection.

5.5.1 Lough Funshinagh SAC

Lough Funshinagh SAC is located directly within the footprint of the proposed scheme and shares pathways for effect through surface water and aerial pathways.

The QIs of Lough Funshinagh SAC are:

- 3180 Turloughs; and
- 3270 Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention p*.p vegetation.

3180 Turloughs

A site survey of Lough Funshinagh has confirmed that the current extent of the turlough is greater than the known mapped extent of the SAC as per the CO[62] document. The absence of any indicator species of a turlough was noted during site survey. Flood conditions at Lough Funshinagh have persisted and would suggest that the normal function of a turlough i.e. flood in winter and drain in summer, has been altered. Fringing habitats within Lough Funshinagh have been identified as improved agricultural grassland and thereby not consistent with regularly inundated turlough vegetation and fringing habitats.

In review of the sites' COs, it is not anticipated that habitat loss, degradation or fragmentation that would give rise to a likely significant effect will occur during construction, operation or decommissioning stages of the proposed scheme. The footprint of the floating pontoon part of the proposed scheme within the SAC would be 25 m^2, with four supporting posts occupying an area of approximately between 300 cm^2 - 400cm^2, in total being <0.001% of the total turlough SAC area.

As stated there will be minor interaction with the turlough habitat itself, limited to the 4 x100mm diameter poles to be placed on the flooded improved agricultural grassland, to secure the pontoon in position. The purpose of the poles is to stabilise the pontoon horizontally. They are not required to provide vertical support. Notwithstanding this, there may be some 'sinking' of the pole into the field but we do not expect this to exceed 150mm.

No intrusive works shall occur within the turlough habitat. It is determined that these minor impacts would therefore be localised and temporary to the area of the proposed scheme and would be completely reversible and therefore would not constitute a likely significant effect in respect of the QIs conservation objective. Any emissions from machinery shall be limited in nature and would be intercepted by the prevailing winds and spread over a wide area and therefore not give rise to a significant effect.

A risk of an accidental pollution event cannot itself be ruled out to the 3180 turlough habitat given the frequency of refuelling events during operation. In the event of a hydrocarbon leak, oils, fuels etc., may travel through surface water pathways and introduce a risk to water quality change affecting the status of the water quality attribute within the conservation objectives. The movement of machinery during construction and operation and the use of boats during construction and decommissioning may also introduce the risk of an accidental pollution event which may travel through surface water pathways and enter Lough Funshinagh.

Similarly, the introduction and/or spread of invasive species may also occur through the construction, operation and decommissioning stages. Invasive non-native species (INNS) may be introduced through construction material used to create the intake compound and/or through machinery and personnel and from boats being used during construction and decommissioning.

[62] NPWS (2018) Conservation Objectives: Lough Funshinagh SAC 000611. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.

Plant material of INNS may travel through surface water pathways in-situ and enter the turlough habitat or via boats and equipment used within the waterbody itself during construction. The floating pontoons may also introduce the risk of INNS if not put through a biosecurity screening prior to installation.

Therefore the potential likely significant effects cannot be ruled out for 3180 turlough in respect of the below impacts:

- Accidental pollution event; and
- Introduction and/or spread of invasive species.

On a precautionary basis, LSE cannot be ruled out for 3180 turloughs and further assessment is required with regard to this QI at AA stage.

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

Site survey data has confirmed that there is no presence of the 3270 QI habitat within the footprint of the proposed scheme or within the SAC at all. Due to the increased flood conditions at Lough Funshinagh, the previous extent of the QI habitat no longer exists within Lough Funshinagh SAC. With the current water level and water quality conditions of Lough Funshinagh, the future possibility of 3270 QI habitat occurring in Lough Funshinagh is negligible. Current water levels exceed the typical growth regime of the 3270 vegetation. There is the potential that the proposed scheme, through lowering water levels, may improve conditions at Lough Funshinagh for the 3270 QI habitat.

No predicted habitat loss, degradation or fragmentation can arise from the proposed scheme when the QI habitat does not exist. Additionally, no impacts arising from an accidental pollution event or introduction/spread of an INNS are anticipated to occur.

Therefore the potential for likely significant effects to 3270 rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation arising from the proposed scheme can be ruled out and no further assessment is required.

5.5.2 Lough Ree SAC

Lough Ree SAC is located approximately 5.5km east of the proposed scheme and is designated for the following QIs:

- 3150 Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation.
- 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites).
- 7110 Active raised bogs
- 7120 Degraded raised bogs still capable of natural regeneration.
- 7230 Alkaline fens
- 8240 Limestone pavements
- 91D0 Bog woodland
- 91E0 Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae); and
- 1355 Otter (*Lutra lutra*)

There are no surface or instream pathways for effect or aerial pathways for effect between the proposed scheme and Lough Ree SAC. The geohydrological linkage between the proposed scheme and the SAC is present as through the sharing of the same groundwater body – Funshinagh[63]. As previously stated, Lough Funshinagh has water levels that exceed the norm. The proposed scheme will draw down the water level closer to its natural state. It is anticipated that this action will not have an effect on the wider groundwater body given its area of 354 km^2 in comparison to the area of Lough Funshinagh at 3.7km^2. The proposed scheme is anticipated to only incur localised and temporary changes to groundwater.

[63] GSI (2023) Funshinagh GWB: Summary of initial characterisation. Accessed at https://gsi.geodata.gov.ie/downloads/Groundwater/Reports/GWB/FunshinaghGWB.pdf August 2024.

Therefore, the groundwater dependent habitats of 7110 Active raised bogs, 7120 Degraded raised bogs still capable of natural regeneration and 7230 Alkaline fens within Lough Ree are not anticipated to be at risk of a likely significant effect from the proposed scheme through groundwater pathways.

Therefore, the risk of likely significant effects to the QI habitats of Lough Ree SAC can be ruled out and does not require AA in respect of these QIs.

Otters can range in territory up to 18 km[64] and are found throughout Ireland. The proposed scheme has the potential to sit within functionally linked land and territory of the species given the presence of otter was noted approximately 400m east of the intake compound. Construction and decommissioning are anticipated to give rise to temporary and localised disturbance effects such as noise and visual disturbance through the presence of machinery and personnel. Suitable habitat for shelter and commuting of otter habitat is present on site at Lough Funshinagh[23] in proximity to the intake compound area. As a result, there is potential that otter within the vicinity may experience temporary disturbance and displacement.

During the Cross River survey (Triturus (2024) Aquatic baseline report for the Lough Funshinagh Interim Flood Relief Scheme), no couching sites or holts were observed at the seven sampling locations. Riverbanks closer to the discharge area were considered to be unsuitable for couching and holt sites however, more suitable habitat for the species is present closer to the callows (S6-7). Spraints were recorded under road bridges over the on the Cross River at sites S5 and S6.

It is considered that the operation of the proposed scheme will give rise to local effects within the Cross River only and there is potential that the increase in flow rate will not give rise to an effect on the foraging activities of otter. However, in the occurrence of high rainfall events generating higher water flows within the Cross River in combination with the pumped flow of the proposed scheme, there is potential that the species may be temporarily disturbed/displaced from the Cross River when foraging.

In consideration of the above material, there is the potential for the proposed scheme, during construction, operation and decommissioning stages to give rise to local and temporary disturbance/displacement effects to otter.

On a precautionary basis, LSE cannot be ruled out for otter (1355) and further assessment is required with regard to this QI at AA stage.

5.5.3 River Shannon Callows SAC

The River Shannon Callows SAC is located approximately 14km downstream of the proposed scheme via its hydrological connection through the Cross River. The site is designated for the following QIs:

- 6410 Molinia meadows on calcareous, peaty or clayey silt-laden soils
- 6510 Lowland hay meadows (*Alopercurus pratensis*, *Sanguisorba officinalis*)
- 7230 Alkaline fens
- 8240 Limestone pavements
- 91E0 Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae); and
- 1355 Otter (*Lutra lutra*).

The pathway for effect to the River Shannon Callows is the hydrological instream connection via the Cross River. The results of hydraulic modelling have concluded that through both low and high flow estimations, there will be no significant effects to the flow on the Cross River or receiving River Shannon. Flood risk shall not be increased through the proposed scheme at either the upper or lower sections of the reach. The addition of the pumped water will have an insignificant impact on flood levels and will not increase the frequency or severity or flooding in the callows.

[64] Reid, N., Hayden, B., Lundy, M.G., Pietravalle, S., McDonald, R.A. & Montgomery, W.I. (2013) National Otter Survey of Ireland 2010/12. Irish Wildlife Manuals No. 76. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

In respect of this, there is no anticipated likely significant effect upon the QI habitats or species in respect of habitat loss, degradation or fragmentation through the addition of pumped water. Water quality sample results of Lough Funshinagh and the Cross River show little difference in parameters deducing that both waterbodies are relatively similar in physicochemical and biological make-up. Therefore, the degradation of habitat through water quality changes arising from the proposed scheme does not exist.

The risk of spread of INNS downstream via the pumped water is negligible as site surveys confirmed no presence of INNS within Lough Funshinagh or the Cross River.

The risk of an accidental pollution event giving rise to effects to the QI habitats of the River Shannon Callows SAC is unlikely to occur. Given the length of the Cross River from the point of scheme discharge to the Shannon Callows (approximately 15 km) and the projected flow rates (300 l/s) of the proposed scheme, any such instances of pollution would be highly localised and temporary, and within the Cross River it would be rapidly dispersed and dissolved thereby being insignificant upon reaching the Shannon Callows QI habitats. Additionally, it is not anticipated that it would impact fish biomass within the Cross River upon which there is potential that otter may prey.

Therefore, the risk of likely significant effects to the QI habitats of the River Shannon Callows SAC can be ruled out and does not require AA in respect of these QIs.

Signs of otter were recorded along the Cross River during site survey in August 2024. There is the potential that otter utilise the Cross River for commuting purposes. As previously stated, the upper reach banks are consolidated and do not support the potential for couching or holt sites, therefore they are not considered to use the Cross River for breeding or resting.

In respect of the QIs conservation objective to maintain the favourable conservation condition of otter through its suite of attributes and measures, it is not anticipated that the operation of proposed scheme would give rise to significant effects. Given the territorial range of the species[65] and the record of otter within 400m of the intake compound, there is the potential for localised and temporary species disturbance and displacement. It cannot be ruled out that the presence of the otter species recorded on-site was a QI of the River Shannon Callows SAC.

On a precautionary basis, LSE cannot be ruled out for otter (1355) and further assessment is required with regard to this QI at AA stage.

5.5.4 Lower River Shannon SAC

The Lower River Shannon SAC is located approximately 90km south (downstream distance) of the proposed scheme. The site is designated for the following QIs:

- 1110 Sandbanks which are slightly covered by sea water all the time
- 1130 Estuaries
- 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
- 1230 Vegetated Sea cliffs of the Atlantic and Baltic coasts
- 1310 Salicornia and other annuals colonising mud and sand
- 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae)*
- 1410 Mediterranean salt meadows (*Juncetalia maritimi*)
- 3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
- 6410 Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)

[65] Reid, N., Hayden, B., Lundy, M.G., Pietravalle, S., McDonald, R.A. & Montgomery, W.I. (2013) National Otter Survey of Ireland 2010/12. Irish Wildlife Manuals No. 76. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland

- 91E0 Alluvial forests with Alnus glutinosa and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)
- 1029 *Margaritifera margaritifera* (Freshwater Pearl Mussel)
- 1095 *Petromyzon marinus* (Sea Lamprey)
- 1096 *Lampetra planeri* (Brook Lamprey)
- 1099 *Lampetra fluviatilis* (River Lamprey)
- 1106 *Salmo salar* (Atlantic Salmon)
- 1349 *Tursiops truncatus* (Common Bottlenose Dolphin); and
- 1355 Otter

The distance between sites makes the potential for any aerial emissions negligible.

There exists a very weak hydrological linkage from the scheme discharge to the Lower River Shannon SAC, and therefore given the distance it is considered that the distance between both (90 km) means that potential LSE on any of the QI habitats can be excluded.

The freshwater pearl mussel catchment for the Lower River Shannon SAC is located within Co. Clare and is completely isolated from the proposed scheme.

Common bottlenose dolphin would not traverse to inland waters given they are a saltwater (but sometimes estuarine) species.

The proposed scheme sits outside the known territorial range for otter designated within this SAC.

As the lower River Shannon ascends into the Upper River Shannon there are a number of physical structures (weirs, culverts, dams[66]) which limit the upstream movement of fish species (Atlantic salmon, sea lamprey and river lamprey). Therefore, these aforementioned QI species are ruled out for further assessment.

Following dedicated aquatic survey of the Cross River, juvenile brook/river lamprey ammocoetes were identified at sampling point S2. Identifying brook lamprey from river lamprey at juvenile stage is difficult due to similar morphological features. As juveniles, their sizes, colours and the absence of developed eyes and teeth make visual identification beyond the genus level almost impossible. However, in light of impassable downstream barriers on the River Shannon, the individuals recorded at the proposed discharge location would likely be potadromous brook lamprey (Triturus, 2024). There is the potential that this population of brook lamprey share a weak linkage to the Lower River Shannon SAC population as individual ammocoetes could drift through the Cross River, entering the River Shannon and then drifting downstream to the Lower River Shannon SAC.

As the proposed scheme will involve installation of a new discharge to the Cross River with associated increases in flows and the introduction of rock armour to the river banks in addition to the operational discharge of water from Lough Funshinagh into the Cross River for up to two years, there is the potential that changes in changes in habitat and water quality in the Cross River may have an impact upon some juvenile brook lamprey individuals which may be weakly linked (through ammocoetes drift) to the Lower River Shannon SAC.

On a precautionary basis, LSE cannot be ruled out for brook lamprey (1096) and further assessment is required with regard to this QI at AA stage.

5.5.5 Ballynamona Bog and Corkip Lough SAC

Ballynamona Bog and Corkip Lough SAC is located approximately 4 km southwest (direct line distance) of the proposed scheme. The site is designated for the following QIs:

- 3180 Turloughs
- 7110 Active raised bogs
- 7120 Degraded raised bogs still capable of natural regeneration

[66] Inland Fisheries Ireland National Barriers Programme Data Viewer. Accessed at https://www.fisheriesireland.ie/what-we-do/research/national-barriers-programme August 2024.

- 7150 Depressions on peat substrates of the Rhynchosporion; and
- 91D0 Bog woodland

The distance between sites makes the potential for any aerial emissions negligible. There are no surface hydrological links, as the Cross River is connected downstream of the site and would not present the potential for a pathway for effect as such.

The proposed scheme sits within the same groundwater body as Lough Funshinagh and Ballynamona Bog and Corkip Lough SAC thereby sharing a geohydrological link. The purpose of the proposed scheme is to draw down the water level to its natural state. Given the scale of Lough Funshinagh at 3.8 km^2 sitting within a wider groundwater body of 354 km^2, it is considered that lowering water levels in Lough Funshinagh to a level higher than historically high levels will not have an effect on that wider groundwater body. No changes to the groundwater supply at Ballynamona Bog and Corkip Lough SAC are anticipated through the proposed scheme as the proposed scheme is anticipated to only incur localised and temporary changes. As a result, it is not anticipated that the groundwater dependent habitats of Ballynamona Bog and Corkip Lough SAC (3180 turloughs, 7110 Active raised bogs, 7120 Degraded raised bogs still capable of natural regeneration and 7150 Depressions on peat substrates of the Rhynchosporion) will experience any significant effects, in respect of their conservation objectives, as a result of the proposed scheme.

Therefore, the risk of likely significant effects to the QI habitats of the Ballynamona Bog and Corkip Lough SAC can be ruled out and does not require AA in respect of these QIs.

5.5.6 Lough Ree SPA

Lough Ree SPA is located approximately 5.5 km east of the proposed scheme and is designated for the following SCIs:

- A004 Little Grebe
- A038 Whooper Swan
- A050 Wigeon
- A052 Teal
- A053 Mallard
- A056 Shoveler
- A061 Tufted Duck
- A065 Common Scoter
- A067 Goldeneye
- A125 Coot
- A067 Golden Plover
- A142 Lapwing
- A193 Common Tern; and
- A999 Wetland and Waterbirds

There is no hydrological pathway for effect between the proposed scheme and Lough Ree SPA given the absence of any connected watercourses between the two sites. No likely significant effects can occur through hydrological pathways. Given the distance between sites, the potential for likely significant effects through aerial emissions is negligible.

I-WeBS annual counts records over the last five years were obtained for Lough Funshinagh, which is a subsite of the South Roscommon Lakes site. Annual counts show that of the SCIs of Lough Ree, coot, golden plover, lapwing, little grebe, mallard, shoveler, teal, tufted duck, whooper swan and wigeon are present, however, only little grebe and mallard have been consistently present in four out of the five years. The remaining species noted have intermittently been observed in the last five years. Wintering bird surveys[21] showed SCIs of wigeon, teal, shoveler and lapwing and breeding bird surveys showed records of mallard recorded all within 500 m of the intake compound. Survey reports note that '*teal and wigeon used the vegetated fringes and adjoining grasslands for feeding, refuge and roosting.*' and during breeding season, lapwing were noted to forage within the southwest corner (location of the proposed scheme) and shoveler foraged within flooded fields nearby. Both breeding and wintering bird reports concluded that Lough Funshinagh '*may be integral to the network of connected and proximate sites'*. As such it can be deduced that Lough Funshinagh provides a functional linkage to species which are SCIs of Lough Ree SPA.

During all phases of the proposed scheme, there is the potential that species may experience temporary and localised disturbance/displacement from within 500 m of the intake compound arising from noise. The project noise at the intake compound is estimated to be 76 dBA at 7m and this would dissipate over the surrounding landscape to background levels.

Modelled sound pressure levels at 50 m intervals from source are provided below in Table 5-3. A maximum of 51dBa was modelled at the nearest location where large numbers of wigeon have been recorded during surveys during Winter 2023/2024 i.e. between 50 m and 100 m from the proposed pumping operation. Noise of less than 55 dBA is considered to be a low-level disturbance stimulus, often below background levels with regular occurrence increasing habituation. Therefore, operation of the generator and pump will not cause any significant effects on bird populations in the area. In fact, the lowering of water levels is expected to provide additional habitat for dabbling ducks including wigeon and teal which were the species found in greatest numbers in proximity to the pumping location.

Table 5-3 Modelled sound pressure levels for distances from noise source.

Distance (m)	Sound Pressure Level (dBA)
50	54
100	47
150	43
200	41
250	35
300	34
350	32
400	31
450	30
500	29

Construction and decommissioning activities are anticipated to give rise to very temporary and localised effects which would not constitute a likely significant effect in respect of the conservation objectives of the SCIs. The operation of the proposed scheme is not anticipated to give rise to a likely significant effect. Whilst Lough Funshinagh may provide functionally linked land, an abundance of habitat both within Lough Ree SPA, the surrounding SPA sites and throughout the rest of Lough Funshinagh provide ample alternative habitat for relevant species. It is anticipated that species, if disturbed/displaced, will seek alternative land within Lough Funshinagh within a few hundred metres of the proposed scheme and would not cause undue pressure on local populations. Therefore, the operation of the proposed scheme would not constitute a significant effect in respect of the conservation objectives as the natural range of the species is not being reduced and there is sufficiently large habitat to maintain the populations on a long-term basis.

Therefore, the risk of likely significant effects to the SCIs of Lough Ree SPA can be ruled out and does not require AA in respect of these SCIs.

5.5.7 River Suck Callows SPA

The River Suck Callows SPA is located approximately 10 km west of the proposed scheme and is designated for the following SCIs:

- A038 Whooper Swan
- A050 Wigeon
- A140 Golden Plover
- A142 Lapwing
- A395 Greenland White-fronted Goose; and
- A999 Wetland and Waterbirds

There is no viable hydrological connection between the proposed scheme and the River Suck Callows SPA given the absence of any connected watercourses between the two sites. Therefore, there is not potential likely significant effects occurring via hydrological pathways. Given the distance between sites, the potential for likely significant effects through aerial emissions is negligible.

There were no instances of Greenland white fronted goose observed during site survey or within I-WeBS records. Records of whooper swan, wigeon, golden plover and lapwing were recorded in the last five years of annual counts for Lough Funshinagh subsite. Wintering and breeding bird surveys confirmed that all species (bar Greenland white fronted goose) have been present within the last year (2023-2024). No roosting habitat for whooper swan was recorded within the proposed scheme nor was there a record of roosts when reviewing the I-WeBS data.

During all phases of the proposed scheme, there is the potential that species may experience temporary and localised disturbance/displacement from within 500 m of the intake compound arising from noise.

The project noise at the intake compound is estimated to be 76dBA at 7m and this would dissipate over the surrounding landscape to background levels. Modelled sound pressure levels at 50 m intervals from source are provided below. A maximum of 51 dBa was modelled at the nearest location where large numbers of wigeon have been recorded during surveys during Winter 2023/2024 i.e. between 50 m and 100 m from the proposed pumping operation Noise of less than 55 dBA is considered to be a low-level disturbance stimulus, often below background levels with regular occurrence increasing habituation. Therefore, operation of the generator and pump will not cause any significant effects on bird populations in the area. In fact, the lowering of water levels may provide additional habitat for dabbling ducks including wigeon and teal which were the species found in greatest numbers in proximity to the pumping location.

Construction and decommissioning activities are anticipated to give rise to very temporary and localised effects which would not constitute a likely significant effect in respect of the conservation objectives of the SCIs. The operation of the proposed scheme is not anticipated to give rise to a likely significant effect. Whilst Lough Funshinagh may provide functionally linked land, an abundance of habitat both within River Suck Callows SPA, the surrounding SPA sites and throughout the rest of Lough Funshinagh provide ample alternative habitat for relevant species. It is anticipated that species, if disturbed/displaced, will seek alternative land within Lough Funshinagh within a few hundred metres of the proposed scheme and would not cause undue pressure on local populations. Therefore, the operation of the proposed scheme would not constitute a significant effect in respect of the conservation objectives as the natural range of the species is not being reduced and there is sufficiently large habitat to maintain the populations on a long-term basis.

Therefore, the risk of likely significant effects to the SCIs of the River Suck Callows SPA can be ruled out and does not require AA in respect of these SCIs.

5.5.8 Four Roads Turlough SPA

The Four Roads Turlough SPA is located approximately 8km west of the proposed scheme and is designated for the following SCIs:

- A140 Golden Plover
- A395 Greenland White-fronted Goose; and
- A999 Wetland and Waterbirds

There is no viable hydrological connection between the proposed scheme and the Four Roads turlough SPA given the absence of any connected watercourses between the two sites. Therefore, there is no potential for likely significant effects occurring via hydrological pathways. Given the distance between sites, the potential for likely significant effects through aerial emissions is negligible.

There were no instances of Greenland white fronted goose observed during site survey or within I-webs records. Records of golden plover were recorded in the last five years of annual counts for Lough Funshinagh subsite. Wintering and breeding bird surveys confirmed that lapwing have been present within the last year (2023-2024).

During all phases of the proposed scheme, there is the potential that species may experience temporary and localised disturbance/displacement from within 500m of the intake compound arising from noise. The project noise at the intake compound is estimated to be 76 dBA at 7m and this would dissipate over the surrounding landscape to background levels. Modelled sound pressure levels at 50m intervals from source are provided below. A maximum of 51 dBa was modelled at the nearest location where large numbers of wigeon have been recorded during surveys during Winter 2023/2024 i.e. between 50 m and 100 m from the proposed pumping operation Noise of less than 55 dBA is considered to be a low-level disturbance stimulus, often below background levels with regular occurrence increasing habituation. Therefore, operation of the generator and pump will not cause any significant effects on bird populations in the area. In fact, the lowering of water levels may provide additional habitat for dabbling ducks including wigeon and teal which were the species found in greatest numbers in proximity to the pumping location.

Construction and decommissioning activities are anticipated to give rise to very temporary and localised effects which would not constitute a likely significant effect in respect of the conservation objectives of the SCIs.

The operation of the proposed scheme is not anticipated to give rise to a likely significant effect. Whilst Lough Funshinagh may provide functionally linked land, an abundance of habitat both within Four Roads Turlough SPA, the surrounding SPA sites and throughout the rest of Lough Funshinagh provide ample alternative habitat for relevant species. It is anticipated that species, if disturbed/displaced, will seek alternative land within Lough Funshinagh within a few hundred metres of the proposed scheme and would not cause undue pressure on local populations. Therefore, the operation of the proposed scheme would not constitute a significant effect in respect of the conservation objectives as the natural range of the species is not being reduced and there is sufficiently large habitat to maintain the populations on a long-term basis.

Therefore, the risk of likely significant effects to the SCIs of the Four Roads Turlough SPA can be ruled out and does not require AA in respect of these SCIs.

5.5.9 Lough Croan Turlough SPA

The Lough Croan turlough SPA is located approximately 4km northwest of the proposed scheme and is designated for the following SCIs:

- A056 Shoveler
- A140 Golden Plover
- A395 Greenland White-fronted Goose; and
- A999 Wetland and Waterbirds

There is no viable hydrological connection between the proposed scheme and Lough Croan turlough SPA given the absence of any connected watercourses between the two sites. Therefore, there is no potential for likely significant effects occurring via hydrological pathways. Given the distance between sites, the potential for likely significant effects through aerial emissions is negligible.

There were no instances of Greenland white fronted goose observed during site survey or within I-webs records. Records of golden plover and shoveler were recorded in the last five years of annual counts for Lough Funshinagh subsite. Wintering and breeding bird surveys confirmed that both golden plover and shoveler have been present within the last year at Lough Funshinagh (2023-2024).

During all phases of the proposed scheme, there is the potential that species may experience temporary and localised disturbance/displacement from within 500 m of the intake compound arising from noise. The project noise at the intake compound is estimated to be 76 dBA at 7m and this would dissipate over the surrounding landscape to background levels. Modelled sound pressure levels at 50 m intervals from source are provided below. A maximum of 51 dBa was modelled at the nearest location where large numbers of wigeon have been recorded during surveys during Winter 2023/2024 i.e. between 50 m and 100 m from the proposed pumping operation Noise of less than 55 dBA is considered to be a low-level disturbance stimulus, often below background levels with regular occurrence increasing habituation.

Therefore, operation of the generator and pump will not cause any significant effects on bird populations in the area. In fact, the lowering of water levels may provide additional habitat for dabbling ducks including wigeon and teal which were the species found in greatest numbers in proximity to the pumping location.

Construction and decommissioning activities are anticipated to give rise to very temporary and localised effects which would not constitute a likely significant effect in respect of the conservation objectives of the SCIs. The operation of the proposed scheme is not anticipated to give rise to a likely significant effect. Whilst Lough Funshinagh may provide functionally linked land, an abundance of habitat both within Lough Croan Turlough SPA, the surrounding SPA sites and throughout the rest of Lough Funshinagh provide ample alternative habitat for relevant species. It is anticipated that species, if disturbed/displaced, will seek alternative land within Lough Funshinagh within a few hundred metres of the proposed scheme and would not cause undue pressure on local populations. Therefore, the operation of the proposed scheme would not constitute a significant effect in respect of the conservation objectives as the natural range of the species is not being reduced and there is sufficiently large habitat to maintain the populations on a long-term basis.

Therefore the risk of likely significant effects to the SCIs of the Lough Croan Turlough SPA can be ruled out and does not require AA in respect of these SCIs.

5.5.10 Middle Shannon Callows SPA

The Middle Shannon Callows SPA is located approximately 14km downstream of the proposed scheme and is designated for the following SCIs:

- A038 Whooper swan
- A050 Wigeon
- A122 Corncrake
- A140 Golden plover
- A142 Lapwing
- A156 Black-tailed godwit
- A179 Black-headed gull; and
- A999 Wetland and Waterbirds

Given the distance between the proposed scheme and the Middle Shannon Callows SPA site, the potential for a pathway for effect via aerial emissions is negligible. The hydrological connection between the Cross River and the Middle Shannon Callows is not anticipated to give rise to any likely significant effect downstream during the operation of the proposed scheme. Hydraulic modelling of the proposed stream concluded no significant impact upon the Shannon Callows habitat within the SPA.

I-WeBS annual counts records over the last five years were obtained for Lough Funshinagh, which is a subsite of the South Roscommon Lakes site. Records show that of the SCIs of the Middle Shannon Callows SPA whooper swan, wigeon, golden plover, lapwing, black-tailed godwit and black headed gull are present. Wintering bird surveys[21] showed SCIs of wigeon and lapwing and breeding bird surveys showed records of lapwing recorded all within 500 m of the intake compound. Survey reports note that '*teal and wigeon used the vegetated fringes and adjoining grasslands for feeding, refuge and roosting.*' and during breeding season, lapwing were noted to forage within the southwest corner (location of the proposed scheme). Both breeding and wintering bird reports concluded that Lough Funshinagh '*may be integral to the network of connected and proximate sites.*' As such it can be deduced that Lough Funshinagh provides a functional linkage to species which are SCIs of Lough Ree SPA

During all phases of the proposed scheme, there is the potential that species may experience temporary and localised disturbance/displacement from within 500 m of the intake compound arising from noise. The project noise at the intake compound is estimated to be 76dBA at 7m and this would dissipate over the surrounding landscape to background levels. Modelled sound pressure levels at 50 m intervals from source are provided below. A maximum of 51 dBa was modelled at the nearest location where large numbers of wigeon have been recorded during surveys during Winter 2023/2024 i.e. between 50 m and 100 m from the proposed pumping operation Noise of less than 55 dBA is considered to be a low-level disturbance stimulus, often below background levels with regular occurrence increasing habituation. Therefore, operation of the generator and pump will not cause any significant effects on bird populations in the area. In fact, the lowering of water levels may provide additional habitat for dabbling ducks including wigeon and teal which were the species found in greatest numbers in proximity to the pumping location.

Construction and decommissioning activities are anticipated to give rise to very temporary and localised effects which would not constitute a likely significant effect in respect of the conservation objectives of the SCIs. The operation of the proposed scheme is not anticipated to give rise to a likely significant effect. Whilst Lough Funshinagh may provide functionally linked land, an abundance of habitat both within Middle Shannon Callows SPA, the surrounding SPA sites and throughout the rest of Lough Funshinagh provide ample alternative habitat for relevant species. It is anticipated that species, if disturbed/displaced, will seek alternative land within Lough Funshinagh within a few hundred metres of the proposed scheme and would not cause undue pressure on local populations. Therefore, the operation of the proposed scheme would not constitute a significant effect in respect of the conservation objectives as the natural range of the species is not being reduced and there is sufficiently large habitat to maintain the populations on a long-term basis.

Therefore, the risk of likely significant effects to the SCIs of Middle Shannon Callows SPA can be ruled out and does not require AA in respect of these SCIs.

5.5.11 Mongan Bog SPA

Mongan Bog SPA is located 20km south of the proposed scheme and is designated for the following SCI:

- A395 Greenland White-fronted Goose

Given the distance between the SPA site and the proposed scheme, a pathway for effect through aerial emissions is considered negligible.

There is no hydrological pathway for effect between the proposed scheme and the SPA site as the site is separated from the River Shannon by the presence of an esker, thereby creating a barrier between any risk of flood conditions and the SPA site.

There are no records of Greenland white fronted goose within the I-WeBS annual counts for the last five years. There were no instances of the species recorded during dedicated wintering bird surveys at Lough Funshinagh. As a result, it is considered that the proposed scheme area does not provide functionally linked land to the Greenland white fronted goose.

Therefore, the risk of likely significant effects to the SCIs of Mongan Bog SPA can be ruled out and does not require AA in respect of these SCIs.

5.6 Screening Assessment Outcome

Following the application of the Source-Pathway-Receptor method to establish the ZoI of the proposed scheme, Table 5-4 lists the sites and respective QIs/SCIs that have been considered to have the potential for likely significant effects and as such require AA.

Table 5-4 European sites and their relevant QIs SCIs considered for further assessment

EU Site	QIs/SCIs that require Appropriate Assessment	Potential impacts where likely significant effects could not be ruled out
Lough Funshinagh SAC	3180 Turloughs	Accidental pollution event; and Introduction and/or spread of Invasive Species
Lough Ree SAC	1355 Otter	Species disturbance/displacement
River Shannon Callows SAC	1355 Otter	Species disturbance/displacement; and
Lower River Shannon SAC	1096 Brook lamprey	Water quality changes

5.7 Assessment of In-Combination Effects with other Projects or Plans

The in-combination assessment has been carried out in review of planning applications within the ZoI of the proposed scheme through the Roscommon County Council planning portal, An Bord Pleanála case search portal, Uisce Éireann projects database and EPA licence applications and amendments for facilities within 1 km of the proposed scheme and the Cross River. For projects where there is the potential for in-combination effects, these are considered in the AA.

Table 5-5 below provides the projects and/or plans which have been considered within the AA report.

Table 5-5 In-Combination Assessment of the proposed scheme

Planning Application No.	Project Details	Distance from the proposed scheme	Potential for In-Combination Effects
22351	This planning application seeks permission for a renovation of an existing dwelling in Ballycreggan, Co. Roscommon. The project involves demolishing parts of the existing structure, constructing a new extension, and upgrading the septic tank system. These changes aim to improve the dwelling's functionality and overall condition at Ballycreggan, Kiltoom, Co. Roscommon. Conditional Permission Granted.	5km south	The planning application is located 5km downstream of the proposed scheme and located approximately 500m from the Cross River. The decommissioning of a septic tank and soak away is to be replaced by a new treatment system and percolation area. A condition to the planning application requires the applicant to ensure that all effluent disposal from the development is to be in compliance with EPA Code of Practice. The only identified pathway for effect arising from the proposed scheme to act as an in-combination effect is through surface water to in-stream water flows through the Cross River. Due to the minor scale of the development and the implementation of the new treatment system, there is no anticipated impacts arising from water quality effects to the Cross River. No in-combination effects are anticipated arising from the proposed scheme and this planning application.
22445	This planning application seeks permission to construct 1 No. dwelling, garage, entrance onto road, new wastewater treatment system and percolating area and all associated site works at Ballycreggan Kiltoom Roscommon Conditional Permission Granted.	6km south	The planning application is located 6km downstream of the proposed scheme and located approximately 200m from the Cross River. The project includes the provision of a new wastewater treatment plant and percolation system and conditions attached further require the applicant to adhere to appropriate drainage standards for surface and wastewater drainage. The only identified pathway for effect arising from the proposed scheme to act as an in-combination effect is through surface water to in-stream water flows through the Cross River. Due to the minor scale of the development and the implementation of the new treatment system, there is no anticipated impacts arising from water quality effects to the Cross River. No in-combination effects are anticipated arising from the proposed scheme and this planning application.

Planning Application No.	Project Details	Distance from the proposed scheme	Potential for In-Combination Effects
20370	This planning application seeks permission for the construction of 8 no two storey detached houses including connections to existing public services and sewers, landscaping and all associated infrastructure works and services at Waterville Housing Estate, Monksland, Bealnamulla, Athlone. Conditional Permission Granted.	10km south	This planning application is located 10km from the proposed scheme and approximately 200m from the Cross River. There is a weak hydrological link between the planning application site through a infilled/vegetated drain. The only identified pathway for effect arising from the proposed scheme to act as an in-combination effect is through surface water into in-stream water flows through the Cross River. Conditions attached to the planning application includes a construction and demolition waste management plan, a management scheme plan, agreement of gully locations and drainage channels with Boyle Municipal District Co-Ordinator and bunding of all oil storage tanks. Through the implementation of these conditions, there is no anticipated impacts arising from water quality effects to the Cross River. No in-combination effects are anticipated arising from the proposed scheme and this planning application.
2360195	This planning application seeks permission for a residential development in Monksland, Athlone. It involves demolishing three existing dwellings and constructing 86 new houses and apartments of varying sizes. Additionally, the development includes a creche, a pumping station, a new residential access road, and public open space. This project aims to transform the area and provide new housing options and community amenities. Planning application under consideration.	11km south	This planning application is located 11km from the proposed scheme and approximately 500m from the Cross River. An AA Screening adjoining the application identified potential water quality impacts to Cross River and affect Shannon Callows SAC and SPA. The NIS adjoining the planning application provides mitigation for any potential adverse effects upon water quality into the Cross River which may affect the downstream European sites. It is determined that sufficient mitigation measures are found within the NIS to conclude no in-combination effects will arise through the implementation of the proposed scheme and this planning application upon the downstream EU sites.
21405	This planning application seeks permission for a ground floor extension to the existing access corridor, along with modifications to the building's exterior, including new windows, escape routes, and ventilation systems. These changes aim to improve access, safety, and functionality. Jazz Pharmaceuticals Ireland Manufacturing & Development, Monksland, Co. Roscommon, N37 AZ84. Planning Application Granted with Conditions	11km south	This planning application is located 11km south from the proposed scheme and approximately 200m from the Cross River. There are no identified pathways for effect between the planning application and the Cross River. Therefore no in combination effects arising from the proposed scheme and the planning application are anticipated.

Planning Application No.	Project Details	Distance from the proposed scheme	Potential for In-Combination Effects
317588	110kV single-bay air insulated substation (Cuilleen), 110kV underground grid connection and all associated works Electricity Development Application Greener Ideas Ltd applicant Permission granted with conditions.	11km south	This planning application is located 11km south from the proposed scheme and approximately 300m from the Cross River. An AA Screening and NIS were submitted with the planning applications. Impacts upon downstream European sites were identified for the receptors of otter and bird species of the Shannon Callows SAC and Middle Shannon Callow SPA respectively with mitigation measures recommended to ameliorate any impacts. With the implementation of these mitigation measures, the potential for an in-combination effect between the proposed scheme and this planning application is negligible. Therefore, no in combination effects arising from the proposed scheme and the planning application are anticipated
22177 18256	This planning application consists of revisions and alterations of the permitted development of a gas fired power plant. The proposed revisions to the gas-fired power plant aim to increase its electrical output to 102MW while incorporating design changes to the infrastructure. These alterations include height adjustments for several buildings, modifications to the storage facilities, and additions to the site development.	11km south	This planning application is located 11km south from the proposed scheme and approximately 300m from the Cross River. An AA Screening was submitted alongside the planning documentation an: concluded no potential for significant effects as a result of the project on EU sites. Therefore, no in combination effects arising from the proposed scheme and the planning application are anticipated
313750	Windfarm development and all associated works. Energia Renewables RoI Ltd.	7km northwest	This planning application is located 7km northwest from the proposed scheme and extends from Dysert to Athlone. The proposed scheme and this planning application share pathways for effect via instream flows to the Cross River and functionally linked land for otter and bird species. An AA Screening and NIS were submitted alongside the planning documentation. The NIS recommended a full suite of mitigation measure to ameliorate any potential adverse effects upon the integrity of European sites with otter and bird species as QIs/SCIs. Upon review of these measures and in consideration of the proposed scheme, the potential for an in-combination effect is considered negligible given the thorough and detailed mitigation proposed through design, construction, operation and decommissioning phases of the planning application. Therefore, no in combination effects arising from the proposed scheme and the planning application are anticipated.

Planning Application No.	Project Details	Distance from the proposed scheme	Potential for In-Combination Effects
n/a	Uisce Éireann: The ongoing works associated with the Athlone Water Supply Scheme Upgrade Phase 2[67], located in Monksland Business Park.	11 km	This project is ongoing with the advanced phase 2 works reported as being complete. The construction stage of Phase 2 was due to commence in 2023 and to include expanding the existing pumping station and upgrading a number of elements of the plant including the primary treatment processes as well as disinfection process. The water treatment plant is located adjacent to the River Shannon in Athlone town centre, approximately 3km upstream of where the Cross River flows into the Shannon River. Therefore, given the nature of the upgrade works, the location of the treatment plant relative to the Cross River outflow to the River Shannon and the nature and duration (short-term) effects of the proposed scheme on water quality, no in-combination effects are anticipated.
n/a	EPA Licensing: Application P1197-01 (Status: Applied) for a Bord Gáis Energy Power Plant	12 km	Application P1197-01 (Status: Applied) for a Bord Gáis Energy Power Plant with capacity to generate up to 102 MW of electricity. The development boundary is located 20 m from the Cross River approximately 12 km downstream of the outfall location. There will be no wastewater discharged into the Cross River, but surface water discharge will be charged into the Cross River, following the implementation of several mitigation measures. Mitigation measures to ameliorate any water quality impacts are recommended within the application. Therefore, no in combination effects arising from the proposed scheme and the planning application are anticipated.

[67] Uisce Éireann, https://www.water.ie/projects/local-projects/athlone-water-supply-scheme#:~:text=Other%20investment%20in%20the%20Athlone%20Water%20Supply%20Scheme%3A&text=This%20includes%20upgrading%2C%20replacing%2C%20and,station%20for%20the%20Annagh%20Reservoir.

5.7.1 Summary of In-Combination Effects Assessment

A thorough search was conducted across all available planning and project application portals to identify any projects that may have the potential to interact with the proposed scheme. The applications identified as having potential are listed in Table 5-5 above. Each of these applications' documents was carefully reviewed to assess the potential for in-combination effects, following which it has been concluded that the potential for any in-combination effects, arising from the proposed scheme and another plan/project does not exist.

5.8 Screening Assessment Outcome

The potential impacts of the proposed scheme, its pathways for effects and receptors upon which there is the potential for impacts were identified. A list of European sites was identified and considered in the screening assessment. Following the application of the SPR method and in review of the COs for each European site, it has been concluded that the potential for LSE exists upon QIs at four European sites. These sites have been scoped in for further assessment in Section 6 and are listed below:

- Lough Funshinagh SAC (3180 turloughs)
- Lough Ree SAC (1355 otter)
- River Shannon Callows SAC (1355 otter); and
- Lower River Shannon SAC (1085 brook lamprey)

To conclude, the proposed scheme has the potential to give rise to LSE to the above-mentioned sites and therefore must be screened in for AA.

6. Natura Impact Statement

6.1 Overview

This section of the report provides an analysis comprising the scientific examinations of the proposed scheme and its implications for the European sites referred to in Section 5 in view of their COs. An analysis of whether the proposed scheme, in light of best scientific information, individually or in combination with other plans or projects, would adversely affect the integrity of a European site is provided in the following subsections.

The following sections provide a review of the potential impact pathways for the QIs or SCIs that have been found at risk of adverse effects. Mitigation measures for the avoidance of impact are then provided.

Taking a precautionary approach, the proposed scheme has the potential to give rise to a potential accidental pollution event and/or the introduction/spread of INNS to the QI habitat of 3180 turlough of Lough Funshinagh SAC. There is potential that river/brook lamprey within the Cross River share a functional linkage with the Lower River Shannon SAC and potential deterioration in water quality could arise through the operation of the proposed scheme. Water transference between two separate waterbodies introduces the potential for water quality changes.

Potential for indirect disturbance/displacement effects have also been identified for otter, a QI of both the River Shannon Callows SAC and Lough Ree SAC. During construction and decommissioning works there is the risk that temporary and localised disturbance/displacement may occur to otter that are within the vicinity of the proposed scheme from the movement of machinery and the installation of the pump and pipeline infrastructure.

6.2 Appropriate Assessment – Assessment of Adverse Effects

The subsequent subsections provide the assessments for adverse effects to occur in light of the proposed scheme to the QI and SCI features of the respective sites identified in Section 5. The attributes and measures for each of the QIs/SCIs are provided and an assessment is made in respect of the COs.

6.2.1 Lough Funshinagh SAC - Assessment of Adverse Effects

The COs, attributes and targets for Lough Funshinagh SAC were reviewed during the Screening Assessment (Section 5) and it was determined that the potential for adverse effects exist upon 3180 turloughs QI habitat. An analysis of the potential adverse effects is provided against the attributes and targets below in Table 6-1 .

The Conservation Objective for the 3180 Turloughs habitat is '*To maintain the favourable conservation condition of Turloughs* in Lough Funshinagh SAC, which is defined by the following list of attributes and targets*.'

Table 6-1 Conservation Objectives for Lough Funshinagh SAC

Qualifying Interest	Attributes	Targets	Potential for Adverse Effects	Impact Assessment	Recommended Mitigation
Turloughs [3180]	Habitat area	Area stable at c.378.3ha or increasing, subject to natural processes.	There will be no change in habitat area in respect of the 3180 turlough lough habitat during construction, operation or decommissioning stages. No adverse effects anticipated in respect of this attribute and target.	There will be no impacts in respect of this attribute arising from the proposed scheme.	Not required.
	Habitat distribution	No decline, subject to natural processes	There will be no decline in habitat distribution in respect of the 3180 turlough lough habitat during construction, operation or decommissioning stages. No adverse effects anticipated in respect of this attribute and target.	There will be no impacts in respect of this attribute arising from the proposed scheme.	Not required.
	Hydrological regime	Maintain appropriate natural hydrological regime necessary to support the natural structure and functioning of the habitat	There will be no changes to the natural hydrological regime in respect of the 3180 turlough lough habitat during construction, operation or decommissioning stages. No adverse effects anticipated in respect of this attribute and target.	There will be no impacts in respect of this attribute arising from the proposed scheme.	Not required.
	Soil type	Maintain variety, area and extent of soil types necessary to support turlough vegetation and other biota	There will be no changes to the soil type in respect of the 3180 turlough lough habitat during construction, operation or decommissioning stages. No adverse effects anticipated in respect of this attribute and target.	There will be no impacts in respect of this attribute arising from the proposed scheme.	Not required.

Qualifying Interest	Attributes	Targets	Potential for Adverse Effects	Impact Assessment	Recommended Mitigation
	Soil nutrient status: nitrogen and phosphorus	Maintain nutrient status appropriate to soil types and vegetation communities	There will be no changes to the soil nutrient status in respect of the 3180 turlough lough habitat during construction, operation or decommissioning stages. No adverse effects anticipated in respect of this attribute and target.	There will be no impacts in respect of this attribute arising from the proposed scheme.	Not required.
	Physical structure: bare ground	Maintain sufficient wet bare ground, as appropriate	There will be no changes to the physical structure of the bare ground in respect of the 3180 turlough lough habitat during construction, operation or decommissioning stages. No adverse effects anticipated in respect of this attribute and target.	There will be no impacts in respect of this attribute arising from the proposed scheme.	Not required.
	Chemical processes: calcium carbonate deposition and concentration	Maintain appropriate calcium carbonate deposition rate and concentration in soil	There will be no changes to the chemical processes in respect of the 3180 turlough lough habitat during construction, operation or decommissioning stages. No adverse effects anticipated in respect of this attribute and target.	There will be no impacts in respect of this attribute arising from the proposed scheme.	Not required.
	Water quality	Maintain appropriate water quality to support the natural structure and functioning of the habitat	There is the potential for a minor, short-term but wholly reversible change to water quality arising from the proposed scheme. The risk of an accidental pollution event during construction has the potential to release hydrocarbons, fuel, oils or cementitious runoff into the water of Lough Funshinagh thereby affecting the target and attribute.	Whilst the risk of a pollution event may occur, the proposed scheme design includes establishing a concrete bund surrounding the diesel generators which shall curtail any potential for a hydrocarbon release during refuelling. The risk of impact is contained to the construction period prior to the installation of the concrete bund whilst the intake compound is created and machinery are used to place the pump intake and access pontoon.	Mitigation proposed to avoid effects in regard to this attribute are summarised here but are found in full in Section 6.4. A Construction Environmental Management Plan (CEMP). Sediment, Erosion and Pollution Control Plan (SEPCP) Non-native Invasive Species Management Plan (NNISMP) and Incident Response Plan (IRP) have been prepared.

Qualifying Interest	Attributes	Targets	Potential for Adverse Effects	Impact Assessment	Recommended Mitigation
				During the installation of the concrete bund a minor amount of cementitious runoff could percolate through the 6f fill it is being poured onto, however the underlying geotextile and surrounding silt fence will limit any impact on the lake during the short period over which the cement is being formed. No risk of an accidental pollution incident is anticipated during operation of the proposed scheme. Risk during refuelling is considered to be minimal, however there is a slight risk of an incident arising from vehicle accident during delivery of fuel to the generator. During decommissioning there is a minor risk again during the removal of the floating infrastructure should machinery experience a sudden leak.	An Ecological Clerk of Works shall be in-situ during construction and decommissioning. Silt and biosecurity measures shall be adhered to (Section 6.4.2)
	Active peat formation	Maintain active peat formation	There will be no changes to active peat formation in respect of the 3180 turlough lough habitat during construction, operation or decommissioning stages. No adverse effects anticipated in respect of this attribute and target.	There will be no impacts in respect of this attribute arising from the proposed scheme.	Not required.
	Vegetation composition: area of vegetation communities	Maintain area of sensitive and high conservation value vegetation communities/units	The potential introduction and/or spread of invasive non-native species cannot be ruled out in regard to these attributes and targets. INNS may introduce through construction and decommissioning stages. Where this is successful, there is the risk that the vegetation composition will be directly impacted as INNS could outcompete native species and inundate the habitat. Area loss and the vegetation zonation/mosaic characteristics may be lost.	In respect of the proposed scheme and the attributes and targets, the introduction/spread of INNS to Lough Funshinagh SAC could have a direct effect during construction and operation through the movement of machinery and personnel and the placement of infrastructure within the SAC. It is therefore necessary to recommend mitigation measures to ameliorate such effects.	To mitigate the risk of the introduction/spread of INNS, all machinery should be thoroughly cleaned to remove soil and organic matter before transport to site. Construction materials must be sourced from reputable suppliers and inspected for plant material/pests upon arrival.
	Vegetation composition: vegetation zonation	Maintain vegetation zonation/mosaic characteristic of the site			
	Vegetation structure: sward height				

Qualifying Interest	Attributes	Targets	Potential for Adverse Effects	Impact Assessment	Recommended Mitigation
		Maintain sward heights appropriate to the vegetation unit, and a variety of sward heights across the turlough	The typical species found within a turlough SAC (see Section 5.5.1 baseline) may also be outcompeted by INNS thereby leading to an indirect effect of habitat degradation.		Additionally, a quarantine period for new materials and machinery allows potential threats to be identified. All personnel are required to be familiar and equipped with good biosecurity control measures. Biosecurity measures will be detailed in a Construction Environment Management Plan (CEMP).
	Typical species	Maintain typical species within and across the turlough			
	Fringing habitats: area	Maintain marginal fringing habitats that support turlough vegetation, invertebrate, mammal and/or bird populations	There will be no changes to the current natural fringing habitat area in respect of the 3180 turlough lough habitat during construction, operation or decommissioning stages. No adverse effects anticipated in respect of this attribute and target.	There will be no impacts in respect of this attribute arising from the proposed scheme.	Not required.
	Vegetation structure: turlough woodland	Maintain appropriate turlough woodland diversity and structure	There will be no changes to vegetation structure for turlough woodland in respect of the 3180 turlough lough habitat during construction, operation or decommissioning stages. No adverse effects anticipated in respect of this attribute and target.	There will be no impacts in respect of this attribute arising from the proposed scheme.	Not required.

6.2.2 River Shannon Callows SAC - Assessment of Adverse Effects

In respect of the QIs at risk of adverse effects arising from the proposed scheme, the screening assessment concluded 1355 otter were at risk. The following subsections shall discuss the potential for adverse effects in respect of the conservation objectives. An assessment of the potential for adverse effects, in light of the conservation objectives and proposed avoidance and/or mitigation measures, is provided below in Table 6-2.

The conservation objective for otter is to maintain the favourable conservation condition of otter in the River Shannon Callows SAC, which is defined by the following list of attributes and targets.

Table 6-2 Conservation Objectives for River Shannon Callows SAC

Qualifying Interests	Attributes	Targets	Potential Adverse Effects	Impact Assessment	Recommended Mitigation
Otter [1355]	Distribution	No significant decline	There is the potential that during the construction, operation and decommissioning period of the proposed scheme, there is a risk that visual and noise disturbance generated by construction related activities, vehicle movement and the presence of personnel could temporarily displace otter species of River Shannon Callows SAC.	As otter may be present in proximity to the proposed scheme, sudden noise during construction/operation may cause otter to be temporarily displaced and disturbed. Whilst the impacts are anticipated to be localised to the intake compound and discharge to the Cross River, otter may be displaced from commuting routes.	An ECoW will be employed during construction and decommissioning stages. A walkover of the turlough edge in proximity to works will be carried out each day during these stages to identify if otter are present. The ECoW will inform site personnel when works can commence without causing disturbance to otter. The ECoW will carry out weekly checks of the pumping area and turlough edge in proximity to identify if any evidence of otter. If any evidence of otter is identified this will be reviewed and any necessary further measures to mitigate effects identified and implemented. Remotely accessed trail camera (s) shall be installed in proximity to the pump intake compound to monitor for any otters present during operation. These shall be checked 2-3 times a week for otter presence. If any evidence of otter is identified this will be reviewed and any necessary further measures to mitigate effects identified and implemented. If obvious sudden avoidance by otter of the pump intake compound is occurring then the Project Ecologist will review

Qualifying Interests	Attributes	Targets	Potential Adverse Effects	Impact Assessment	Recommended Mitigation
					behaviour, consider whether this is significant and discuss as necessary with relevant NPWS staff as to whether revised pumping hours may be required. This could include reduced pumping at specific times however it is considered likely that otter would become habituated to the pump and maintaining operation is likely to be the best course of action.
	Extent of terrestrial habitat	No significant decline. Area mapped and calculated as 282.1ha	There will be no changes to the extent of terrestrial habitat in respect of otter at the Shannon Callows SAC during construction, operation or decommissioning stages of the proposed scheme. No adverse effects anticipated in respect of this attribute and target.	There will be no impacts in respect of this attribute arising from the proposed scheme.	Not required.
	Extent of freshwater (river) habitat	No significant decline. Length mapped and calculated as 146.7km	There will be no changes in the mapped extent of freshwater river habitat in respect of otter at the Shannon Callows SAC during construction, operation or decommissioning stages of the proposed scheme. No adverse effects anticipated in respect of this attribute and target.	There will be no impacts in respect of this attribute arising from the proposed scheme.	Not required.
	Couching sites and holts	No significant decline	There will be no changes to couching sites and holts in respect of otter at the Shannon Callows SAC during construction, operation or decommissioning stages of the proposed scheme. No adverse effects anticipated in respect of this attribute and target.	There will be no impacts in respect of this attribute arising from the proposed scheme.	Not required.
	Fish biomass available	No significant decline	There will be no decline in the fish biomass in respect of otter at the Shannon Callows SAC during construction, operation or decommissioning stages of the proposed scheme.	There will be no impacts in respect of this attribute arising from the proposed scheme.	Not required.

Qualifying Interests	Attributes	Targets	Potential Adverse Effects	Impact Assessment	Recommended Mitigation
			No adverse effects anticipated in respect of this attribute and target.		
	Barriers to connectivity	No significant increase	There will be no significant increase in barriers in respect of otter at the Shannon Callows SAC during construction, operation or decommissioning stages of the proposed scheme. No adverse effects anticipated in respect of this attribute and target.	There will be no impacts in respect of this attribute arising from the proposed scheme.	Not required.

6.2.3 Lower River Shannon SAC - Assessment of Adverse Effects

On a highly precautionary basis it has been assumed the Cross River is functionally linked to the Lower River Shannon SAC for brook lamprey. This assessment has been made because there is a potential functional connection between the brook lamprey within the Cross River, that could theoretically drift downstream to support the SAC population; either as larval (ammocoetes) or as transformed adults.

The CO for brook lamprey is '*To maintain the favourable conservation condition of Brook Lamprey in the Lower River Shannon SAC, which is defined by the following list of attributes and targets*.'

An assessment of the potential for adverse effects, in light of the conservation objectives and proposed avoidance and/or mitigation measures, is provided below in Table 6-3.

Table 6-3 Conservation Objective for Lower River Shannon SAC

Qualifying Interests	Attributes	Targets	Potential Adverse Effects	Impact Assessment	Recommended Mitigation
Brook lamprey [1096]	Distribution	Access to all water courses down to first order streams	There will be no change in distribution with the SAC boundary. There is potential for local and temporary changes in the distribution of this species in functionally linked river habitat in the Cross River ~76km upstream of the SAC boundary.	Survey data from the Cross River has identified brook lamprey ammocoetes utilising marginal silts at the discharge location and eDNA results identify that brook lamprey is present throughout the Cross River.	No mitigation required regarding this attribute.
	Population structure of juveniles	At least three age/size groups of brook/river lamprey present	There will be no change in population structure of juveniles within the SAC boundary. There is potential for local and temporary disturbance of this species in functionally linked river habitat in the Cross River (~76km upstream of the SAC boundary) but significant loss of individual ammocoetes is not anticipated.		In the event that juvenile lamprey are considered at risk, or located within the immediate discharge location where the riverbed and banks will be subject to protection measures, they will be translocated

Qualifying Interests	Attributes	Targets	Potential Adverse Effects	Impact Assessment	Recommended Mitigation
	Juvenile density in fine sediment	Mean catchment juvenile density of brook/lamprey at least 2/m^2	There will be no change in the mean ammocoetes density in fine sediment within the SAC boundary. There is potential for local and temporary changes in density of ammocoetes in the Cross River in the immediate vicinity of the pumped discharge (~76km upstream of the SAC boundary) and associated bed/bank erosion protection measures, which will consist of a geotextile layer will cover the riverbed and banks. The geotextile will extent over a length of 10m, centred on the outflow location (5m upstream and 5m downstream of outflow). The geotextile will be held in place by rock armour which consists of 200kg rocks approximately 0.5m in diameter. The rock armour will extend up to the proposed high-water mark at the outfall location. In addition, natural flag stones will be installed with the leading and tail edge interfaces level to the the existing riverbed at the outfall location. However, the proposed outfall area does not directly overlap with soft silt lamprey ammocoete habitat.	It is considered than any residual effects (after mitigation) would be localised and minor and limited to a single functionally linked river a long way upstream of the SAC; on this basis an adverse effect of the SAC can be ruled out.	to suitable habitat upstream of the discharge during pre-construction electrofishing under licence. Suitable receptor locations have been identified upstream of the discharge location. A qualified fisheries ecologist (potentially the ECoW) will carry out the translocation of brook lamprey to receptor locations they have identified prior to electrofishing.
	Extent and distribution of spawning habitat	No decline in extent and distribution of spawning beds	There will be no change in the extent and distribution of spawning habitat within the SAC boundary. There is potential for local and temporary changes in the extent and distribution of spawning habitat in the Cross River in the immediate vicinity of the pumped discharge (~76km upstream of the SAC boundary) and associated bed/bank erosion protection measures, which will consist of a geotextile layer will cover the riverbed and banks. The geotextile will extent over a length of 10m, centred on the outflow location (5m upstream and 5m downstream of outflow). The geotextile will be held in place by rock armour which consists of 200kg rocks approximately 0.5m in diameter. The rock armour will extend up to the proposed high-water mark at the outfall location. In addition, natural flag stones will be installed with the leading and tail edge interfaces level with the existing riverbed to avoid localised erosion.		
	Availability of juvenile habitat	(Number of positive sites in 2nd order channels and greater, downstream of spawning areas) More than 50%	There will be no change in the availability of juvenile habitat within the SAC boundary. There is potential for local and temporary changes in the extent and distribution of spawning habitat in the Cross River in the immediate vicinity of the pumped discharge (~76km upstream of the SAC boundary) and associated bed/bank erosion protection measures, which will consist of a geotextile layer will cover the riverbed and banks.		

Qualifying Interests	Attributes	Targets	Potential Adverse Effects	Impact Assessment	Recommended Mitigation
		of sample sites positive.	The geotextile will extent over a length of 10m, centred on the outflow location (5m upstream and 5m downstream of outflow). The geotextile will be held in place by rock armour which consists of 200kg rocks approximately 0.5m in diameter. The rock armour will extend up to the proposed high-water mark at the outfall location. In addition, natural flag stones will be placed with the leading and tail edge level to existing bed level to further protect the riverbed at the outfall location. Survey of the Cross River identified abundant area of optimal and sub-optimal juvenile (silt) habitat.		

6.2.4 Lough Ree SAC - Assessment of Adverse Effects

In respect of the QIs at risk of adverse effects arising from the proposed scheme, the screening assessment concluded 1355 otter were at risk. The following subsections discuss the potential adverse effects in respect of the conservation objectives. An assessment of the potential for adverse effects, in light of the conservation objectives and proposed avoidance and/or mitigation measures, is provided below in Table 6-4.

The conservation objective for otter is to maintain the favourable conservation condition of otter in Lough Ree SAC, which is defined by the following list of attributes and targets.

Table 6-4 Conservation Objective for Lough Ree SAC

Qualifying Interest	Attributes	Targets	Potential Adverse Effects	Impact Assessment	Recommended Mitigation
Otter 1355	Distribution	No significant decline	There is the potential that during the construction, operation and decommissioning period of the proposed scheme, there is a risk that visual and noise disturbance generated by construction related activities, vehicle movement and the presence of personnel could temporarily displace otter species of Lough Ree SAC.	As otter may be present in proximity to the proposed scheme, sudden noise during construction/operation may cause otter to be temporarily displaced and disturbed. Whilst the impacts are anticipated to be localised to the intake compound, otter may be displaced further into Lough Funshinagh and its wider habitats.	An ECoW will be employed during construction and decommissioning stages. A walkover of the turlough edge in proximity to works will be carried out each day during these stages to identify in otter are present. The ECoW will inform site personnel when works can commence without causing disturbance to otter. The ECoW will carry out weekly checks of the pumping area and turlough edge in proximity to identify if any evidence of otter. If any evidence of otter is identified this will be reviewed and any necessary further measures to mitigate effects identified and implemented. Remotely accessed trail camera (s) shall be installed in proximity to the pump intake compound to monitor for any otters present

Qualifying Interest	Attributes	Targets	Potential Adverse Effects	Impact Assessment	Recommended Mitigation
					during operation. These shall be checked 2-3 times a week for otter presence. If any evidence of otter is identified this will be reviewed and any necessary further measures to mitigate effects identified and implemented. If obvious sudden avoidance by otter of the pump intake compound is occurring then the Project Ecologist will review behaviour, consider whether this is significant and discuss as necessary with relevant NPWS staff as to whether revised pumping hours may be required. This could include reduced pumping at specific times however it is considered likely that otter would become habituated to the pump and maintaining operation is likely to be the best course of action.
	Extent of terrestrial habitat	No significant decline. Area mapped and calculated as 330.6ha along river banks/lake shoreline/around pools	There will be no changes to the extent of terrestrial habitat in respect of otter at Lough Ree SAC during construction, operation or decommissioning stages of the proposed scheme. No adverse effects anticipated in respect of this attribute and target.	There will be no impacts in respect of this attribute arising from the proposed scheme.	Not required.
	Extent of freshwater (river) habitat	No significant decline. Length mapped and calculated as 22.7km	There will be no changes to the extent of freshwater habitat (river) in respect of otter at Lough Ree SAC during construction, operation or decommissioning stages of the proposed scheme. No adverse effects anticipated in respect of this attribute and target.	There will be no impacts in respect of this attribute arising from the proposed scheme.	Not required.
	Extent of freshwater (lake) habitat	No significant decline. Area mapped and calculated as 2097.4ha	There will be no changes to the extent of freshwater habitat (lake) in respect of otter at the Lough Ree SAC during construction, operation or decommissioning stages of the proposed scheme. No adverse effects anticipated in respect of this attribute and target.	There will be no impacts in respect of this attribute arising from the proposed scheme.	Not required.

Qualifying Interest	Attributes	Targets	Potential Adverse Effects	Impact Assessment	Recommended Mitigation
	Couching sites and holts	No significant decline	There will be no changes to the extent of couching sites and holts in respect of otter at Lough Ree SAC during construction, operation or decommissioning stages of the proposed scheme. No adverse effects anticipated in respect of this attribute and target.	There will be no impacts in respect of this attribute arising from the proposed scheme.	Not required.
	Fish biomass available	No significant decline	There will be no decline in fish biomass available in respect of otter at Lough Ree SAC during construction, operation or decommissioning stages of the proposed scheme. No adverse effects anticipated in respect of this attribute and target.	There will be no impacts in respect of this attribute arising from the proposed scheme.	Not required.
	Barriers to connectivity	No significant increase. For guidance, see map 9	There will be no increase in barriers to connectivity in respect of otter at Lough Ree SAC during construction, operation or decommissioning stages of the proposed scheme. No adverse effects anticipated in respect of this attribute and target.	There will be no impacts in respect of this attribute arising from the proposed scheme.	Not required.

6.3 In-Design or Embedded Mitigation

6.3.1 Drainage

Cross drains consisting of HPDE drainage pipes will be laid on top of the installed geogrid / geotextile prior to the placement of stone aggregate at the intake compound. This will ensure the existing drainage regime of the site is maintained. Foul drainage from the welfare facilities at the construction site will be disposed of by removal from site by a licence waste contractor to an appropriately licensed treatment facility.

6.3.2 Working Hours

Construction operations on site are proposed to be between the hours of 07:00 and 19:00, Monday to Friday, and 07:00 to 16:00 on Saturdays. Delivery of materials to site will generally be between the hours of 07:00 and 19:00, Monday to Friday, and 08:00 to 16:00 on Saturdays, and will be scheduled to avoid peak times. Due to the urgent nature of construction activities, or to mitigate disruption to the local environment, there may be a requirement for working outside of these hours.

6.3.3 Hydraulic Power Unit

A Hydraulic Power Unit (HPU) bund consisting of a concrete slab and bund to contain and support the HPUs and fuel tanks is proposed. The bund will provide at least 110% storage for 2 no. fuel tanks (i.e. 6,600 litres) plus an additional allowance for 75 mm of rainfall accumulation. The fuel tanks are also double skinned. A sump will be provided at the lowest corner of the slab to enable rainwater to be pumped out at regular intervals during the operational phase. The upstand walls also serve as a wheel stop to prevent vehicles accidentally impacting the fuel tanks during turning manoeuvres.

6.4 Proposed Mitigation

This section presents the mitigation measures required in addition to the design measures which are set out in Section 6.3 of this AA. The design measures have either avoided or reduced the potential for the proposed scheme to affect the conservation objectives of the European sites within its ZoI.

However, despite these design measures, mitigation measures are also required, and will be implemented, under supervision of the Ecological Clerk of Works (employed by RCC) during the construction and decommissioning phase and a Project Ecologist (employed by RCC) during the operation phase. Both roles can be filled by the same person for the duration proposed scheme. The purpose of these roles is to ensure that the proposed scheme will not affect the conservation objectives of any of the European sites within its ZoI.

As set out in Section 6.2 above, the potential impacts associated with the proposed scheme that require mitigation are:

- Measures to protect the water quality of Lough Funshinagh SAC Turlough (3180);
- Measures to protect vegetation composition attributes, vegetation structure and typical species of Lough Funshinagh SAC Turlough (3180) from invasive species;
- Measures to protect the distribution of Otter (1355) in the River Shannon Callows SAC and Lough Ree SAC; and
- Measures to protect attributes for Brook Lamprey (1096) in Lower River Shannon SAC.

Mitigation measures are set out in various sections below and include more general mitigation measures to be implemented throughout the spatial extent of the entire proposed scheme. The employment of a designated ECoW on site during construction and decommissioning and a Project Ecologist during operations is required for the duration of the proposed scheme and specific measures proposed to either eliminate or reduce to insignificant effects on specific attributes. Some mitigation measures proposed primarily for specific attributes of QIs will likely provide mitigation for other attributes or other QIs.

Integral to the overall mitigation strategy is the Construction Environmental Management Plan (CEMP) which is included in Appendix I. The CEMP summarises the overall environmental management strategy that will be adopted and implemented during the construction and decommissioning phases of the proposed scheme.

The purpose of the CEMP is to demonstrate how the proposed construction works can be delivered in a logical, sensible and safe sequence with the incorporation of specific environmental control measures relevant to construction works of this nature. The CEMP has been prepared in accordance with many industries best practice guidance including:

- TII's Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan; and
- Construction Industry Research and Information Association (CIRIA) in the UK, Environmental Good Practice on Site Guide, 4th Edition (CIRIA 2015).

The CEMP has been prepared in conjunction with the Environmental Impact Assessment (EIA) Screening Report and this AA Screening and NIS Report, having regard to consultations with environmental bodies, in particular, the National Parks and Wildlife Service (NPWS) and Inland Fisheries Ireland (IFI). The CEMP must be read in conjunction with the information already provided in this AA Screening and NIS Report. It should be noted that the CEMP provides environmental management and mitigation including best practice and any mitigation included within the CEMP does not necessarily provide mitigation specifically to protect European sites.

The key Site-Specific Method Statements/Management Plans of relevance to this AA Screening and NIS Report are described below.

A Sediment, Erosion and Pollution Control Plan (SEPCP) will be embedded within the CEMP and will summarise the procedures and technical practices for implementing effective sediment, erosion and pollution control through a variety of delivery methods for the construction phase of the proposed scheme. The purpose of the SEPCP is to demonstrate at this stage, how the proposed construction works can be delivered in a logical, sensible and safe sequence with the incorporation of specific sediment, erosion and pollution control measures relevant to construction works of this nature. This demonstrates that run-off from the construction site will not impact on any European sites.

A Non-native Invasive Species Management Plan (NNISMP) will be embedded within the CEMP and will outline the strategy that will be adopted during the construction of the proposed scheme in order to manage and prevent the spread of the non-native invasive species to any European sites. There is potential for invasive species exists as machinery and material will be imported from outside the proposed scheme boundary; therefore, the NNISMP will be implemented as a precautionary preventative measure. Mink (*Neovison vison*) and Canadian pondweed were identified during baseline surveys. The proposed scheme is not considered to have potential to spread mink. The fish screen on the intake pump, with mesh of maximum 10mm openings, will prevent Canadian pondweed entering the pipelines due to pumping, during the operations phase the screen will be checked daily by the Project Ecologist to ensure there are no blockages.

An Operations Phase Monitoring Strategy (Appendix J) has been prepared to outline the monitoring strategy that will be adopted during the operation of the proposed scheme to monitor water quality and hydrology throughout the Cross River and Lough Funshinagh. The Operations Phase Monitoring Strategy aims to provide a comprehensive plan designed to safeguard water resources during the operational phase of the proposed scheme. This strategy outlines the systematic approach that will be implemented to monitor water quality, detect and mitigate potential risks, and ensure ongoing compliance with regulatory and environmental standards.

The focus of including all of the stringent measures in the CEMP is on the prevention of the incident arising in the first place. However, an Incident Response Plan (IRP) has been prepared to ensure that in the unlikely event of an incident, response efforts are prompt, efficient, and suitable for particular circumstances. The IRP describes the procedures, lines of authority and processes that will be followed. The IRP details the procedures to be undertaken in the event of the release of any sediment into a watercourse, serious spillage of chemical, fuel or other hazardous wastes (e.g. concrete), non-compliance incident with any permit or license, or other such risks that could lead to a pollution incident, including flood risks.

All of the Contractor's site staff will receive relevant and appropriate training, on site induction and/or onsite toolbox talks by the Ecological Clerk of Works to ensure that they have the appropriate knowledge to successfully implement the CEMP. The induction and/or toolbox talk will emphasise the sensitivity of the waterbodies, surrounding habitats and species and methods and working practices employed to protect the water environment, habitat and species. Further, the CEMP outlines the inspections, auditing and monitoring compliance strategy that will be adopted by the Contractor.

In summary, the implementation of the CEMP ensures that any direct or indirect or ex-situ impacts to the conservation objectives supporting the QI habitats and QI/SCI species of any European site, in particular any impacts to Lough Funshinagh SAC, River Shannon Callows SAC, Lough Ree SAC and Lower River Shannon SAC will not arise and will ensure that adverse effects on site integrity are avoided.

6.4.1 Ecological Clerk of Works

An Ecological Clerk of Works (ECoW) will be appointed for the duration of the construction and decommissioning of the project. In general, the ECoW duties will include daily supervision of onsite works during construction and decommissioning to review and confirm that mitigation measures are being implemented correctly and adhered to, and to identify any unforeseen effects which could not have been reasonably predicted in the drafting of this report. Further details on duties relating to specific risks are identified through this mitigation section of the AA report.

The ECoW will be a qualified ecologist and member of a relevant professional body such as the Chartered Institute of Ecology and Environmental Management and will be employed by and report directly to Roscommon County Council. The ECoW shall have a broad range of onsite ecological and environmental supervision including freshwater ecology and fisheries specialism and experience of overseeing construction activities in or near water.

The ECoW will provide an introductory toolbox talk for any people working on site to highlight all sensitive receptors including the turlough itself and any potential mobile species such as birds and otter which may be present.

The ECoW will carry out a pre-construction walkover of the site to confirm that there have been no further evidence of protected species or significant change in conditions on site.

Specific ECoW duties for the qualifying interest features of the European designated sites are outlined within Table 6-1 to Table 6-4. Implementation of these measures is the responsibility of RCC.

6.4.2 Project Ecologist

A Project Ecologist will be appointed for the durations of the operations phase of the proposed scheme. In general, Project Ecologist duties will include weekly site visits during operation to review and confirm that mitigation measures are being implemented correctly and adhered to, and to identify any unforeseen effects which could not have been reasonably predicted in the drafting of this report. Further details on duties relating to specific risks are identified through this mitigation section of the AA Screening and NIS report.

The Project Ecologist will be a qualified ecologist and member of a relevant professional body such as the Chartered Institute of Ecology and Environmental Management (CIEEM) and will be employed by and report directly to Roscommon County Council. The Project Ecologist shall have a broad range of onsite ecological and environmental supervision including freshwater ecology and fisheries specialism and experience of overseeing construction activities in or near water. The person appointed as the Project Ecologist can be the same as the as the person appointed as the ECoW.

6.4.3 Lough Funshinagh SAC Turlough (3180) Habitat – Attribute Water Quality

Mitigation measures are proposed below to eliminate both the discharge of polluting materials (e.g. hydrocarbons from plant and machinery, concrete etc.) and the mobilisation of silts and sediments into the turlough during construction. These pollution prevention measures will be implemented during the construction period, during operation and during decommissioning.

The risk of leakage or spillage of fuel, chemicals and other potentially polluting substances would be mitigated through good site practice and management, implemented via the CEMP for the proposed scheme. The appointed Contractor(s) will ensure that the CEMP for the proposed scheme complies with the Contractor(s)'s own EMS. All measures detailed in the CEMP will be adhered to by contractors working on site.

6.4.3.1 Construction

Silt Measures

Silt fencing will be installed to eliminate any silt load entering the turlough and any other waterbody. The silt fencing specification will be reviewed by a qualified surface water specialist on behalf of RCC. The installation of silt fencing will be supervised by the ECoW and will be inspected at least three times per day during the construction and decommissioning works to ensure it is performing as required and for example has not become clogged with any sediment. If any failures in sediment fencing are identified these shall be rectified immediately on identification.

No direct untreated point discharge of construction runoff to watercourses or groundwater bodies will be permitted.

The regular monitoring of downstream receptor water quality for sediments and hydrocarbons and the inspection of the pollution control facilities will be carried out during construction works.

Where a pollution incident is detected, construction works will be stopped until the source of the construction pollution has been identified and remedied.

All pollution control measures will be monitored daily to ensure their continued integrity and desired function.

Continuous monitoring of sediment concentrations in the receiving water, during construction activities near watercourses, will be carried out to ensure compliance and respond immediately to pollution events.

The Roscommon County Council project manager will be responsible for ensuring the successful finalisation, implementation and maintenance of the detailed Sediment, Erosion and Pollution Control Plan and the Incident Response Plan.

These measures are based on the following best practice guidelines to ensure that water bodies are adequately protected during construction work:

- Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (Inland Fisheries Ireland, 2016)
- Central Fisheries Board Channels and Challenges – The Enhancement of Salmonid Rivers
- CIRIA – Guideline Document C648 Control of Water Pollution from Linear Construction Projects, technical guidance
- CIRIA – Guideline Document C793 The SuDS Manual
- CIRIA – Guideline Document C624 Development and flood risk – guidance for the construction industry
- CIRIA (C649) Control of water pollution from linear construction projects, site guide (2006)
- CIRIA (C532) Control of water pollution from construction sites, guidance for consultants and contractors (2001); and
- Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes (NRA, 2005)

Hydrocarbon Measures
Fuelling of machines will be carried out in accordance with OPW Protocols, machines will be kept no less than 50 m away from all watercourses except where necessary for installation and fuelled at a safe location with all machines provided with spill kits.

Fuel trucks will be certified in accordance with regulations. No fuels will be stored on site.

An effective spillage procedure should be put in place (see below). Any waste oils or hydraulic fluids should be collected, stored in appropriate containers and disposed of offsite in an appropriate manner. Site operatives should provide spill kits and they should be stored on-site during construction and used in the event of a fuel or chemical spillage. Such kits should contain absorbent materials (such as absorbent granules, booms or mats). Appropriate operatives responsible for handling chemicals or oils or for plant refuelling should be trained in the use of this kit.

Vehicle and Plant Movements
Haul routes will be regularly inspected and maintained to minimise sediment laden run-off.

All vehicles, plant and equipment will be regularly inspected and maintained in accordance with manufacturers' recommendations. Records of inspections will be maintained on site.

Areas of hard standing will be provided at site access and egress points, where practicable. The areas will be regularly inspected and cleaned.

Storage of Fuels, Oils and Other Chemicals
Further details on the storage of fuels, oils and other chemicals are provided within the CEMP, with a summary as follows:

Spill kits to be available near all points of work and personnel trained in their use.

- Physical barriers will be installed wherever necessary to stop any material overspill; and
- No fuels, oils or other chemicals will be stored on-site aside from those within the HPUs

Storage tanks for oils, fuels or chemicals will be sited on an impermeable base, surrounded by an impermeable bund, and inspected regularly for leaks. Any valve, filter, sight gauge, vent pipe or other ancillary equipment must be kept within the bund when not in use. The drainage system of bunded areas shall be sealed with no outlet to any watercourse, pond or underground strata

Bunded areas will be located on stable and on level ground and located away from all waterbodies.

All bulk fuels storage must be contained within a double skinned bowser/container or have a bund. Double skinned tanks or bowsers must also be bunded unless the outer skin would provide secondary containment. The bund must have sufficient volume to contain 110% of the contents of the largest fuel/pipe container or 25% of the total storage capacity of all the containers, whichever is the greater.

- All fuel containers, including those containing waste fuels, must be stored on a drip tray/bunded area away from vehicle traffic within a designated storage area, where possible, to avoid damage.
- Plant will be regularly inspected, serviced and maintained to minimise the risk of leaks/spills. At the end of each working day, driveable plant will be moved away from watercourses.

Operation
Silt fencing will be retained during the operation period to ensure that any outfalls from the compound and in particular any rainwater which will be pumped out through the sump in the lowest corner of the slab will flow overland and through silt fencing. Silt fencing will be inspected by the Project Ecologist on a daily basis during operation until the Project Ecologist is satisfied that the silt fencing is in good working order. Following this silt fencing will then be inspected at least once a week or as often as identified as necessary by the Project Ecologist.

6.4.4 Lough Funshinagh SAC Turlough (3180) - Vegetation composition attributes, Vegetation structure and typical species

Mitigation to prevent impacts to water quality are outlined above.

The potential for introduction and spread of invasive species through plant, equipment and materials is considered to be the main potential risk for impact on vegetation and typical species attributes.

Biosecurity measures will be included to cover workers, plant and equipment working in/or near Lough Funshinagh and the Cross River. The biosecurity measures will adhere to the check-clean-dry protocol.

The hose, pump, pipe and pontoon, will be newly manufactured in the Netherlands and transported to site. Therefore, this equipment will be sterile with no potential for transfer of invasive species.

Biosecurity measures shall be implemented for the construction stage of the project. Measures will be required to specify no transfer of organic materials from outside the construction site without appropriate safeguards to avoid the introduction and/or spread of invasive non-native species to the site.

All loose stone material used for the compound and access road will be washed prior to import to site.

All machinery should be dry and free of mud or debris from all previous sites. If necessary, machinery and equipment will be washed down to remove any soil and organic material and then disinfected before entering site. No machinery and equipment will be allowed within 10m of the turlough edge and any other waterbodies including the Cross River unless necessary for the construction and decommissioning of the infrastructure.

A visual inspection of plant machinery, equipment and material will be conducted by the ECoW when entering site to confirm absence of organic material. The most recent project working locations where all machinery and plant has been deployed shall be recorded and reviewed by RCC and the ECoW prior to entering the site. The contractor will confirm that machinery is not being brought onto site immediately from works on other waterbodies. If this is the case, then a record should be provided detailing disinfection methods as approved by IFI.

All boats, their trailers and any lines/ropes, equipment etc., that have the potential to be used within Lough Funshinagh for the purpose of the proposed scheme must adhere to the IFI biosecurity guidance[68] and the IFI Biosecurity Protocol for Field Survey Work[69] and the 'Check, Clean, Dry' protocol. All boats, trailers and equipment must be thoroughly inspected prior to commissioning of works for attached plants, animals or mud. Any foreign material should be removed and disposed of responsibly. To ensure complete disinfection, boats, trailers, and equipment should be allowed to dry thoroughly for at least 48 hours before being used in another waterbody. Boat operators must be mindful of anchor lines, ensuring they do not drag along the bottom of the waterbody, which can disturb aquatic habitats. All boats/equipment must clean and disinfect any live wells, baitwells or any other likely sources of contaminated water prior to entering Lough Funshinagh and this should be carried out at a controlled facility where waste can be safely disposed of. The bilge must be flushed with disinfectant before leaving the cleaning facility. Following works, all boats and equipment must be visually inspected for all surfaces and any attached plant and animal material, mud or associated debris must be removed in a controlled manner.

6.4.5 River Shannon Callows SAC Otter (1355) – Distribution

The potential for visual and noise disturbance to otter exists therefore mitigation measures are proposed.

The ECoW will be present on site every day during the construction and decommissioning stages. Prior to construction commencing each day the ECoW will carry out a walkover check of the turlough edge in proximity to the works to identify if any otters are present. The ECoW will inform site personnel when works can commence without causing disturbance to otter.

[68] IFI Biosecurity Theme. Accessed at https://www.fisheriesireland.ie/what-we-do/research/research-theme-biosecurity August 2024.
[69] IFI (2010) IFI Biosecurity Protocol for Field Survey Work. December 2010. Accessed at https://www.fisheriesireland.ie/sites/default/files/2021-06/research_biosecurity_biosecurity_for_fieldsurveys_2010.pdf

The ECoW will carry out weekly checks of the pumping area and turlough edge in proximity to identify any evidence of otter during the construction and decommissioning phase. If any evidence of otter is identified this will be reviewed and any necessary, further measures to mitigate effects identified and implemented.

Working hours are detailed in Section 6.2.2. There is no lighting proposed during construction and operation however if required this will be directional and pointed away from waterbodies including Lough Funshinagh and its shoreline and the Cross River and its riparian corridor. Any lighting on site will be reviewed by the ECoW and if necessary, changes to lighting arrangements will be discussed and agreed to safeguard movement of otters.

Remotely accessed trail camera(s) shall be installed in proximity to the pump intake compound to monitor for any otters present during operation. These shall be checked 2-3 times a week for otter activity by the Project Ecologist. If any evidence of otter is identified this will be reviewed and any necessary, further measures to mitigate effects identified and implemented. If obvious sudden avoidance by otter of the pump intake compound is occurring, then the Project Ecologist will review behaviour, consider whether this is significant and discuss as necessary with relevant NPWS staff as to whether revising pumping hours may be required.

6.4.6 Lower River Shannon SAC – Brook Lamprey (1096)

To protect brook lamprey during in-stream construction activities, it is advised to schedule in-stream work outside the spawning and early larval development periods. Therefore, in-stream work should be avoided during the spawning period (March to June) to prevent disturbance of spawning adults and the disturbance of spawning beds where eggs are deposited. This period will also protect the early part of the lamprey larval development stage (i.e. June) as early developmental umohoites are vulnerable to sedimentation and habitat disruption.

The installation of the geotextile material and natural flag stones on the bed of the Cross River, should be carried out under the supervision of an ECoW. The ECoW will involve overseeing the installation process and the fish translocation operation. This will be required to move fish from impacted areas to avoid risk of fish mortality. Fish translocation would take place in advance of the geotextile and natural flag stones installation under a section 14 authorisation from DECC by means of electro-fishing under the conditions of the licence. Fish will be translocated to suitable upstream nursery areas.

Silt mitigation measures including silt fencing will be installed to eliminate any silt load entering the Cross River. In addition, any areas of exposed sediment deemed at risk of erosion during heavy rainfall shall be protected using measures such as coir matting until vegetation is able to establish on these surfaces. These measures will be overseen by an on-site ECoW.

The nearest soft sediment juvenile lamprey (ammocoete) nursery areas downstream of the geotextile installation and outfall would be monitored by the Project Ecologist and fisheries specialist to ensure integrity of soft sediment habitat remains intact during the pumping operation. Should any significant visible changes be observed the pumping regime can be adjusted accordingly to reduce potential impacts such as 'scour out'.

6.4.7 Lough Ree SAC – Otter (1355) – Distribution

The potential for visual and noise disturbance to otter exists therefore mitigation measures are proposed.

The ECoW will be present on site every day during the construction and decommissioning stages. Prior to construction commencing each day the ECoW will carry out a walkover check of the turlough edge in proximity to the works to identify if any otters are present. The ECoW will inform site personnel when works can commence without causing disturbance to otter.

The ECoW will carry out weekly checks of the pumping area and turlough edge in proximity to identify if any evidence of otter. During operations, these checks will be conducted by the Project Ecologist in addition to weekly checks of the remotely operated cameras. If any evidence of otter is identified this will be reviewed and any necessary, further measures to mitigate effects identified and implemented.

7. Summary and Conclusions

7.1 Summary

This AA Screening and NIS report has been prepared in accordance with Article 6 (3) of the 'Habitats Directive 92/43/EEC and Part XAB of the Planning and Development Act, 2000 (as amended).

The AA Screening employed a Source Pathway Receptor method to identify the potential impacts, pathways and receptors of the proposed scheme. Eleven European sites were identified for consideration within the scoping exercise of the screening assessment. The potential for a likely significant effect(s) arising from the proposed scheme alone was identified for four European sites:

- Lough Funshinagh SAC – accidental pollution event and introduction/spread of INNS to turlough habitat
- Lough Ree SAC – Species disturbance/displacement to otter
- River Shannon Callows SAC – Species disturbance/displacement to otter; and
- Lower River Shannon SAC – Water quality changes to brook lamprey

As a result, the proposed scheme was screened in, and the aforementioned sites and their receptors were scoped in for further assessment (NIS).

The NIS includes a report of a scientific examination of the proposed scheme, and the four European sites to identify and characterise any possible implications of the proposed scheme individually or in combination with other projects or plans in view of the conservation objectives. The targets and attributes of the four European sites in respect of the receptors scoped in for AA were assessed against the potential impacts. Following this evaluation, mitigation measures to ameliorate any adverse effects arising from the proposed scheme were proposed.

With the implementation of the mitigation measures proposed within this report, alongside the embedded design measures within the proposed scheme, there is sufficient evidence for the AA to conclude that the implementation of the proposed scheme would not result in adverse effects, alone or in-combination, on the integrity of Lough Funshinagh SAC, Lough Ree SAC, the River Shannon Callows SAC and the Lower River Shannon SAC, including in respect of their qualifying features that were scoped in for AA.

7.2 Conclusions

In order for the AA to comply with the requirements of Article 6(3) of the Habitats Directive, an AA must be undertaken and must include an examination, analysis, evaluation, findings, conclusions and final determination. The information in this report will, along with all other submissions and observations following public consultation, enable An Bord Pleanála to perform its statutory functions in this regard.

This AA has examined and analysed, in light of best scientific knowledge, with respect to the relevant European sites, the sources and pathways for effect, and how these might result in adverse effects on the identified QIs and therefore the integrity of European sites.

Mitigation measures are set out within this report to ensure that adverse effects on the integrity of European sites will be avoided during the implementation of the proposed scheme either alone or in combination with other plans or projects.

Accordingly, in the professional opinion of the authors of this report, whilst it has been acknowledged that, in the absence of mitigation, there is the potential for the proposed scheme to have likely significant effects on European sites, with the implementation of the mitigation measures outlined in this AA, the integrity of any European site will not be adversely affected.

Appendix A– Statements of Competency

ARUP

Appendix A

Roscommon County Council

Reference:

| September 2024

Job number 303666-00

Ove Arup & Partners Ireland Limited
One Albert Quay
Cork
T12 X8N6
Ireland
arup.com

A.1 Statement of Competencies

The statements of competencies for the contributing authors to this AA report are provided below:

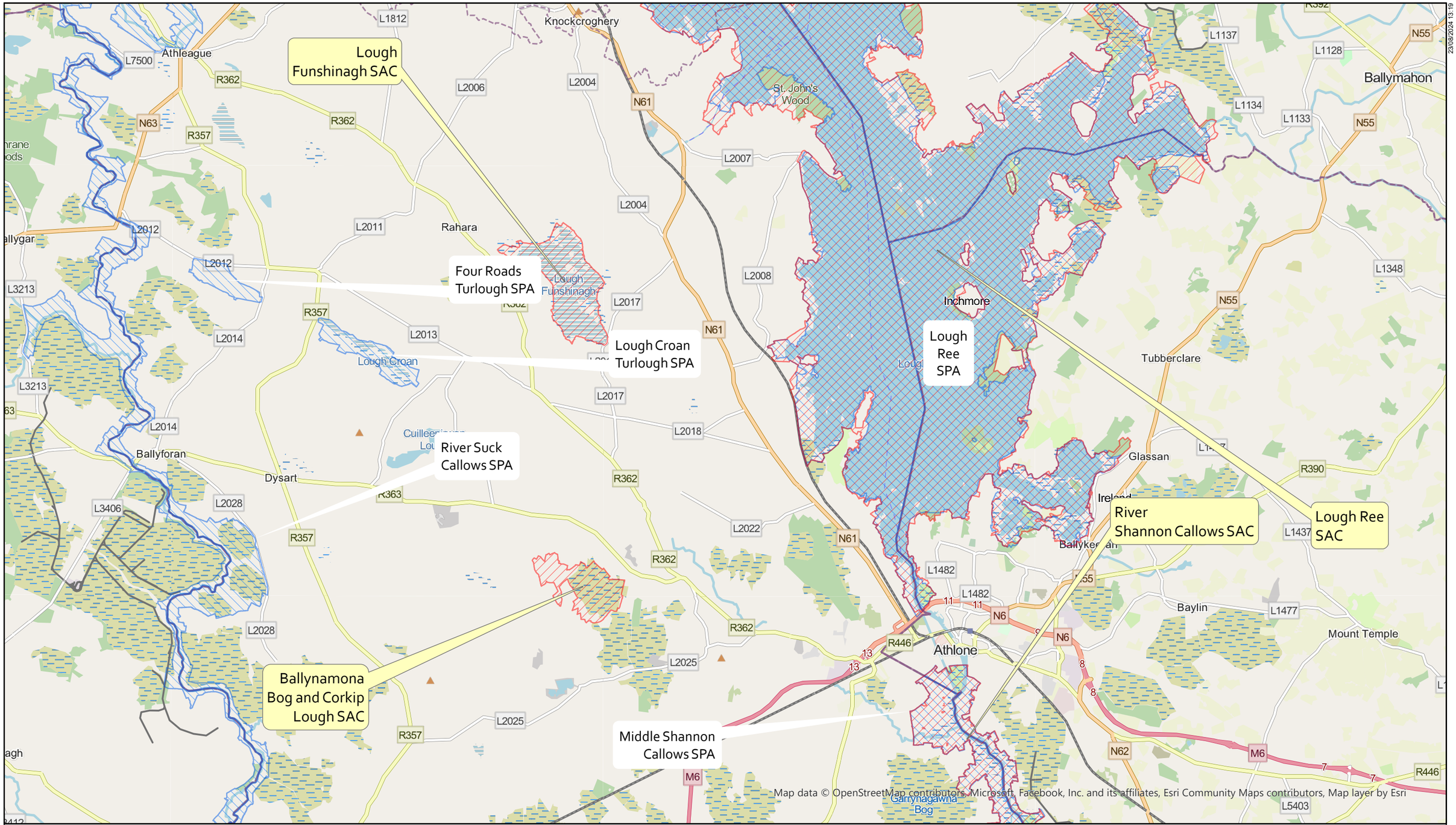
Fraser Maxwell (BSc, MSc, MCIEEM, CEnv) approved this report as a competent expert. Fraser is an Associate Director consultant at Arup, leading the Ecology team for Arup's North and North-West Yorkshire Region (Belfast, Glasgow, Edinburgh, Leeds, Manchester, York and Newcastle offices) with over 24 years' experience conducting EcIAs and over 20 years of undertaking AAs. He is an experienced leader of technical projects including high profile projects and has provided expertise internationally. Fraser is a member of the Scottish CIEEM Committee.

Donncha Madden has a BSc in Applied Ecology and a PGEDip in Restoration Ecology and is a Chartered Ecologist and Full Member of CIEEM. Donncha has over 20 years' experience in the environment and ecology sector and has prepared numerous Appropriate Assessment Screening and full Appropriate Assessment reports for a variety of plans and projects in both Ireland and the UK.

Tom House has a BSc in Geography and Geology and an MSc in Environmental Modelling, Monitoring and Reconstruction and is a chartered member (CEnv) of the Institute of Fisheries Management. Tom has over 9 years continuous field experience in aquatic ecological surveys applied throughout the UK, specialising in geomorphology and fisheries surveys, fisheries habitat mapping, and catchment scale management initiatives for causes of WFD failures. Tom has experience as biodiversity lead for numerous hydropower, solar PV, rail, and road schemes for international projects.

Hannah Sheridan has a BSc (Hons) in Marine Science and an MSc in Marine Planning for Sustainable Development and is a Qualifying Member of CIEEM. Hannah has four years of experience working as an ecologist in public and private sectors and has prepared Screening for Appropriate Assessments, Natura Impact Statements/Reports and biodiversity chapters for EIARs across a number of projects and plans in the Republic of Ireland and Northern Ireland

Appendix B– Designated Sites Map



Special Protection Areas

Special Area of Conservation

Metres

0 250 500 1,000

Coordinate System:

Irish Transverse Mercator

Rev	Date	By	Chkd	Appd	Authd
01	23/08/2024	HS	DM	COD	--

ARUP

Bedford House
16-22 Bedford Street
Belfast
BT27FD

Client

Roscommon County Council

Project Name

Lough Funshinagh Interim Flood Relief Scheme

Drawing Title

European Sites

Scale at A3

1:100,000

Role

FOR INFORMATION

Suitability

FOR INFORMATION

Project Number

303666-00

Rev

01

Drawing Name

P01

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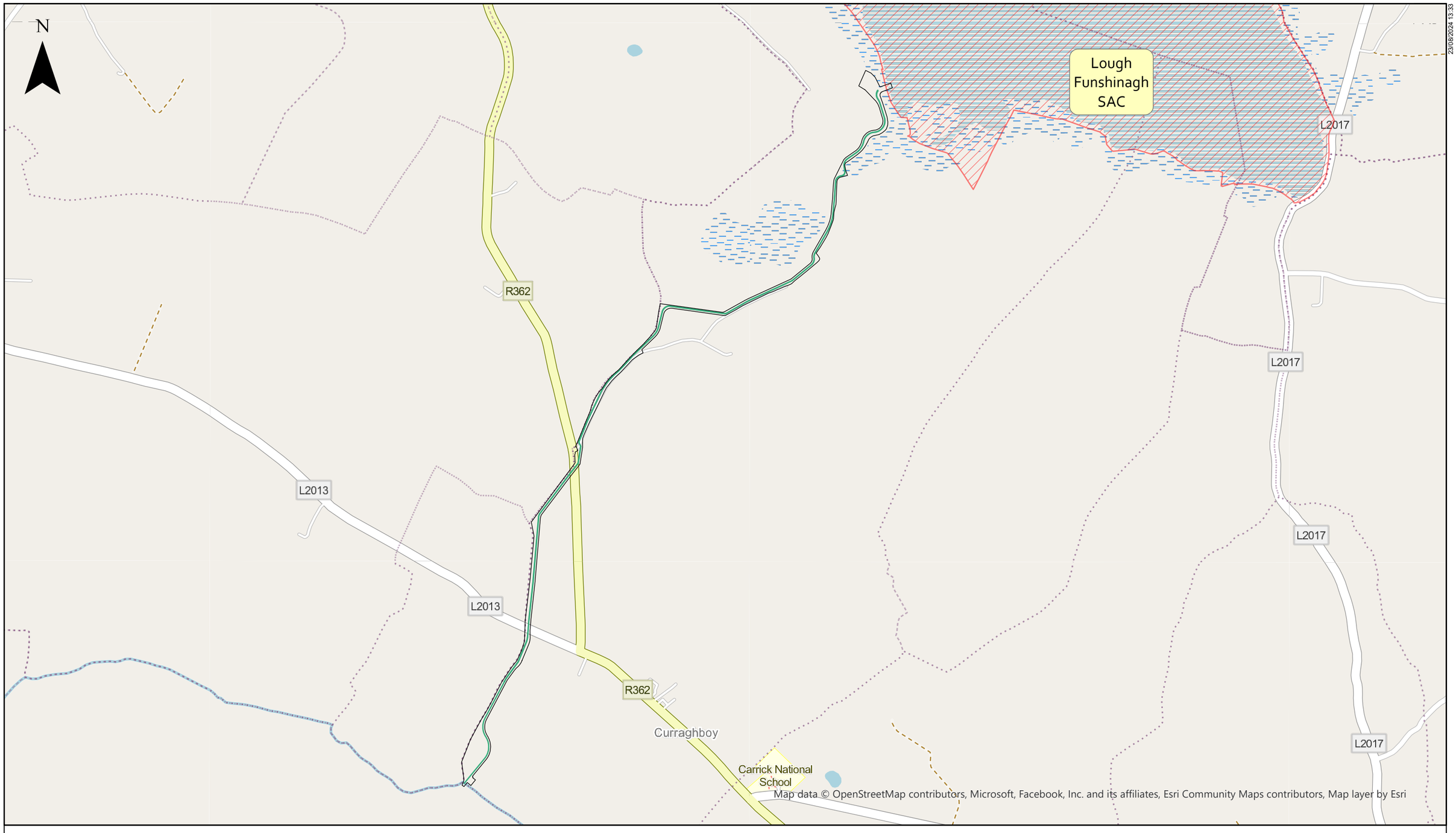
Appendix C - Scheme layout



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Special Area of Conservation
Special Area of Conservation
Pipe route
Pipe route
Planning boundary
Planning boundary

River Network
Order 1
Order 2
Order 3
Order 4
River Network
Order 5
Order 6
Order 7

River Flow Direction
River Flow Direction

Metres
0 250 500 1,000

Coordinate System:

Irish Transverse Mercator

Rev	Date	By	Chkd	Appd	Authd
01	23/08/2024	HS	DM	COD	--

ARUP

Bedford House
16-22 Bedford Street
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BT27FD

Client

Roscommon County Council

Project Name

Lough Funshinagh Interim Flood Relief Scheme

Drawing Title

The Proposed Scheme

Scale at A3
1:100,000

Role
FOR INFORMATION

Suitability
FOR INFORMATION

Project Number
303666-00

Rev
01

Drawing Name
P02

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Appendix D – Wintering Birds Survey of Lough Funshinagh

2024

Lough Funshinagh Baseline Surveys

Winter Birds Survey (2023 -2024) of Lough Funshinagh

June 2024

RYAN HANLEY

CONSULTING ENGINEERS

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Floor 5 Jervis House, Jervis Street, Dublin 1, D01 E3W9.

Unit 1203, Building 1000, Gateway Business Park, New Mallow Road, Cork, T23 HDW9.

Innovation House, Moneen Road, Castlebar, Co. Mayo, F23E400.

Client	Roscommon County Council
Project No.	2608
Project Title	Lough Funshinagh Baseline Surveys
Report Title	Winter Birds Survey (2023 -2024) of Lough Funshinagh

Rev.	Status	Author	Reviewed By	Approved By	Issue Date
1.0	Issue	Nicholas Duff & Breda Quinn	Dr Ross Donnelly-Swift	Elaine Shields	5th July 2024

TABLE OF CONTENTS

1 INTRODUCTION & BACKGROUND

Lough Funshinagh is located approximately 12km north-west of Athlone, in Co. Roscommon. Lough Funshinagh is an intermittent turlough, prior to 2016, the lake would become nearly dry every three or four years and was known as Irelands "disappearing lake" (GSI, 2012). It was filled by two small streams entering from the north-west and was drained by a swallow hole in the southeastern corner. Following extreme flooding in 2016, Lough Funshinagh has stopped draining and the lakes surface area has increased significantly.

Lough Funshinagh was formally designated, in 2019, a Special Area of Conservation (SAC), site code 000611, under the European Union's Habitats Directive (92/43/EEC) (as amended). The site is selected for the following habitats/or species listed on Annex I/II of the E.U. Habitats Directive (*= priority habitats; numbers in brackets are Natura 2000 codes):

- [3180] Turloughs* and
- [3270] Rivers with muddy banks with *Chenopodion rubri p.p.* and *Bidention p.p.* vegetation.

Lough Funshinagh is important for wintering and breeding waterfowl and is designated as a Wildfowl Sanctuary. Lough Funshinagh, while it is not designated as a Special Protection Area (SPA) itself, is surrounded to the east and west by various SPAs. Lough Ree SPA is located c.4.2km to the east, while Lough Croan Turlough SPA is located c.4km to the west, as well as Four Roads Turlough SPA which is c.9km west and River Ruck Callows SPA which is c.9.5 west.

Lough Funshinagh is a subsite (code: 0E303) of South Roscommon Lakes (Site Code 0E020), a national survey site composed collectively of several small and large lakes, monitored for its winter bird species through the Irish Wetland Bird Survey (IWeBS), conducted by Bird Watch Ireland. IWeBS counters, including skilled volunteers, NPWS Rangers and BirdWatch Ireland staff, record waterbirds at wetland sites across the country during the winter season (September to March). This has been dedicated to monitor Irish wintering waterbirds since 1994/95. IWeBS aims to monitor all nonbreeding waterbirds in Ireland to provide the principal data on which the conservation of their populations and wetland habitats is based. To this end, IWeBS has three main objectives:

1. Asses the size of waterbird populations;

2. Identify important sites for waterbirds; and

3. Assess trends in their numbers and distribution (BirdWatch Ireland, 2021).

These surveys have been completed for Lough Funshinagh annually from the 1994/1995 wintering season to the 2022/2023 wintering season, with some gaps in data for the years 1997/98, 1998/99, 2001/02, 2003/04, 2004/05, 2020/21.

The Irish Wildlife Manuals series serves as a record of work carried out or commissioned by NPWS, and is one means by which it disseminates scientific information. The Irish Wetland Bird Survey: Waterbird Status and Distribution 2009/10 – 2015/16 report provides a single comprehensive account on the current population status of wintering waterbirds and their key sites in the Republic of Ireland for the period 2009/10 – 2015/16. Detailed accounts are provided for 72 regularly occurring waterbird species and national (and all-Ireland) population estimates are provided, as well as updated analyses on trends for abundance and range of each species. Population data were also used to calculate thresholds relating to site importance at both the national and international (flyway) level (Lewis *et al*, 2019).

The Geological Survey Ireland, as part of its groundwater monitoring network programme, has been monitoring Lough Funshinagh's water levels since 2016. This wintering season, Lough Funshinagh has been rising steadily since September 2023 and as of March 2024, Lough Funshinagh has reached record high flood levels of 69.29 meters above sea level.

Figure 1: Water levels at Lough Funshinagh, Co. Roscommon 2016 – 2024 (GSI, 2024).

1.1 Statement of Authority

The field surveys and reporting were carried out by Nicholas Duff, a Senior Ecologist for Ryan Hanley and Breda Quinn, an Ecologist for Ryan Hanley. Nicholas Duff holds a B.Sc. in Ecology and a Diploma in Environmental Impact Assessment Management and has over 40 years professional experience in conservation ecology, ecological surveys, habitat management, impact assessment and related fields. Bird survey experience includes monitoring of national parks and upland birds, corncrakes (BWI), national/international surveys, studies for NPWS on hen harrier, red-throated divers, barnacle geese, Greenland white-fronted geese and whooper swans in connection with SPA designation. He has carried out numerous bird assessments for EIA, such as wind farm projects, employing a range of standard methods for breeding or wintering birds. Breda Quinn holds a B.Sc. in Wildlife Biology from the Institute of Technology Tralee (Now MTU) and has over four years of ornithological survey experience, ranging from specialised raptor surveys to breeding bird surveys and wintering bird surveys in various habitats.

Nick and Breda were each assisted by a Ryan Hanley Graduate Ecologists.

Railiane Abreu De Lima who has a BSc (Hons) in Biological Sciences from Universiade Metodista de Piracicaba (UNIMEP) in Brazil, and Teaching License from the same University and Course. Railiane has over two years' experience as a professional ecologist and is adequately experienced in ecological reporting and field surveys in Ireland. Railiane also has experiences in prevention of Wildlife Crimes for Freeland Foundation (Brazil) and small mammals 'taxonomy and museum curator in Brazil for the Vertebrate Zoology Laboratory part of the Biological Sciences Department of Sao Paulo University (Brazil).

Rémi O'Connell has been working as a professional ecologist with Ryan Hanley for nearly a year. He completed his studies in University College Cork (UCC) where he earned a BSc (Hons) in ecology and environmental biology. During his time working with Ryan Hanley, he has participated in multiple walkover and bird surveys, where he developed strong competence in skills such as data collection and representation, GIS analysis, field research procedure and report-writing skills.

Paola Rodolfi assisted in the data collection and spatial analysis. Paola holds a B.Sc. in Marine Biology and a Masters in Environmental Management. She has over 12 years' experience in environmental reporting and data analysis. Her focus has been in survey data analysis and geospatial data analysis for environmental purposes. She is proficient with QGIS software and familiar with ArcGIS for mapping. The analyses she performs include species distribution and abundance, calculations on habitats surfaces, and the various layouts and map production skills.

This report was reviewed by Dr Ross Donnelly-Swift, Senior Ecologist with Ryan Hanley. Ross holds a BSc (Hons) Biology from Maynooth University NUI, a MSc Environmental Science from Trinity College Dublin, and a PhD Biosystems Engineering from University College Dublin.

1.2 Acknowledgements

Ryan Hanley wishes to thank BirdWatch Ireland for providing IWeBS data on request for the sub-sites Lough Funshinagh (0E303) and Lough Croan (0E002) of IWeBS site, Southern Roscommon Lakes (0E020). Ryan Hanley also wishes to acknowledge Irish Birding / Joe Doolan for records collected and provided via Irishbirding.com.

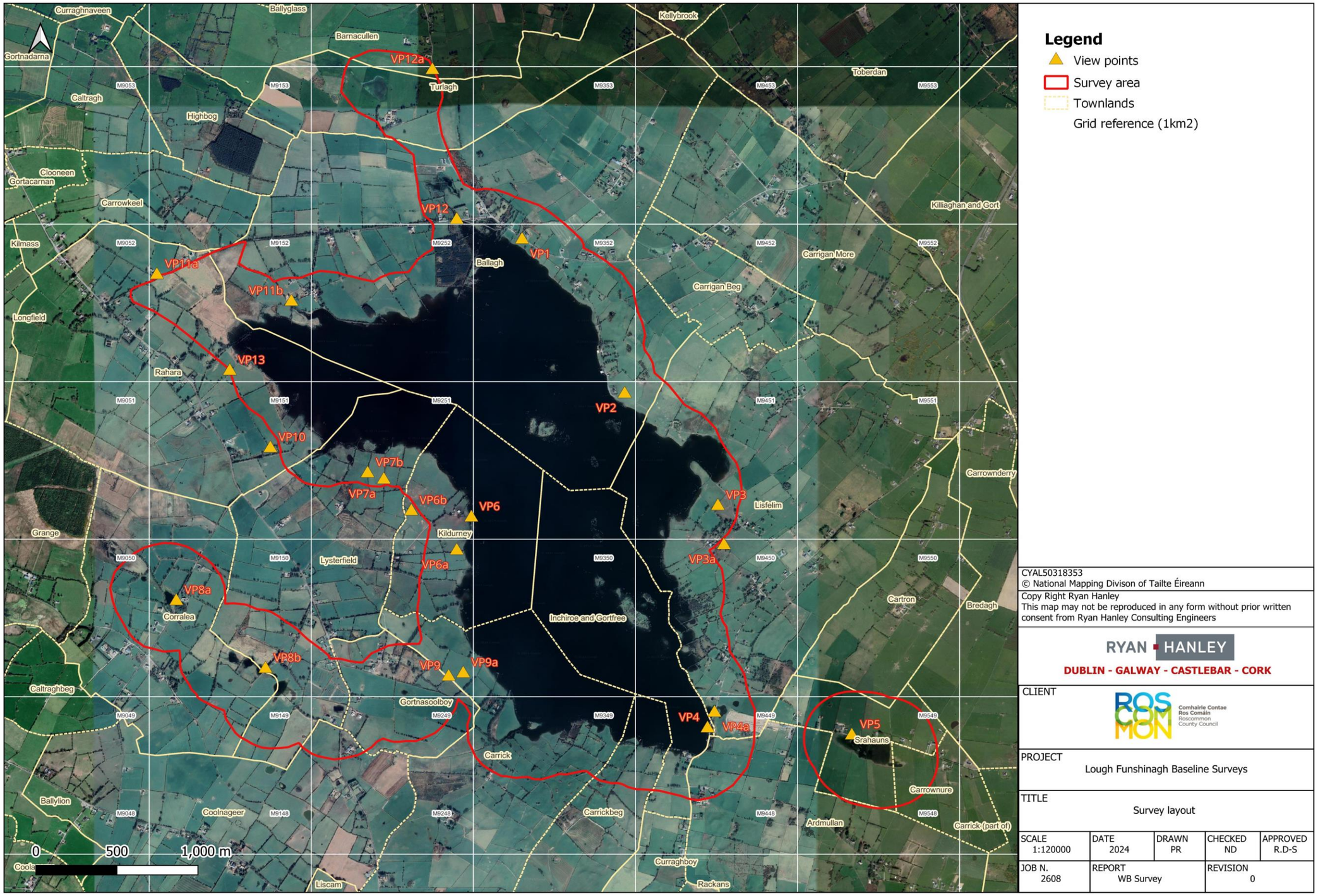

Figure 2: Winter bird survey area overlaid on the OS 1km square grid and showing townlands at the site.

2 SURVEY METHODOLOGY

2.1 Survey area and vantage points

The delimitation of the survey area (see Figure 2) was set in accordance with the habitat's potential importance to wintering bird species of the area. As well as Lough Funshinagh, other smaller adjacent lakes have been included in the survey area. Lough Funshinagh and the adjacent lakes formed the focus for the survey, together with associated habitats of the flood plain, wetlands in particular.

Preliminary vantage points were estimated at desktop stage but were officially assigned onsite. Some were along public roads, while others involved gaining permission to park and walk through private lands.

2.2 Survey Methods

A widely used method for wetland and waterbirds is that described by Bibby (2000) as a 'look-see' approach which is an instantaneous count from one or more (or continuous) viewpoints over a subject waterbody or larger wetland area/site. This method is used for national and international surveys including IWeBS. The survey site or area was accessed via local public and private roads and then on foot to reach suitable viewpoints (VPs) from which to observe and count waterbird species on the lake, shore zones and adjacent wetland habitats using professional binocular and telescope. The site was split along a north-south axis, between two survey teams working in coordination, thereby to attain as complete as possible survey coverage of this large site. The viewshed from each viewpoint (or set of viewpoints labelled as a, b, c, etc) enabled the site to be divided into survey zones limited to approximately 1km extent for bird identification, counting and location recording. ITM coordinates were estimated and assigned to each recorded observation of a species individual, group or flock marked down on the field map. The Lough Funshinagh survey area, including selected small outlying turlough lakes with fringing wetland habitats (see Figure 2), was surveyed on one day visit per month from November 2023 to March 2024.

3 SURVEY RESULTS

3.1 Constraints to field survey

The main constraints experienced in following standard or single survey routes were as follows:

i. At times of high water in rivers and watercourses/drain channels, it was not possible to cross some channels or access some shoreline locations.

ii. In the mid-winter period (November to December) short day length and early night-fall curtailed survey coverage. This issue was addressed by splitting the field survey coverage between two ecologists, one assigned to cover the east side and the other to cover the west side, of L. Funshinagh and outlier lakes.

iii. Given the limitations to access, some few sections of shoreline may have received less complete coverage owing to physical characteristics, visual obstruction and unavailability of access routes. The limitations were partially overcome by viewing and counting from opposing sides of the lake.

3.2 Conditions, coverage and spatial data framework

Field surveys were conducted on five dates from 28th November 2023 to 11th March 2024, each being approximately five to six hours in duration (including traveling between vantage points). Weather conditions were generally suitable without rain or strong winds and generally good visibility (low sun and glare was encountered some days, which is normal for this time of the year and time of survey). Frosty conditions occurred on some occasions, with shoreline sheet-ice in January. Lake water levels were noted to have increased substantially between the December and January visits and remained high for the remainder of the survey.

Figure 2 shows the layout of viewpoints (VPs) that were used to achieve coverage of the survey area on a monthly basis. Some alternative access routes and VPs were used or added according to constraints or field survey conditions during the course of the season's survey visits. In some situations, an initial VP location was changed or added to with alternative viewpoints, as dictated by access and viewing constraints, avoiding disturbance of bird flocks, and appointing the best practicable situation for viewing and counting birds as distributed on given survey visits.

This survey focused on waterbird species, which waterfowl, waders and other bird families of water-dependent species typically using the habitats of Lough Funshinagh and allied wetlands, lakes and ponds. Other bird groups were noted where possible, in terms of presence and prevalence, but were not counted or recorded in a systematic way, as this was straying from the survey objective and beyond its scope. Raptor species were also recorded.

The target species of this survey were categorised as wetland and waterbirds; i.e., birds that are ecologically dependent on aquatic and wetland habitats. This includes migratory species whose populations depend on the biogeographical zone of which Ireland is a key part and important owing to mild, oceanic conditions (Sheppard, 1993; Lewis *et al*, 2019). During the survey, birds were observed foraging, loafing or roosting, moving by swimming or in flight, on or over the lake, shore zones, wetland margins and in pastures a short distance above the shores.

The survey data was spatially recorded by ITM coordinates and also organised according to the Ordnance Survey (O.S.) 1km national grid squares, as shown in Figure 2 and Table 2.

3.3 Survey records and data collection

The detailed field survey data were recorded in an MS Excel workbook; a spreadsheet form was populated with the survey records from each visit, along with observation notes (see Appendix 1). On walkovers, the survey route was tracked on a smartphone device using the GPS app, Outdoor Active/Gaia, providing spatial data on survey coverage. Waterbird species were recorded to precise locations, assigning ITM coordinates for each record, also to 1km grid square units' level, so that data analyses can be used to determine what habitats would be deemed important within the survey area for the birds recorded, as well as spatial patterns of habitat usage within the site. Waterbird data from all survey dates has been compiled and collated to show the records by date for each 1km square survey unit and the whole survey area; this data is also collated by species, as presented in Appendix 2. For the purposes of this report, the data has been analysed to show peak numbers of all bird species recorded in the survey area (Table 1). Peak numbers are also presented for each 1km square survey unit in Table 2. These data are displayed graphically in Figures 3 to 7. A set of photographs from the field surveys, illustrating habitat features, some bird observations and conditions at Lough Funshinagh are contained in Appendix 4.

3.4 Species composition

Table 1 lists 26 species recorded during the winter survey across all habitats encompassed from November 2023 to March 2024. The prominence of each species at the site is reflected in the peak number recorded over the season. Despite variation in species counts over the five survey visits, these peak values give a fair indication of relative abundance of bird species and groups overall. While some waterbirds used the full lough when foraging, most waterbirds were distributed along the edges of the lough and the edges of the islands within the lough. The island habitat was used to a high capacity during November and December and then gradually lessened from January to March as the water level rose, covering the fringing habitat. This fringing habitat was found to support concentrations of certain target species, whether feeding or roosting.

The combination of the turlough and wetland habitat types with mixed farmland within the survey area and its location between various SPAs, are factors which underlie the broad range of taxonomic groups of over-wintering bird families recorded in this survey; these include (1) Anatidea, (2) Scolopacidae, (3) Podicipedidae, (4) Phalacrocoracidae, (5) Accipitridae, (6) Charadriidae, (7) Scolopacidae, (8) Laridae, (9) Alcedinidae, (10) Rallidae, (11) Ardeidae.

The survey found that Golden plover and Lapwing were the most abundant species, occupying the turlough, island edges as well as the agricultural fields, with peak numbers reaching above 1000. Wigeon, Teal and Black-headed gulls were also abundant, with peak counts ranging between 566 and 739 and Greylag geese, Mallard and Shoveler also had high peak counts of over 100. Most of the waterbirds preferred roosting and foraging along the outer fringes of the turlough and island edges. However, the Cormorant, Shoveler, grebes and gull species were all found making use of the entire site. A Kingfisher was recorded within the treeline surrounding the turlough and buzzard, a raptor species, were recorded in agricultural fields, bounded by woodland, treelines and hedgerows, surrounding the turlough. Some qualitative observations were noted on other species occurring in the pastoral habitats adjacent to the Lough Funshinagh.

3.5 Species Accounts (Waterbirds)

Large waterfowl & allies – swans, geese, ducks, cormorants, grebes and rails

Waterfowl, the Anatidae, comprising ducks, geese and swans, make up the largest family of swimming waterbirds. Two swan, one goose and five duck species were recorded in this survey. The resident Mute Swan was recorded across Lough Funshinagh frequently as pairs or family groups of up 6 birds including juveniles. Whooper swans migrate to Ireland from Iceland in autumn, arriving in their thousands at gateway sites such as Lough Foyle and Lough Swilly, foraging in agricultural grasslands and cropped lands here, before dispersing southward along the major river networks, lakes and wetlands (Robinson *et al*, 2004). The Shannon / midlands basin from Lough Erne to the Shannon Estuary, as well as lakes and turloughs to the west, form a network of sites used by wintering flocks of whooper swan. In this survey, whooper swans were recorded through the season from November to March, though in small numbers and at varying locations; on the east side of Lough Funshinagh at Inchiroe and at Ballagh, on the outlier Lough Cup at Srahauns, and in a seasonal lake and flooded agricultural grassland extending to the north of L. Funshinagh at Turlagh. The **peak number was 26 Whoopers recorded in December**.

Greylag geese were present on all visits (heard but not seen on the west side of L. Funshinagh on the first visits in November 2023, probably in fields therefore, but out of view. The geese were predominantly observed on the western side of L. Funshinagh in Kildurney and Carrick, along the shore while roosting, feeding in grasslands above the shore, and swimming on the lake although geese took to the open water sometimes as a consequence of slight disturbance of those located on the shore. Small numbers were also recorded near the north and south-east shore areas. The geese associated with duck, wigeon, teal and mallard. High numbers were observed from December to January, with a **peak of 105 greylag geese recorded in December** which exceeds the all-Ireland threshold[1] of 35 birds. However, with no long history of greylags migrating to this region, this flock appears to have originated from the feral goose population and therefore not treated as a natural species for the purposes of scientific monitoring and conservation assessment (Lewis *et al*, 2019).

Teal and wigeon were the most abundant duck species sharing similar habitat and widely distributed in hidden recesses and bays and along shore areas flanked by fringing wetland vegetation, alder and willow cover. Teal were abundant throughout the season, though numbers fluctuated from month to month with **a significant spike in January to peak at 739 teal**, far exceeding the all-Ireland threshold[1] of 360 birds. This high number may have been a result of teal leaving frozen sites in January in favour of open water on Lough Funshinagh when only near shore sheet-ice occurred, being a large lake. Teal were widely distributed around shoreward locations on L. Funshinagh in groups of 10 or more, larger flocks of over 100 birds were recorded in favoured habitat. Shoreline habitats became less available as water levels increased, so that in February and March the islets were immersed and fringes of swamp, marsh and wet grassland submerged; coincident with high water levels teal were relatively few on L Funshinagh itself while proportionately higher numbers were recorded at the small/outlier sites at Kildurney (VP6), Lysterfield/Corralea (VP8) to the west, Lisfelim/Srahauns and L. Cup (VP5) to the southeast and at Turlagh to the north (VP12).

[1] Threshold set as 1% of the All-Ireland population, signifying a site of national importance for the species (see Lewis et al, 2019)

Wigeon numbers increased rapidly in early winter to peak at 670 birds in January (exceeding the all-Ireland threshold[1] of 560 birds) decreasing steadily thereafter, though remaining abundant. Having similar habitat preferences to teal, favouring shallow open water close to shore, large flocks of wigeon were also observed grazing in fields above the shore when water levels were highest from February to March; this was observed at Kildurney for example. Wigeon were widely distributed in loose flocks of typically c.50 to 100 birds, occasionally more, predominantly along the west and south shoreward areas of L Funshinagh. Smaller flock sizes were recorded at outlying turloughs at Corralea (VP8), Kildurney (VP6) and Srahauns/L. Cup (VP5).

Exceeding the all-Ireland threshold[1]multiple times, a significant **peak number of 212 Shoveler was recorded in January** in the south of L. Funshinagh, but this duck species was not observed on any other months' visit apart from 2 shoveler on the south of the lake at Inchiroe and Gortfree and a further 2 shoveler at the small outlier turlough at Corralea (VP8) in March. The midlands region is important for Shoveler and there may be movement and interchange with other sites in the area, such as Lough Ree and Lough Croan, which are only c.5km away. The number recorded in January is equivalent to 10% of the all-Ireland population.

Tufted duck is a relatively numerous species over-wintering in Ireland, is widely dispersed, preferring open water and adequately deep-water lakes, being a diving duck. **Only 14 tufted duck were recorded** in March, foraging in the middle open-water zone of Lough Funshinagh.

Grebes are a separate family, similar to diving ducks, like mergansers, and to divers, they are proficient underwater hunters. Little grebes are widely dispersed on a variety of coastal and inland wetlands but are small and secretive, often hidden within wetland margins of reed swamp and thick aquatic vegetation, and hence overlooked during counts. They were most prominent in the densely vegetated outlier lakes at Corralea (VP8), in 1km square M9150, and in vegetated shore-zones of Lough Funshinagh, recorded at Ballagh (VP1, in M9352) and at Carrick (VP9 in M9350) though with extensive swamp and alluvial woodland cover in other areas, numbers on L. Funshinagh were probably under-estimated. None were recorded in the coldest month, January, **and the peak number of 8 little grebe was recorded in February**. Great-crested grebe was abundant through the survey season, tending to forage more in the deeper central parts of L. Funshinagh, both in the north (Kildurney, Ballagh) and south (Inchiroe and Gortfree), were rafts of up to ten or more birds were observed foraging together, but were otherwise widely dispersed on the lake as ones or twos. Numbers were high in December, February and March **with a season peak of 41 great-crested grebes recorded in March, 2024**, which exceeded the all-Ireland 1% threshold of 30 birds.

Cormorant belongs to the family, Phalacrocoridae; small flocks were observed on L. Funshinagh roosting in dead trees (inundated in the lake). Ten to twenty or more birds were observed perched in this way at favoured roost sites around the lakes shore-zones, with highest numbers in the northwest/north in Rahara/Lysterfield and Ballagh, as well as the southwest of the lake at Carrick. Otherwise, cormorants were seen dispersed all around the open water of L. Funshinagh when foraging. The **peak numbers of 46 cormorant were recorded from December to January**, which is below the all-Ireland 1% threshold of 110 birds.

The rails, Rallidae, include two species recorded in the survey, moorhen and coot. Moorhen were recorded on the thickly vegetated outlier lakes at Corralea (VP8) in 1km square M9150, most prolific on Lough Cup at Srahauns (M9549) where 11 moorhen were recorded in November and were otherwise recorded on Lough Funshinagh itself within vegetated shore-zone at Ballagh (M9252). Moorhen occurs widely in Ireland, but numbers are almost certainly underestimated in this type of

baseline waterbird survey, owing to their preference for dense wetland vegetation cover, making accurate population estimation unattainable; thus, their wintering status in Ireland is unknown (Lewis *et al*, 2019). **Peak numbers of 14 moorhen were recorded from November to December**, few recorded in the coldest months from January to February, then later, a return to 11 birds recorded in March.

Coot is a widespread species, favouring a range of wetlands from lakes, ponds, gravel pits, and canals to slow-moving rivers, open marshes and lagoons (Lewis *et al*, 2019). Coot were recorded only at Lough Cup, Srahauns, when **a peak of 5 coot was recorded in December and in March**. This open water species predominates in large, shallow, mesotrophic lakes with submerged vegetation, of the midlands and west. Largely herbivorous in its diet, the coot dives to the bottom, seizing plant material and returning to the surface to eat it.

Waders including plovers, sandpipers and allies

Lapwing and Golden Plover belong to the plover family or Charadriidae. These two species had similar patterns of occurrence, behaviour and habitat use, observed in this survey. Both species were present in large flocks from November to December, which were observed in flight over and around the site but not always settled on the ground. They combined in flight and on the ground whilst maintaining species flock cohesion. The flocks were mobile and dynamic, observed orbiting around L. Funshinagh for periods and repeating this during the course of the survey visit. It's likely that these flocks were also moving between, to or from other sites in the area such as Lough Croan, but this wider movement could not be visually followed or tracked any further than c.1km; beyond this the flightline of a flock tended to leave the surveyors' field of view. **Large flocks of up to 1800 golden plover were recorded in flight** in November, apparently often splitting into smaller groups, which were watched landing on the islets of L. Funshinagh at Ballagh, Inchiroe and Gortfree, as well as above shore along the northwest part of the lake at Rahara (M9151), which was quite inaccessible for viewing to observe. The peak number was 1800 in flight, though **approximately1000 golden plover were observed actually on-site, on the ground at Inchiroe, set down to roost with Lapwing. This number exceeds the 1% all-Ireland threshold value of 920 birds.** The recorded abundance of both species fell in January with zero records in February and March, indicative of onward dispersion and migration of these populations southward on the flyway. Lapwing were recorded roosting predominately at Rahara, the islets in Ballagh, Inchiroe and at Lisfelim, with an overall site **peak of 1458 lapwing recorded in December, which exceeds the all-Ireland threshold of 850 birds**.

Other recorded wader species, belonging to the large group known as sandpipers and allies, or Scolopacidae, included Snipe, Curlew, Dunlin and Redshank, all of which have large over-wintering migrant populations in Ireland. Snipe are secretive and very widely dispersed in wetland habitats bordering lakes and rivers, as well as bogs and fens, where they probe the soft wet substrates for worms and invertebrate larvae. Wet rush grassland, marsh, fen and swamp margins are favoured inland habitats, but snipe do not form flocks like other waders, though small concentrations are frequent in optimal habitats. Flood zones associated with turloughs, and lowland rivers, provide abundant seasonal habitat for over-wintering snipe, especially in the midlands and west. Recording snipe in the current survey relied on incidental observations or putting up birds when walking to VPs. Occasional snipe were recorded along the wet lake margins and in wet grassland around L. Funshinagh, however it's likely that the species went largely undetected and therefore under-estimated. **A peak number of 14 snipe was recorde**d in January, in swamp margins of the outlier turloughs at Corralea (M9150); it appeared that these snipe were congregating in relatively unfrozen habitat when other habitats, such as grasslands, were frozen hard. These birds were disturbed by chance during the field survey and were counted as they flew off a short distance before landing.

Curlew were recorded in small flocks along the shoreline of L. Funshinagh, most numerous in Carrick (M9250) in the southwest and Lisfelim (M9451) along the east shore, where agricultural grassland above the shore provided secure feeding areas, while shoreline features were roost locations. **Peak numbers of 28 curlew were recorded in December to January**, which is well below the 1% national threshold of 350. Curlew is widely distributed through the midlands and west with the largest numbers occurring mainly on muddy estuaries and shores in coastal areas (Lewis *et al*, 2019).

Redshank are distributed mainly along the coast and estuaries in Ireland. Very small numbers were recorded at L. Funshinagh, where **2 redshank were recorded at Ballagh** (M9352) roosting on the shore with lapwing in November and a bird was calling from the shore at Carrick (M9349) in March.

Dunlin were not confirmed in the survey, however, were likely present when small waders were observed flying within flocks of golden plover in January. It's possible that c.20 or more dunlin may occur in winter. IWeBS records show this to be the case – see section 4.2.

Herons and other species

Little Egret and Grey Heron belong to the Ardeidae (Herons) family. Little Egret is a new resident and wintering species in the UK and Ireland where the population has grown rapidly and expanded across Ireland from the south-east to northwest and is now widely distributed, predominantly around coastal sites, though its inland distribution is increasing also (Lewis *et al*, 2019). Single birds or small numbers were recorded through the season along the shorelines of L. Funshinagh and at outlier sites, such as Corralea (VP8, M9150). The highest number was 5 little egret recorded at Ballagh (VP1, M9352) and **the peak number of 8 little egret was recorded in February**.

Gulls

Black-headed gull is the most abundant and widespread gull species in Ireland, overwintering at both coastal and inland sites and comprising both resident and migrant populations (Lewis *et al*, 2019). As with most gulls, it's a very mobile species, opportunistic in its approach to foraging, and forage habitat availability, which includes agricultural lands. For this reason, numbers at any given time or site can be erratic and sporadic. Black-headed gulls were observed to be prevalent though widely dispersed at L. Funshinagh, recorded foraging on the wing all around the shore-zone through the season; typically, from 10 to 30 birds in most of the 1km squares. Later in the season, from February to March, larger numbers were recorded in cohesive flocks, roosting at a number of locations in the survey site, with 200 birds recorded at Ballagh (M9253) and 268 birds at Lisfelim (M9451); **the peak number of 566 black-headed gulls was therefore in February**. This is below the nominal threshold of 1000 birds used to differentiate sites of significance at national level (Lewis *et al*, 2019).

Other gull species were occasional and few in number. The **survey peak number of 8 Lesser black-backed gulls** was observed at L. Cup, Srahauns (VP5 in M9549) in November. On L. Funshinagh, four were observed on the east shore at Lisfelim (M9451) and elsewhere in smaller numbers around the shore-zone of the lake, often roosting when seen. Two birds were also observed at the outlier small lakes at Corralea (VP8b, M9150). **Four Great black-backed gulls were recorded in Ballagh** (M9352) at the north of L. Funshinagh in March only.

Kingfishers

The Coraciiformes - Kingfishers and Allies includes for one atypical, specialist waterbird species. Kingfisher was observed only once, one flying along the south-east shoreline (M9449) in January.

Table 1. Wintering Bird Survey (WBS) – Species, total counts and peak number recorded in the survey area.

BTO Sp. Code	Bird Species Common Name	Bird Species Scientific Name	Seasonality: R=resident W= winter M=migrant	Conservation Status: BOCCI4 red-data list; A1=Annex 1	Survey period - Total Counts					Peak No. recorded
					Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	
GJ	Greylag Goose	*Anser anser*	W/M	Amber	0	105	93	11	12	**105**
MS	Mute Swan	*Cygnus olor*	R	Amber	29	33	26	23	30	**33**
WS	Whooper Swan	*Cygnus cygnus*	W/M	A1, Amber	5	26	4	0	9	**26**
SV	Shoveler	*Anas clypeata*	R/W	Red	0	0	212	0	4	**212**
WN	Wigeon	*Anas penelope*	W/M	Amber	69	273	670	376	293	**670**
T.	Teal	*Anas crecca*	R/W	Amber	128	74	739	87	211	**739**
MA	Mallard	*Anas platyrhynchos*	R/W	Amber	33	29	157	67	27	**157**
TU	Tufted Duck	*Aythya fuligula*	R/W	Amber	0	0	0	0	14	**14**
MH	Moorhen	*Gallinula chloropus*	R	Green	13	14	1	4	11	**14**
CO	Coot	*Fulica atra*	R/W	Amber	4	5	0	2	5	**5**
LG	Little Grebe	*Tachybaptus ruficollis*	R	Green	2	1	0	8	4	**8**
GG	Great-crested Grebe	*Podiceps cristatus*	R	Amber	18	25	7	23	41	**41**
L.	Lapwing	*Vanellus vanellus*	R	Red	594	1485	245	0	0	**1485**
GP	Golden Plover	*Pluvialis apricaria*	W/M	A1, Red	1000	630	159	0	0	**1000**[2]
CU	Curlew	*Numenius arquata*	W	Red	1	28	27	4	0	**28**
SN	Snipe	*Gallinago gallinago*	R/W	Red	0	2	14	2	0	**14**
RK	Redshank	*Tringa totanus*	R/W	Red	2	0	0	0	1	**2**
BH	Black-headed Gull	*Chroicocephalus ridibundus*	R/W	Amber	68	66	40	566	245	**566**
GB	Great Black-backed Gull	*Larus marinus*	R/W	Green	0	0	0	0	4	**4**
LB	Lesser black-backed gull	*Larus fuscus*	R/W	Amber	8	2	0	7	2	**8**
CA	Cormorant	*Phalacrocorax carbo*	R	Amber	18	45	46	39	26	**46**
H.	Grey Heron	*Ardea cinerea*	R	Green	3	12	7	3	1	**12**
ET	Little Egret	*Egretta garzetta*	R	A1, Green	1	3	0	8	3	**8**
BZ	Buzzard	*Buteo buteo*	R	Green	0	1	3	1	0	**3**
KF	Kingfisher	*Alcedo atthis*	R	A1, Amber	0	0	1	0	0	**1**
RN	Raven	*Corvus corax*	R	Green	0	0	0	1	0	**1**

[2] 1800 golden plover were observed in flight over and around the site during the November survey visit; 1000 of these were counted on the ground habitat on one occasion before flying again.

Table 2. Peak numbers of species recorded in each 1km grid square survey unit and for the whole survey period

Species	1km2 Grid reference - Peak values														
	M9352	M9252	M9351	M9451	M9450	M9449	M9349	M9549	M9350	M9151	M9251	M9152	M9150	M9250	M9253
Greylag Goose	10	13	50	0	5	0	0	0	42	0	41	0	0	32	0
Mute Swan	9	2	10	7	0	4	2	2	6	0	6	5	1	0	2
Whooper Swan	4	0	0	0	16	0	0	6	4	0	0	0	0	0	9
Shoveler	0	0	10	0	0	112	0	0	90	0	0	0	2	0	0
Wigeon	18	70	16	170	20	0	250	29	127	34	250	6	10	42	0
Teal	319	12	36	122	20	27	20	18	71	20	112	4	32	40	20
Mallard	16	0	105	5	10	0	7	6	30	10	6	5	1	15	4
Tufted duck	0	4	9	0	0	0	0	0	1	0	0	0	0	0	0
Moorhen	0	1	0	0	0	0	0	11	0	0	0	0	8	0	0
Coot	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
Little Grebe	2	0	0	0	0	0	0	0	1	0	0	0	7	0	0
Great-crested Grebe	8	10	7	1	10	2	1	0	15	0	19	7	0	0	0
Lapwing	84	200	263	317	300	0	0	25	100	250	165	200	2	39	0
Golden Plover	28	170	60	200	1000	0	0	1	0	200	5	0	0	15	0
Curlew	0	0	1	28	2	0	0	0	10	0	4	0	0	15	0
Snipe	0	0	0	0	0	0	0	0	1	0	2	0	14	0	0
Redshank	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Black-headed Gull	13	20	25	268	5	10	0	33	10	12	28	35	7	4	200
Great Black-backed Gull	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lesser Black-backed Gull	0	0	2	4	0	2	0	8	0	0	0	1	2	0	0
Cormorant	12	6	9	1	2	10	0	0	20	0	13	0	0	26	0
Grey Heron	2	1	2	1	2	0	1	0	2	1	3	1	1	2	0
Little Egret	5	1	1	0	0	0	0	0	1	1	1	0	1	0	1
Buzzard	2	0	0	0	0	1	0	0	0	0	1	0	0	0	0
Kingfisher	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Raven	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0

3.6 Bird Habitats

Habitats of importance to wetland and waterbirds within the survey area may be broken down by their key features and value for use by the range of bird species recorded. Note that habitat types have been surveyed, mapped and described in a separate study in support of the Lough Funshinagh Baseline Surveys. Alpa-numeric habitat type codes follow the categories described by Fossitt (2000) in *A Guide to Habitats in Ireland*. For the purpose in hand, habitat features used by wetland and waterbirds were evaluated,

a) for feeding and refuge value,

b) for roost site value,

c) for connectivity value.

Habitats present within the study area include Turloughs (FL6), Wet willow-alder-ash woodland (WN6), Reed and large sedge swamps (FS1), Tall-herb swamps (FS2), Marsh (GM1), Drainage ditches (FW4), Wet grassland (GS4), Improved agricultural grassland (GA1), Hedgerows (WL1), Treelines (WL2), (Mixed) broadleaved woodland (WD1) and Conifer plantation (WD4). A more detailed description of these habitats and additional habitats found at Lough Funshinagh will be detailed in Habitat Survey carried out during the optimal survey season in 2024.

The open water within the Lough Funshinagh turlough provided significant feeding value for species like the cormorant, swan, gull and the grebe species recorded. This open water also provides connectivity for all bird species, allowing them to move freely and mostly undisturbed throughout the Lough Funshinagh habitats.

The islands within the Lough Funshinagh turlough were particularly important to many bird species recorded during the winter bird surveys. This habitat provided feeding and roosting habitat for large numbers of lapwing and golden plover. As the water level got higher throughout the survey season, the islands became less available. Other birds, mainly teal and wigeon, also preferred this habitat and were noted foraging and roosting within and around these islands. As the water lever rose bird numbers utilising these sites reduced.

The vegetated fringes and emergent vegetation between the lough and the surrounding grasslands and wooded areas were also particularly important for a variety of bird species recorded during the winter bird surveys. Habitats included within these areas include GS4, GA1, GM1, FS1, FS2 and WN6. Lapwing and golden plover preferred secure areas near the shore, where they could forage mostly undisturbed. Teal and wigeon used the vegetated fringes and adjoining grasslands for feeding, refuge and roosting also. Other birds like moorhen and little grebe preferred the more sheltered emergent vegetation habitats. The grey heron and little egret also made use of the more sheltered habitats, as well as the adjoining WN6 habitats.

The willow, alder, hawthorn and ash cover along the high-water level shoreline was utilised by these species also, as well as and many other species like the dabbling ducks and the kingfisher was also recorded making use of this habitat. Dead tree species within Lough Funshinagh were utilised by cormorants throughout the survey season as easily accessible perches and roost sites.

4 EVALUATION OF SURVEY RESULTS

The survey area is limited to Lough Funshinagh, a medium-large lake, and some outlying wetlands and small seasonal lakes and flooded pastureland within c.2km. The site forms one part of a network of lakes, including turloughs, as well as rivers with seasonal flood plains across the west midlands, encompassing Lough Ree, Lough Croan, the rivers Shannon and Suck, and numerous small lakes and sites hosting large numbers of mobile waterbirds which make up the population of winter migrants. This evaluation is made at site level but integral to the wider wetland and waterbird habitat network.

Long term monitoring of winter, migratory bird populations, with some species having a wide biogeographical range, shows how numbers fluctuate between years, sometimes relating to significant changes in environmental conditions. Changes have been identified in wintering waterbird distributions at large geographical scales in response to short and long-term changes in weather conditions (Lewis *et al*, 2019). Research findings illustrate the different reactions of waterbird species to changes in weather and climate, with individual ecology and habitat requirements being important factors. Monitoring by IWeBS and other internationally coordinated monitoring schemes provides a robust basis for interpretation of wintering bird populations and long-term trends. This baseline winter bird survey is providing accurate data for one winter season only and how typical or representative that is for Lough Funshinagh may best be judged by comparison to the published long-term monitoring data available.

4.1 Waterbird Abundance in the winter bird survey (WBS)

The winter waterbird assemblage at L. Funshinagh is composed of both resident and migrant birds, which may involve the same species. Migratory populations arrive in Ireland in autumn from breeding regions to the north from Greenland-Iceland or the Fenno-Scandinavian regions (Wernham, Toms & Marchant, 2002). The flyways and dispersal patterns are particular to each species or species groups. The timing of seasonal arrival and dispersal patterns of migrants is informed by research and monitoring through long-term surveys such as IWeBS (and WeBS in the UK), as well as bird-ringing data, tracking studies radio- and satellite- telemetry. Abundance levels for each species over the season are consequent on their migration patterns, affecting the timing of their occurrence and peak abundance, at site level.

Abundance levels for each of the 24 waterbird species recorded at Lough Funshinagh over the 2023/24 winter season are expressed as season peak numbers (Table 1) and are also broken down by 1km grid square of the survey area for all waterbird species (Table 2). The profiles for each species are plotted in bar charts for each month of the survey; see Figures 3 to 7.

Just two species, golden plover and lapwing were recorded in numbers exceeding 1000 birds; six species, namely greylag goose (feral/resident type), shoveler, wigeon, teal, mallard and black-headed gull were recorded in numbers exceeding 100 but less and 1000 birds, while nine species exceeded 10 but were less than 100 birds, namely mute swan, whooper swan, tufted duck, moorhen, great-crested grebe, curlew, snipe, cormorant and grey heron. The remaining seven species, coot, little grebe, redshank, great black-backed gull, lesser black-backed gull, little egret and kingfisher all numbered less than ten birds at any time in the survey.

Whilst not to diminish the importance of the site for all waterbird species recorded in the survey, it is evident that a number of **key species** (Table 3) may be highlighted in this report in respect of their

significant occurrence at this site and in view of their ecological conservation importance. The following factors regarding species at the L. Funshinagh survey site were considered important:

- Abundance reaching numbers of national importance; i.e., exceeding the all-Ireland 1% threshold[3];
- Forming a significant proportion of the flyway population of a migratory species;
- Red data listing in BOCCI4;
- Annex I of the EU Birds Directive.

Table 3. Criteria used to define and select Key Species at the Lough Funshinagh WBS site

Bird Species	Significant abundance in WBS	Conservation status (Red-Data, Annex 1)	Qualifying Interest in nearby SPAs	Key Species
Black-headed Gull	Yes	Amber	No	No
Cormorant	No	Amber	No	No
Grey Heron	No	Green	No	No
Curlew	No	Red	No	No
Lapwing	**Yes**	**Red**	**Yes**	**Yes**
Redshank	No	Red	No	No
Mute Swan	No	Amber	No	No
Great-crested Grebe	Yes	Amber	No	No
Mallard	No	Amber	Yes	No
Teal	**Yes**	**Amber**	**Yes**	**Yes**
Little Egret	No	Green	Y	No
Little Grebe	No	Green	Yes	No
Golden Plover	**Yes**	**Red**	**Yes**	**Yes**
Wigeon	**Yes**	**Amber**	**Yes**	**Yes**
Moorhen	No	Green	No	No
Lesser black backed Gull	No	Amber	No	No
Whooper Swan	No	Amber	Yes	No
Coot	No	Amber	Yes	No
Greylag Goose	No	Amber	No	No
Snipe	No	Red	No	No
Shoveler	**Yes**	**Red**	**Yes**	**Yes**
Kingfisher	No	Amber	No	No

[3] A site qualifies as being nationally important if it regularly supports more than 1% of a national population of a species. If a site regularly holds 1% of the national population of an Annex 1 species, then it is deemed internationally important.

Tufted duck	No	Amber	Yes	No

Table 3 highlights a short-list (bold/shaded), comprising five winter migrant key species all occurring in nationally important numbers. This means that L. Funshinagh may meet the criteria to classify as a nationally important site for these species. For this reason, some additional analysis was carried out for the purpose of evaluating the abundance and distribution of the select five key species for each month of the survey. Figures 3 to 7 present mapping of the distribution of these key species, while the inset charts show the given month's data for all species.

Figure 3: Winter bird survey results for <u>November 2023</u> – total counts of all waterbird species (chart) and distribution of key species on the map

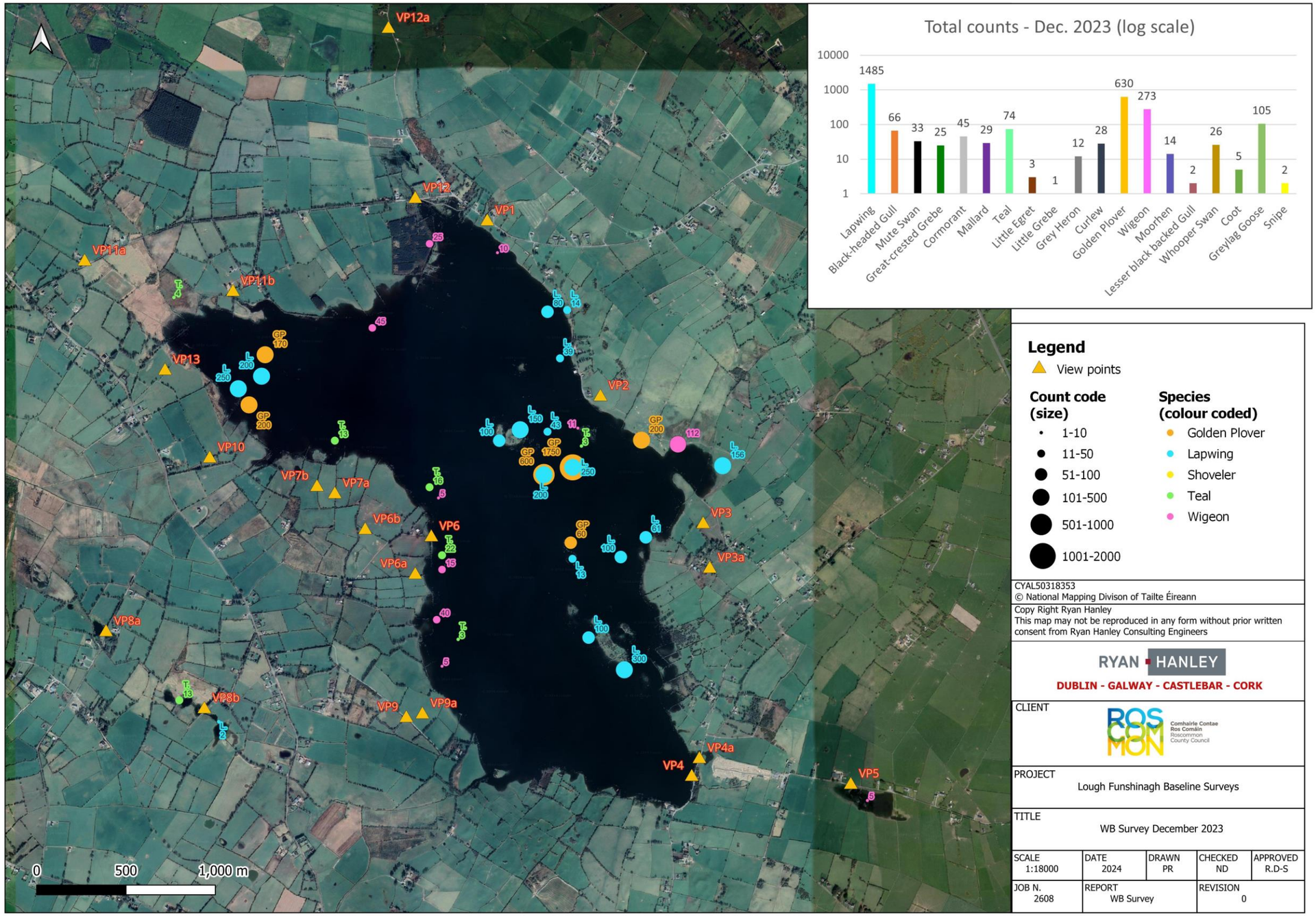

Figure 4: Winter bird survey results for December 2023 – total counts of all waterbird species (chart) and distribution of key species on the map

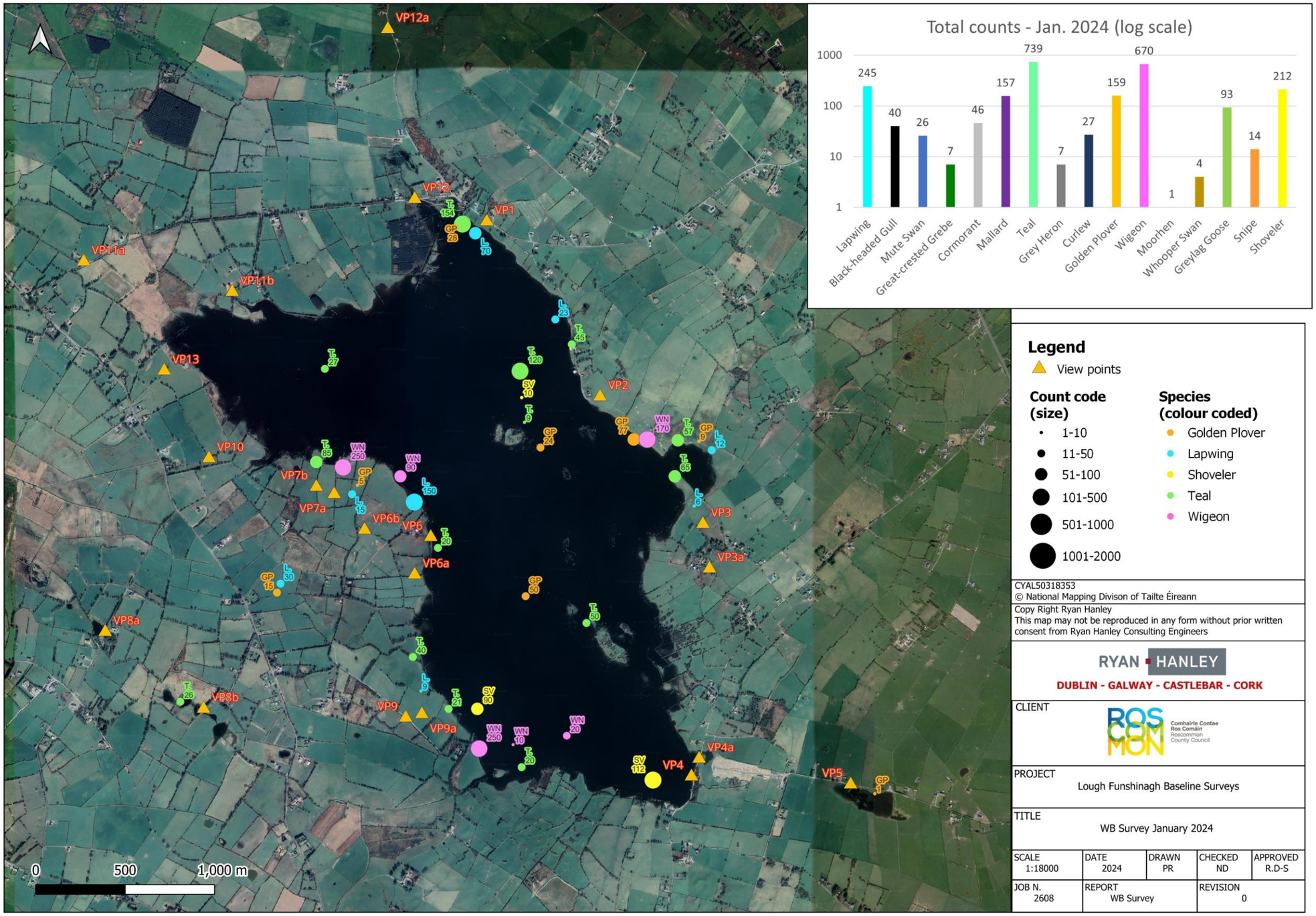

Figure 5: Winter bird survey results for <u>January 2024</u> – total counts of all waterbird species (chart) and distribution of key species on the map

Legend

View points

Count code (size)

- 1-10
- 11-50
- 51-100
- 101-500
- 501-1000
- 1001-2000

Species (colour coded)

- Golden Plover
- Lapwing
- Shoveler
- Teal
- Wigeon

CYAL50318353
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RYAN HANLEY
DUBLIN - GALWAY - CASTLEBAR - CORK

CLIENT: ROSCOMMON Comhairle Contae Ros Comáin Roscommon County Council

PROJECT: Lough Funshinagh Baseline Surveys

TITLE: WB Survey February 2024

SCALE	DATE	DRAWN	CHECKED	APPROVED
1:18000	2024	PR	ND	R.D-S

JOB N.	REPORT	REVISION
2608	WB Survey	0

Figure 6: Winter bird survey results for <u>February 2024</u> – total counts of all waterbird species (chart) and distribution of key species on the map

Figure 7: Winter bird survey results for <u>March 2024</u> – total counts of all waterbird species (chart) and distribution of key species on the map

4.2 Waterbird Species survey results from the 2023/24 WBS compared with IWeBS data

Lough Funshinagh is one of a set of wetland sites including lakes and turloughs, named collectively as South Roscommon Lakes in the IWeBS sites list. The sub-site data for Lough Funshinagh was received from BirdWatch Ireland on request in March 2024. This provides a substantial, continuous dataset spanning 30 years from the 1994/95 season, when IWeBS was initiated, up to the present time.

Some comparisons are made between the single season 2023/24 WBS data with the long-term IWeBS data for the waterbird species observed, particularly the key species short-listed in section 4.1 above, to draw inferences into historic trends in species presence and abundance at Lough Funshinagh over the years, up to the present time (note that the current IWeBS season's data for 2023/24 was not yet available and therefore not included in the dataset received at this time; however, this will be requested at a later date in order to make a direct comparison with the results of this current survey with IWeBS for the same season). Analyses of IWeBS data for abundance trends in respect of the key species are presented in Appendix 3 and discussed hereunder.

Some general and direct remarks are made about this baseline winter bird survey data compared with IWeBS data for L. Funshinagh collected over the past 30years. IWeBS has recorded a total of 37 species (omitting Great White Egret, which is not a regularly occurring migratory species, and domestic greylag goose). This IWeBS list includes all the species recorded in this current survey; species not recorded in the current survey are listed below in Table 4 where some reasoning is presented in respect of those species' status and regularity which may account for those species' apparent absence in this WBS. Species common to both WBS and IWeBS are listed in Table 5.

For most of the species in Table 4, the fact that they were not recorded in this WBS survey is of little significance today relative to expectations. Some of them were historically infrequent or have undergone changes in geographical range and distribution that have taken place at population level owing to factors, including climate change, that are largely extrinsic to the site.

For the species in Table 5, wherein the WBS results are compared with IWeBS, a number of species are shown, in the analysis, to have undergone declines in abundance over the past 30 years, as explained in Table 5 and demonstrated in Appendix 3. Regarding duck species, IWeBS data shows significant long-term declines for wigeon, shoveler, mallard and pintail at Lough Funshinagh. These trends appear to correspond with the all-Ireland 25-50% declines for this group of species over the 2011/12 – 2015/16 period as reported by Lewis et al, 2019. Somewhat contrary to the all-Ireland trends, is the decline of teal at L. Funshinagh, which may be over 50% at the site indicated by IWeBS data, compared to relatively stable population abundance for Ireland as a whole. While a high peak number of 739 teal was recorded during the WBS January visit, the numbers recorded in the other months were relatively modest and mostly under the 200-mark. There were indications of an upturn and slight increases for tufted duck from IWeBS site data compared to the overall decline at all-Ireland level. This species was not frequent at the site during the 2023/24 season as it was only recorded in March in the WBS.

With regard to other lake user species, IWeBS data indicate slight increases for cormorant and great-crested grebe over the past 10 to 15 years at L. Funshinagh, which is close to all-Ireland trends. This WBS found regular occurrence and consistent abundance of both species over the 2023/24 season.

Large numbers of golden plover and lapwing were observed from November to December in the WBS, which is consistent with the IWeBS trends for the site. Numbers can vary abruptly and it's likely that large mobile flocks move to or from other sites in the locality or nearby in the region. It is noted

from monthly data trends in IWeBS that historically numbers remained high from January to February for these species. From observations of flock activity and where plovers were settling to roost, the possibility that high and increasing water levels, submerging the islets and Inchimore peninsula, removes available roost-sites after December is suggested. This may shorten the season for Lapwing in particular, causing flocks to move to other sites, which may account for the trend of declining numbers observed. In Ireland there is a clear trend of decline in wintering golden plover, (c.40%) over the past 20 years, the reasons for which are not well known, but may relate to climate changes effects on migratory range (Gillings *et al*, 2006) as discussed by Lewis *et al* (2019). The IWeBS decline is even more accentuated (60%) for Lapwing in Ireland.

4.3 WBS compared with Bird Atlas 2007-2011 data

Bird Atlas 2007-2011 is the definitive statement on breeding and winter bird distributions in Britain and Ireland. The Bird Atlas dataset for Ireland is available (Bird Atlas 2007 - 2011 - Detail - Biodiversity Maps (biodiversityireland.ie) via Biodiversity Maps which is the data portal and mapping system of the National Biodiversity Data Centre.

4.4 Spatial distribution of waterbird species at the WBS site

The spatial distribution patterns for each species, which were recorded as ITM coordinates and processed in GIS, demonstrate the relationship with habitat features at site level. Mapping the data, as in Figures 3 to 7, shows the importance of shallow inshore areas for a suite of species, dabbling ducks, swans, herons and geese associated with secluded bays and recesses, shoreline wetlands including wet willow alder ash woodland (WN6) fringes, wet grassland (GS4), marsh (GM1), reed and tall sedge swamp (FS1), as well as the islets and isolated lake shores at Inchiroe and Gortfree. The distribution mapping shows that most parts of the inshore and shoreline habitats all around L. Funshinagh support a range of species in flocks, both roosting and foraging. The variety of species and their distribution patterns did change through the season; there were relatively few plovers recorded from January onwards and use of island habitats by all species diminished and had ceased altogether in February to March. Deeper open water in the central zone of Lough Funshinagh was occupied by diving waterbirds and fish feeding species such as great-crested grebe, cormorant and tufted duck. Rising water levels resulted in island and shoreline habitats becoming progressively submerged in the latter half of the season from late December onwards. The change in conditions may affect the balance in habitats available to waterbirds with differing requirements, becoming more favourable for deep water species, but less so for those preferring shallow water and littoral shore areas for both feeding and roosting. It appeared that islets and peninsular features, used as secure roost sites by golden plover, lapwing, ducks, waders and others, were lost as a resource for these species' assemblages during the course of the season.

Table 4 Wintering bird species in IWeBS history at L Funshinagh but not recorded in the current WBS (referencing population trends from Lewis *et al*, 2019)

BTO Sp. Code	Species	Scientific Name	1% nat. thres-hold	IWeBS 30-year Peak	Species status at L. Funshinagh Reasons for absence in WBS survey based on population decline, rarity or low detectability	BOCCI4 status
BS	Bewick's Swan	*Cygnus columbianus*	20	40	Historically important regional site but not recorded here since 2002/03. Long-term decline of species, nearly extinct in Ireland owing to shift in wintering grounds, attributed to climate change.	RED
NW	Greenland White-fronted Goose	*Anser albifrons flavirostris*	100	9	Largely absent since before IWeBS, nine recorded in 1996/97 and one bird in 2017/18. Long-term decline of species flocks in traditional habitats and sites. Local flock at L. Croan and River Suck Callows (Burke et al, 2013). Severe range contraction, species mainly confined to Wexford Slobs and L. Swilly.	AMBER
GA	Gadwall	*Mareca strepera*	20	7	Infrequent records of 2 to 3 birds in IWeBS, last recorded in 2018/19. Long-term upward trend in population, though sharp decline in recent years.	AMBER
PT	Pintail	*Anas acuta*	20	100	Uncommon winter migrant to Ireland, scarcely recorded at L Funshinagh since 1996/97, mostly none or less than 10 birds. Long-term decline of winter migrants to Ireland moderated in 2002-2012.	AMBER
PO	Pochard	*Aythya farina*	110	220	Erratic in numbers, scarcely recorded here since 2010, e.g., 12 birds in 2017/18 at best. In severe decline as winter migrant to Ireland	RED
RM	Red-breasted Merganser	*Mergus serrator*	25	1	Very atypical here or at any inland sites. Only one recorded in at L Funshinagh in 1999/00	AMBER
WA	Water Rail	*Rallus aquaticus*		1	Very secretive, concealed and sparse. Rarely observed or recorded, only in 1996/97 and 2007/08.	GREEN
DN	Dunlin	*Calidris alpina*	460	12	Unrecorded in most years, otherwise few; 12 in 2017/18	RED
BW	Black-tailed Godwit	*Limosa limosa*	200	13	Unrecorded in most years, otherwise rare and untypical here; 13 recorded in 2018/19.	RED
WM	Whimbrel	*Numenius phaeopus*		11	Exceptional, atypical inland, species occurs briefly on passage, usually near the coast. Single record from 1996	GREEN
GK	Greenshank	*Tringa nebularia*	20	9	Long-term increasing population trends, largely coastal. Rarely recorded at L Funshinagh, or anywhere inland, so peak an exception. 1bird record in 2019/20 but not recorded in previous >20 years	GREEN
CM	Common Gull	*Larus canus*		2	Not uncommon, but having a mainly coastal winter distribution, 2 birds in 1996/97 and in 2013/14 are the only IWeBS records	AMBER
HG	Herring Gull	*Larus argentatus*		5	Mainly coastal distribution. Peak of five birds in IWeBS, just one or a few recorded in some years, none in others. Occasional at best.	AMBER

Table 5 Appraisal of WBS results compared with IWeBS 30-year historic data for L Funshinagh (referencing population trends from Lewis *et al*, 2019)

Species	Scientific Name	1% Nat. thres-hold	IWeBS 30year Peak	WBS 2023/24 Peak	Species status at L. Funshinagh Compare current WBS data with IWeBS	BOCCI4 status
Greylag Goose	*Anser answer*	35	106	105	Unrecorded in IWeBS from 1994 to 2015; no history of Icelandic migrants here. Numbers at site have increased since first record in 2015/16. Flock likely **of feral naturalised population**.	N/A
Mute Swan	*Cygnus olor*	90	85	33	Numbers fluctuate over the year in the IWeBS dataset, so birds probably disperse to alternative sites in the region. WBS peak is a little above the IWeBS peak mean value of 26 birds.	AMBER
Whooper Swan	*Cygnus cygnus*	150	90	26	The WBS peak number is just below the IWeBS peak mean value of 28 birds. Note that numbers recorded in IWeBS have not exceeded 27 birds during the past ten years. The WBS result is therefore very consistent with the trend for the site.	AMBER
Shoveler	*Anas clypeata*	20	550	212	Shoveler was not regularly present at the site through survey seasons but the recorded peak in the WBS is the highest record since the 1996/97 IWeBS season. Shoveler was recorded in most years of IWeBS; numbers vary, giving a peak mean value of 60. This local population may over-winter at multiple sites including Lough Croan. Supporting numbers being well above the 1% all-Ireland threshold makes L. Funshinagh an important site for Shoveler, which suffers a long-term decline.	RED
Wigeon	*Anas penelope*	560	858	670	While present in most years of IWeB, recorded numbers vary erratically over the years. Wigeon numbers grow to high levels from December to February normally peaking in January, though it varies. The WBS peak is the largest since IWeBS peak recorded in 2017/18 (804 birds). Numbers frequently exceed the 1% all-Ireland threshold.	AMBER
Teal	*Anas crecca*	360	1600	739	Similarly to wigeon, teal numbers vary within and between seasons, probably as influenced by habitat conditions and low (freezing) temperatures. WBS peak number was well above the IWeBS peak mean and the highest record since the IWeBS 2017/18 peak of 900 teal. Abundance is often higher than 1% threshold.	AMBER
Mallard	*Anas platyrhynchos*	280	186	157	The WBS peak number from January was more than twice that for mallard recorded in the other months of the survey, perhaps owing to icy conditions forcing birds to move in from elsewhere. This is the highest number since the IWeBS peak of 2008/09. Mallard was recorded in all years of IWeBS, giving a mean value of 67 birds.	AMBER
Tufted Duck	*Aythya fuligula*	270	96	14	Fairly regular species, tending to occur more in the latter half of the season. Variable numbers, absent or few in some years, mean value 38 birds.	AMBER
Moorhen	*Gallinula chloropus*	n/a	20	14	Recorded at outlying sites to a large extent in the WBS. IWeBS mean of 9 birds and regularly records indicates fairly constant occurrence, though in small numbers only since 2016/17	GREEN
Coot	*Fulica atra*	190	65	5	Two or less in IWeBS records since 2008. Was more abundant in the 1990's here.	AMBER
Little Grebe	*Tachybaptus ruficollis*	20	33	8	Small, often concealed and easily missed, was found also at the outlier sites in the WBS. Mean value of 7 birds from IWeBs, the peak record from 2019/20 was a little exceptional.	GREEN

Species	Scientific Name	1% Nat. thres-hold	IWeBS 30year Peak	WBS 2023/24 Peak	Species status at L. Funshinagh Compare current WBS data with IWeBS	BOCCI4 status
Great-crested Grebe	*Podiceps cristatus*	30	14	41	Most abundant in coastal bays, estuaries and large midlands lakes, this species numbered relatively high in our WBS, breaking the IWeBS peak record in every month except December. The WBS peak in March exceeds the all-Ireland 1% threshold.	AMBER
Lapwing	*Vanellus vanellus*	850	7000	1485	IWeBS shows highly variable numbers; occasionally over 2500 lapwing and 30-year mean of 1545. Large flocks until January in WBS and peak number recorded is typical	RED
Golden Plover	*Pluvialis apricaria*	920	4000	1000	As lapwing, highly variable numbers in IWeBS, 4000 birds not unusual, recorded in several years; 30-year mean of 1268. In WBS, flocks up to 1800 golden plover recorded overhead Nov/Dec, though c.1000 birds on ground roost.	RED
Curlew	*Numenius arquata*	350	430	28	Regular presence of curlew but steady decline in numbers during IWeBS since 1995, averaging around 50 birds over the past 10 years, so our WBS peak looks representative of current status	RED
Snipe	*Gallinago gallinago*	n/a	35	14	1 or 2 snipe were recorded in most years; mean value was 2. Therefore, the peak number was very exceptional. The peak in the WBS was also an unlikely flock in an outlier site swamp which were disturbed by chance and flew up in one instant. Snipe are largely undetected in generic surveys	RED
Redshank	*Tringa totanus*	240	12	12	IWeBS typically recorded 2 or 3 redshank or none in some years. Similar results were attained in our WBS. Slightly higher numbers were recorded in the early ten years of IWeBS (6 to 12 birds).	RED
Black-headed Gull	*Chroicocephalus ridibundus*	n/a	250	566	Generally dispersed widely at the site during WBS, numbers close to IWeBS mean value, a few large roving/roosting flocks pushed numbers recorded in WBS up to much higher levels in February and March, may not be a typical result.	AMBER
Great Black-backed Gull	*Larus marinus*	n/a	4	4	The WBS peak matched the long term IWeBS peak; sole records in both surveys. A very infrequent species at the site; often scans inland waterway in spring scouting for prey foraging.	GREEN
Lesser black-backed gull	*Larus fuscus*	n/a	8	8	Records from the WBS included birds at L Cup (peak) and other outlier lakes to the west. The peak in L Funshinagh itself was 4 birds. IWeBS records were occasional, more so in the past 10 years, 8 birds in 2016/17.	AMBER
Cormorant	*Phalacrocorax carbo*	110	50	46	IWeBS records vary, few or no birds in some years. Regular in the past ten years of IWeBS peaking in 2022/23. Our WBS recorded cormorant consistently through the season with highest numbers from Dec-Feb almost equalling the IWeBS peak	AMBER
Grey Heron	*Ardea cinerea*	25	13	12	Single and widely dispersed, heron may be missed when stationary in tall wetland vegetation, small numbers were frequent in both IWeBS and our WBS and similar peak numbers recorded.	GREEN
Little Egret	*Egretta garzetta*	20	28	8	Was present in most months of the WBS. Since first recorded by IWeBS here in 2010, small numbers were recorded each year with a slightly exceptional peak, giving a mean value of 9 birds in the recent 10 years. WBS result is quite typical.	GREEN
Kingfisher	*Alcedo atthis*	n/a	3	1	Rarely seen, one occasional record in some IWeBS season, the peak was recorded in 2019/20. One record in the WBS in January in the SE shore of Lough Funshinagh.	AMBER

4.5 Conservation Status (BoCCI4 and Annex 1)

Table 1 shows the conservation status of all species recorded in the survey, as determined by the fourth assessment of Birds of Conservation Concern in Ireland (BoCCI4) (Gilbert et al. 2021), which updated and replaced existing Red-listing methods (Batten et al. 1990, Whilde 1993). BoCCI has been reviewed approximately every seven years.

Of the 24 waterbird species recorded, 6 (25%) are red-listed, 13 (54%) are amber-listed, while the remaining five (21%) are green-listed. There were four species listed in Annex I of the EU Birds Directive for special conservation measures, of which golden plover is the only one red listed. This high proportion of 79% red and amber listed species underlines the importance of the site for bird conservation and biodiversity. While not recorded in significantly high numbers, the value of the site to support regularly occurring red-listed species, curlew, redshank is important in terms of maintaining biodiversity and contributing to the conservation of the species overall.

Similarly, while not observed in this WBS, the 30-year IWeBS dataset indicates (Table 4) that recurring low numbers of Gadwall, Pintail, Pochard and Dunlin are expected to continue occurring at L. Funshinagh if habitat conditions remain favourable.

4.6 Nature Conservation Sites

Lough Funshinagh is itself designated as an EU site, namely, Lough Funshinagh SAC (000611), for the priority habitat, Turloughs*[4][3180]. There are a number of wetland sites in the locality which are of international importance for wintering waterbirds and form part of the SPA Natura 2K network in Co. Roscommon. The following SPAs are relevant in terms of location, distance relative to L. Funshinagh and are designated for many of the same species in common:

- Lough Croan Turlough SPA (004139), 4km to the southwest
- Four Roads Turlough SPA (004140) 7km to the west;
- River Suck Callows SPA (004097) 10km to the west;
- Lough Ree SPA (004064) 5km to the east.

It is likely that there is movement and interchange of waterbird species between Lough Funshinagh and the above-mentioned sites, especially migratory species which are mobile and gather in large flocks, including species of conservation interest (SCI) which are among the qualifying interests of these sites. In this regard, Lough Funshinagh may be regarded as integral to the network of connected and proximate sites, including the SPAs named above.

4.7 Summary of the results and outcomes of the wintering birds survey (WBS)

Monthly spatial data of wintering bird species was collected during the winter bird survey of Lough Funshinagh and outlying wetland areas from November 2023 to March 2024.

The abundance and distribution of 24 waterbird species was recorded to specific locations, displayed in maps, tables and charts of the survey site, highlighting the peak numbers for each species during the survey (Table 1). The data is also organised into 15, 1km grid square survey units, providing finer resolution of spatial occurrence and distribution, comparable to national datasets. There is close correspondence between this single season of WBS data and IWeBS data from the past 30 years for L. Funshinagh. Five key species were short-listed as regular species occurring in significant numbers of all-Ireland importance: Shoveler, wigeon, teal, golden plover and lapwing. It may be deduced that the site is of national importance for these species, but also important for the full range of waterbirds occurring in sub-threshold numbers including six red-listed species and four Annex I species.

A number of less frequent species, small numbers of which were occasionally recorded in IWeBS, were not observed (or confirmed) in this WBS, such as pochard, pintail, gadwall and dunlin.

Habitat types used by the range of birds at the site were noted in respect of foraging and roost-sites. Inshore and wetland habitats along the shore margins were notable for the main range of species. High water levels submerged a

[4] * denotes and EU Priority, as defined in the Directive EEC/43/1993

proportion of these areas making them unavailable to plovers and dabbling duck over the course of the season, thereby making conditions less favourable to some species. By contrast diving species including cormorant and great-crested grebe, which forage in open deeper water, were recorded in relatively high numbers.

Lough Funshinagh is part of a network of lake and wetland sites in the surrounding locality and is probably integral to nearby SPAs in terms of supporting the wintering waterbirds which are mobile and dynamic in their use of sites over the season. This applies in particular to the five key species.

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Appendix E – Breeding Birds Survey Report of Lough Funshinagh

2024

Lough Funshinagh Baseline Surveys

Breeding Birds Survey of Lough Funshinagh

August 2024

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Client	Roscommon County Council
Project No.	2608
Project Title	Lough Funshinagh Baseline Surveys
Report Title	Breeding Birds Survey of Lough Funshinagh

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1.0	Issue	Rémi O'Connell and Paola Rodolfi	Breda Quinn	Dr Ross Donnelly-Swift	20th August 2024

TABLE OF CONTENTS

1 INTRODUCTION & BACKGROUND

This report details the results, methodology and findings for the Breeding Bird Survey throughout Lough Funshinagh, carried out by Ryan Hanley Ecologist's between the months April to June 2024. This report details a description of the results obtained and a following discussion of the significance of these results with regards to National and European Union (EU) legislation.

Birdwatch Ireland is an independent conservation organisation in Ireland. Its primary objective is the protection of wild birds and their habitats in Ireland and in order to fulfil this objective they undertake a wide variety of work including the Countryside Bird Survey (CBS).

CBS is an annual occurring survey which is conducted by the Birdwatch Ireland staff, National Parks and Wildlife Service (NPWS) rangers and skilled volunteers all over the country. CBS data has served to show that populations of Irelands common and widespread birds are continually changing. Over time, reasons for decline may be identified and there will be opportunities to provide advice to help reverse such trends. The CBS focuses mainly on hedgerow/treeline and grassland species rather than waterbird species, therefore, the Lough Funshinagh Breeding Bird Survey (BBS) does not follow the CBS methodology. The CBS is based on a random stratified approach where the Republic of Ireland is divided into 10-km grid-squares. For each 10-km square selected, it is the 1-km square at the extreme southwest corner that is surveyed. The CBS survey aims to achieve coverage of the same 1-km squares each year, ideally by the same observer who will carry out a survey within the selected 1-km square twice within each breeding season, once between 1st April and 15th May and another between 15th May and 30th June (O'Halloran, 2012). This survey technique is often employed for large-scale breeding bird survey's which span over wide geographical ranges (Crowe et al., 2010).

However, the Lough Funshinagh BBS was geographically restricted to Lough Funshinagh, Lough Cup and a select number of smaller wetland sub-sites within its immediate environs. As such, an alternative Breeding Bird Survey methodology was utilised for this survey which employed the use of assigned transect routes which covered the majority of Lough Funshinagh's and Lough Cup's perimeters; this methodology has been previously employed under similar survey conditions (Brown and Shepherd, 1993). Six visits is considered to be a proportionate survey effort for all terrestrial and freshwater habitats. Surveys of the breeding bird community should start between half an hour before sunrise and half an hour after sunrise. Surveys should typically be concluded by around mid-morning. Surveys should be carried out in good conditions, avoiding heavy rain, strong winds and where visibility is negatively affected (such as excessive fog). A survey transect should be walked at a slow, ambling pace, stopping to scan priority habitat/features where appropriate. Priority habitats should be surveyed more intensively. The key principle is that the survey transect should enable the surveyor to see and hear everything on site (Bird Survey & Assessment Steering Group, 2024).

Over the course of the six survey dates encapsulating the entire survey, this perimeter was surveyed multiple times between both survey groups. In addition, any species of note observed during the Lough Funshinagh Baseline Habitat Surveys in June and July 2024 are also noted in this report.

1.1 Statement of Authority

The field surveys and reporting were led by Dr Ross Donnelly-Swift, a Senior Ecologist for Ryan Hanley. The Breeding Bird Survey was carried out by a number of ecologists and environmental specialists that are qualified and experienced in the field, assisted with data collection, field observations, GIS analysis and report preparation.

Damien McAndrew holds a BSc. (Honours) in Environmental Science from ATU Sligo and has two years' experience working as an Ecological Consultant. He has worked on a range of projects that require habitat surveys and species-sensitive surveys such as birds and bats. In addition, he has experience in surveying for bats, otters, and habitat assessments.

Breda Quinn holds a B.Sc. in Wildlife Biology from the Institute of Technology Tralee (Now MTU) and has over four years of ornithological survey experience, ranging from specialised raptor surveys to breeding bird surveys and wintering bird surveys in various habitats. Breda has been working as a professional ecologist with Ryan Hanley for three years. She has worked on various project reports such as Biodiversity chapters for Environmental Impact Assessment reports (EIAR), Appropriate Assessment (AA) screenings, EIA screenings, Natura Impact Statements (NIS), Invasive Species Management Plans (ISMP) and Preliminary Ecological Assessments (PEA).

Anneita Brahmin is an Assistant Environmental Scientist at Ryan Hanley. Anneita holds a B.Sc. (Hons) from the University of Natal, South Africa. She has over twelve years' experience in both marine and terrestrial ecology. Anneita served as a conservation scientist, developing conservation plans to main the integrity of marine and terrestrial protected areas. Over this period, she also gained ornithological experience by being involved in wetland bird surveys.

Rémi O'Connell has been working as a professional ecologist with Ryan Hanley for over a year. He completed his studies in University College Cork (UCC) where he earned a BSc (Hons) in Ecology and Environmental Biology. During his time working with Ryan Hanley, he has participated in multiple walkover, invasive plant and bird surveys. He has worked on an array of projects which involved Environmental Impact Assessment (EIA), Natura Impact Statement (NIS), Appropriate Assessment (AA) Screening, Multi-Criteria Analysis (MCA), Initial Assessment Report (IAR), Invasive Species Management Plan (ISMP) and Invasive Alien Plant Species (IAPS) reports.

Paola Rodolfi assisted in the data collection and spatial analysis. Paola holds a B.Sc. in Marine Biology and a Masters in Environmental Management. She has over twelve years' experience in environmental reporting and data analysis. Her focus has been in survey data analysis and geospatial data analysis for environmental purposes. She is an expert in QGIS software and familiar with ArcGIS for mapping. The analyses she performs include species distribution and abundance, calculations on habitats surfaces, and the various layouts and map production skills.

This report was reviewed by Dr Ross Donnelly-Swift, Senior Ecologist with Ryan Hanley. Ross holds a BSc (Hons) Biology from Maynooth University NUI, a MSc Environmental Science from Trinity College Dublin, and a PhD Biosystems Engineering from University College Dublin. In addition, Ross Lectured at Dundalk Institute of Technology on soil and hydrology and was a Research Fellow in the School of Natural Sciences at Trinity College Dublin. Ross has extensive experience and knowledge in ecological assessments, conducting field experiments, writing scientific reports, habitat surveying and species-specific surveys that include bats, badger, otter, birds (winter and breeding), flora and invasive species.

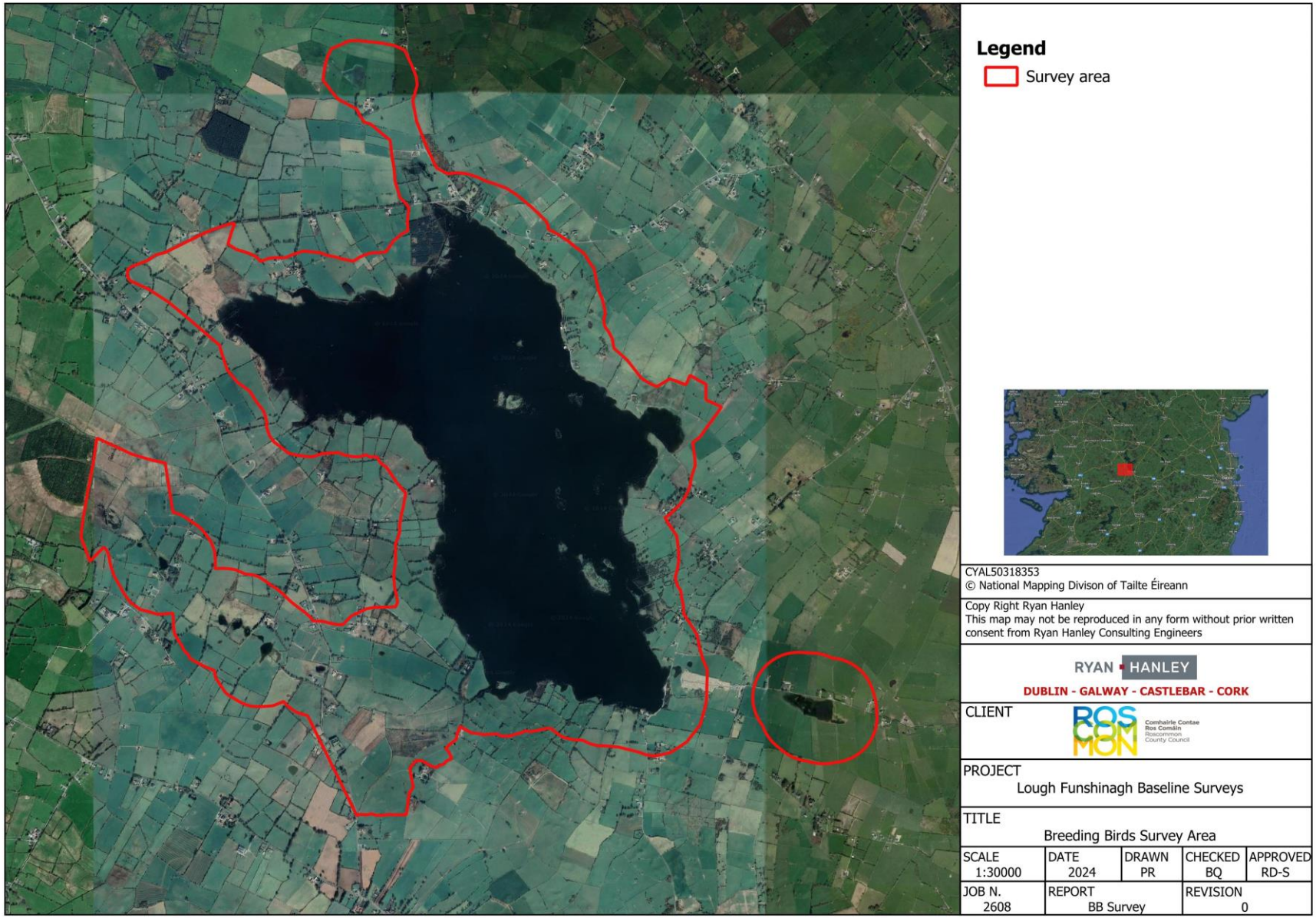

Figure 1. 1 Breeding Bird Survey Area

2 SURVEY METHODOLOGY

2.1 Survey area and transects

The delimitation of the survey area (see **Figure 1. 1**) was set in accordance with the habitat's potential importance to breeding bird species of the area. As well as Lough Funshinagh, other smaller adjacent loughs and wetlands have been included in the survey area, this includes Lough Cup. Lough Funshinagh, Lough Cup and the adjacent smaller turloughs and wetlands formed the focus for the survey, together with associated habitats of the flood plain, wetlands in particular. Breeding bird species inhabiting the hedgerows and treelines at the margins of Lough Funshinagh and other wetlands were also noted.

Preliminary survey transect lines were estimated at desktop stage but were officially assigned on-site. Some transect lines were along public roads, as Lough Funshinagh water levels were high during the survey. The majority of transect lines involved gaining permission to walk through private lands along the boundary of Lough Funshinagh and the adjacent smaller loughs and wetlands. Lough Cup was observed from the road boundary given the high-water level this lough was fully visible.

2.2 Survey Methods

The methodology employed for this breeding bird survey involved six dates for which the survey began before dawn (4:15AM – 6:30AM) and one dusk survey date which began at approximately 20:30PM. As standard it is recommended that six bird survey visits be undertaken as part of a survey for breeding birds. This was done to maximise the likelihood that all observations made were of birds breeding in the area and not birds which had migrated to the survey area from other breeding sites in the surrounding area. The survey site was divided into transect routes along the margins at Lough Funshinagh and the adjacent smaller loughs and wetlands. The transect routes assigned for this survey encompassed the perimeter of Lough Funshinagh, where accessible. The survey was carried out between two survey teams working in coordination, thereby to attain as complete as possible survey coverage of this site. Each team took opposite sides of Lough Funshinagh to ensure no cross counting occurred during each survey. Within each survey team both members took on a role of observing and identifying species through a combination telescopic equipment, auditory cues and observation with the naked eye. The roles within the survey groups were not entirely homogenous, as one member of each group was typically tasked with recording the observational data. This was done to ensure at least one surveyor within each team was consistently maintaining observational capacity as the survey was undertaken, thus reducing likelihood of missed observations during the potential circumstance that both surveyors were recording observations at the same time. Each team was led by a competent and experience ecologist.

The survey site or area was accessed via public and private roads and then on foot to reach suitable starting points from which to begin the pre-meditated transect routes. Once at the start of each transect route, each survey team began observing and counting waterfowl species on the lough, shore zones and adjacent wetland habitats using professional binoculars and spotting scope. The perimeter of the lough, where accessible, was covered multiple times between both survey teams. Irish Transverse Mercator (ITM) coordinates were estimated and assigned to each recorded observation of a species individual, group or flock marked down on the field map. The Lough Funshinagh survey area, including selected small outlying sub-sites with fringing wetland habitats (see **Figure 1**), was surveyed from the months April to June 2024. The previous Wintering Bird Survey of Lough Funshinagh was completed between the November 2023 and March 2024. This enabled the Breeding Bird Survey to commence approximately two weeks after the completion of the Wintering Bird Survey.

3 SURVEY RESULTS

3.1 Constraints to field survey

The main constraints experienced in following standard or single survey routes were as follows:

i. At times of high-water levels in watercourses/drainage channels, it was not possible to cross some channels or access some shoreline locations.

ii. Owing to the necessitated timing of a breeding bird survey during spring/summer months (April-June), which must begin before dawn, visibility was reduced at the beginning of each survey with a gradual increase in clarity and luminosity typically observed as each survey progressed. Identification was also done by analysing bird call captured on wildlife audio recording equipment.

iii. Given the limitations to access, some few sections of shoreline may have received less complete coverage owing to physical characteristics, visual obstruction and/or restricted access to survey transect routes. The limitations were overcome by viewing and counting from opposing sides of the lake/flooded areas. The islands of Lough Funshinagh were largely under water at the start of the survey due to high water levels. Any islands with nesting potential were observed from the shoreline.

3.2 Conditions, coverage and spatial data framework

Field surveys were conducted on six dates from 4th April 2024 to 12th June 2024, each being approximately five to six hours in duration (including traveling along transect routes). Weather conditions were suitable without rain or strong winds and good visibility after sunrise and into the later hours of the survey day (low sun, cloudiness and glare was encountered on some days, which is normal for this time of the year and time of survey). For the dawn surveys there was typically a trend of fog at the beginning of each survey on Lough Funshinagh which reduced as the survey progressed. The 5th survey was a dusk survey to capture any species more detectable at dusk (Bird Survey & Assessment Steering Group, 2024).

Figure 1. 1 shows the survey area which was visited throughout the survey. Some alternative access routes were used or added according to constraints or field survey conditions during the course of the season's survey visits, for example increased water levels or novel introductions of farm animals to agricultural land.

This survey focused on waterbird species, which waterfowl, waders and other bird families of water-dependent species which typically use Lough Funshinagh and its allied habitats, lakes and ponds. Other bird groups were noted where possible, in terms of presence and prevalence, but were not counted or recorded in a systematic way, as this was straying from the survey objective to capture species dependent on wetland habitats. Species of conservation concern were also recorded if observed.

The target species of this survey were categorised as wetland and waterbirds; i.e., birds that are ecologically dependent on aquatic and wetland habitats. This includes migratory species whose populations depend on the biogeographical zone of which Ireland is a key part and important owing to mild, oceanic conditions (Sheppard, 1993; Lewis et al, 2019). During the survey, birds were observed nesting, foraging, loafing or roosting, moving by swimming or in flight, on or over the lough,

shore zones, wetland margins and in pastures a short distance above the shores. The survey data was spatially recorded by ITM coordinates, as shown in **Figure 4. 1**, **Figure 4. 2 and Figure 4. 3.**

3.3 Survey records and data collection

The detailed field survey data were recorded in a Microsoft (MS) Excel workbook; a spreadsheet form was populated with the survey records from each visit, along with observation notes. On walkovers, the survey route was tracked on both smartphone and tablet devices using QField, and also by hand utilising physical maps of the survey site, providing spatial data on survey coverage. Waterbird and hedgerow species were recorded to precise locations, assigning ITM coordinates for each record, so that data analyses can be used to determine what habitats would be deemed important within the survey area for the birds recorded, as well as spatial patterns of habitat usage within the site. For the purposes of this report, the data has been analysed to show peak numbers of all bird species recorded in the survey area (**Table 3. 1**). These data are displayed graphically in **Figure 4. 1**, **Figure 4. 2** and **Figure 4. 3.** A set of photographs from the field surveys, illustrating habitat features, some bird observations and conditions at Lough Funshinagh are contained in Appendix 3.

3.4 Species composition

Table 3. 1 lists 19 species recorded during the Breeding Bird Survey (BBS) across all habitats encompassed from April to June 2024. The prominence of each species at the site is reflected in the peak number recorded over the season. Despite variation in species counts over the six survey visits, these peak values give a fair indication of relative abundance of bird species and groups overall. While some waterbirds used the full lough when foraging, most waterbirds were distributed along the edges of the lough, and the edges of the islands within the lough when they became available later in the season. The islands on Lough Funshinagh were not predominately used during April and early May due to high water levels which caused the inundation of these island habitats. The utilization of island habitat by bird species inhabiting the lough then gradually increased from late May to June as the water level receded, exposing the fringing habitat. This fringing habitat was found to support concentrations of certain target species, whether feeding or roosting.

The combination of the lough and wetland habitat types with mixed farmland within the survey area and its location between various Special Protection Areas (SPA), are factors which underlie the broad range of taxonomic groups of bird families recorded in this survey; these include (1) Anatidea, (2) Scolopacidae, (3) Podicipedidae, (4) Phalacrocoracidae, (5) Charadriidae, (6) Laridae, (7) Rallidae, (8) Ardeidae.

The survey found that Black-headed Gull, Cormorant, Mute Swan, Mallard, Greylag Goose and Great-Crested Grebe were, overall, the most abundant species observed throughout the entire survey, occupying the lough, island edges as well as the flooded agricultural fields. A large flock of Whimbrel, numbering 60, was also observed on one occasion (01/05/24) foraging in an agricultural field at the northern end of Lough Funshinagh. Black-Headed Gull, Cormorant, Great-crested Grebe, Grey Heron, Greylag Goose, Mallard and Mute Swan were the only key species which were observed during all 6 survey dates carried out.

Black-Headed Gull, Whimbrel, Cormorant, Great-Crested Grebe and Greylag Goose had the highest peak numbers recorded across the entire survey period for a specific survey date, these peak counts were 50, 40, 30, 25 and 18, respectively. The highest total counts across the entire survey period were

Black-headed Gull, Mallard, Greylag Goose, Mute Swan and Cormorant, which were 222, 107, 87, 82 and 81, respectively.

Over the entire survey, the dusk survey carried out on the 22nd of May recorded the lowest overall count for bird species. This is to be expected as the other surveys carried out took place before and after dawn. Since Lough Funshinagh acts solely as foraging and roosting habitat for certain species, many species would have returned to their home range before dusk, thus returning to cryptic breeding sites not visible from the lake margins, or areas too distant for detection from the survey transect routes outlined. The dusk survey did not detect any additional waterfowl species. Swift (*Apus apus*) was observed along the SE shoreline during the dusk survey indicating this species is likely to be nesting in buildings in the vicinity of Lough Funshinagh. Swift is of conservation concern however is not a wetland species.

3.5 Species Accounts (Waterbirds)

Large waterfowl & allies – swans, geese, ducks, cormorants, grebes and rails

Waterfowl, the Anatidae, comprising ducks, geese and swans, make up the largest family of swimming waterbirds. One swan, one goose and four duck species were recorded in this survey. The resident Mute Swan was recorded across Lough Funshinagh frequently as pairs or family groups of up 5 birds including cygnets. Mute Swan was recorded consistently across the survey, with a total of between 9 to 18 individuals recorded on any given month throughout the survey. The peak number of Mute Swan recorded during one survey was 7 individuals, this record was taken at one of the flooded areas at the SW end of Lough Funshinagh. Mute Swan was observed nesting in a number of locations around Lough Funshinagh and on Lough Cup.

Greylag geese were present on all visits, their total counts ranged from 16-22 individuals during the first four survey dates (04/04/24 – 16/05/24), while the total counts for the last two survey dates were 3 and 9, respectively. The geese were predominantly observed at the lake margins, along the shore while roosting, feeding in grasslands above the shore, and swimming on the lough. Consistent observations were recorded across the survey, a **peak of 18 greylag geese was recorded in May** which does not exceed the all-Ireland threshold[1] of 35 birds. However, since this survey did not take place during the migratory season (autumn-winter), coupled with no long history of greylags migrating to this region, this flock appears to have originated from the feral goose population and therefore not treated as a natural species for the purposes of scientific monitoring and conservation assessment (Lewis et al, 2019). During the additional Baseline Habitat Surveys of Lough Funshinagh Greylag geese was consistently detected along the southern section of Lough Funshinagh.

Mallard were the most abundant duck species recorded with a total of 107 individuals recorded across the survey period. These sightings were widely distributed across the lough, from its centre to its margins, including sheltered areas and cryptic locations such as along shore areas flanked by fringing wetland vegetation, alder and willow cover. Although Mallard were abundant overall, they were not recorded in large groups, the peak number recorded during a specific survey was 7 individuals. The total number of individuals recorded for Wigeon and Teal across the survey period

[1] Threshold set as 1% of the All-Ireland population, signifying a site of national importance for the species (see Lewis et al, 2019)

was 8 and 5, respectively. Tufted Duck was recorded in low numbers during four surveys (4 in April and 8 in May). Total count for Tufted Duck is 12. Mallard was the dominant duck species observed breeding at Lough Funshinagh over this survey by a considerable margin. Habitat surveys of the wetland sub-site in the SW corner of Lough Funshinagh noted the presence of Mallard in this area in June and July 2024 with a total of 12 recorded during one survey. Water levels of Lough Funshinagh had receded in July 2024 and this wetland sub-site was predominantly a muddy field with marginal rush habitat. 1 Shoveler was observed once during the BBS foraging in the flooded grassland fields to the SW of Lough Funshinagh. This species likes shallow eutrophic water and feeds on invertebrates such as molluscs and insect larvae (Wilson and Carmody, 2011). It mainly breeds in Ireland around the mid-Shannon basin (Birdwatch Ireland, 2024). Mallard feeds on a wide range of invertebrate and aquatic vegetation. Nests are usually in a hollow in the undergrowth near water. Tufted Duck is the most common diving duck in Ireland and is mainly carnivorous. It nests in thick long vegetation close to the water (Wilson and Carmody, 2009). Teal breeds on lakes and will move its breeding grounds in response to changes in weather conditions. Wigeon prefers coastal habitats but can be found inland on lakes (Wilson and Carmody, 2011).

Grebes are a separate family, similar to diving ducks, like mergansers, and to divers, they are proficient underwater hunters. Little grebes are widely dispersed on a variety of coastal and inland wetlands but are small and secretive, often hidden within wetland margins of reed swamp and thick aquatic vegetation, and hence overlooked during counts. The majority of these Little Grebe were recorded inhabiting the smaller wetland subsites at the SW and SE of the lake margins. Overall, a total of 10 Little Grebe were observed over the whole survey. Great-crested grebe was abundant through the survey season, tending to forage more in the deeper central parts of Lough Funshinagh, both in the north (Kildurney, Ballagh) and south (Inchiroe and Gortfree), were rafts of up to 25 birds were observed foraging together, but were otherwise widely dispersed on the lake in smaller groups. Later in the survey season Great-crested grebe were observed with chicks on the open water of Lough Funshinagh. Over the whole survey, **there was a total of 69 Great-crested Grebe recorded with a peak number of 25 observed in one grouping during May**. Little Grebe feeds on invertebrates and small fish. It breeds on inland lakes and rivers with a muddy bottom. Its nest is a floating platform of vegetation anchored to fallen branches. The Great Crested Grebe preys on fish and small amphibians. Its nest is made floating vegetation or concealed along the waterside (Wilson and Carmody, 2009).

Cormorant belongs to the family, Phalacrocoridae; small flocks were observed on Lough Funshinagh roosting in dead trees (inundated in the lough). The largest group (34) of Cormorant was observed during May, Cormorant was observed during all surveys with a peak number of 34. They were often observed perched on dead trees at favoured roost sites around the water inundated lough shore-zones, with highest frequency of observations being at the northeast end of Lough Funshinagh, while the peak recording was located on the west of the lough. Otherwise, cormorants were seen dispersed all around the open water of Lough Funshinagh when foraging. The **peak numbers of 30 cormorant was recorded during May**, this is below the all-Ireland 1% threshold of 110 birds. Cormorant feeds on fish, the nest is large and made of twigs, rushes and reeds. They roost in trees (Wilson and Carmody, 2011).

The Rails, Rallidae, include two species recorded in the survey, Moorhen and Coot. The majority of Moorhen were recorded at the smaller sub-sites surrounding the Lough Funshinagh, particularly at Lough Cup. Moorhen occurs widely in Ireland, but numbers are almost certainly underestimated in this type of baseline waterbird survey, owing to their preference for dense wetland vegetation cover, making accurate population estimation unattainable; thus, their breeding status in Ireland is unknown

(Lewis et al, 2019). Some Moorhen were detected by call. Consequently, Moorhen were not recorded in large groups with their **peak number recorded being of 4 individuals in May**.

Coot is a widespread species, favouring a range of wetlands from lakes, ponds, gravel pits, and canals to slow-moving rivers, open marshes and lagoons (Lewis et al, 2019). Similarly, Coot were predominantly recorded at the smaller sub-sites located around Lough Funshinagh with some observations at the northern margins of the Lough also being recorded, **a peak of 4 coot was recorded over four of the survey dates**. This open water species predominates in large, shallow, mesotrophic lakes with submerged vegetation, of the midlands and west. Largely herbivorous in its diet, the coot dives to the bottom, seizing plant material and returning to the surface to eat it. Coot was observed nest building at Lough Cup with chicks observed at this location in July 2024. Moorhen hunts for food on land and in the water with a broad diet. It nests at the waterside or on low branches. Coot also has a varied diet, but it nests either at the waterside or out in the open. Nests are made from dead plant material (Wilson and Carmody, 2011).

Waders including plovers, sandpipers and allies

Lapwing belong to the plover family or Charadriidae. During this survey they were not recorded in large numbers like the previous WBS survey at Lough Funshinagh, with **a total of 21 Lapwing recorded across the entire survey** and a **peak count of 14 recorded** at the wetland sub-site during April. Habitat surveys of this wetland sub-site noted the presence of Lapwing in this area in June and July 2024 with a total of 26 recorded during one survey. Water levels of Lough Funshinagh had receded in July 2024 and this wetland sub-site was predominantly a muddy field with marginal rush habitat.

A total of 22 Snipe were recorded over the entire survey period. Snipe were observed, or heard drumming, in wetland habitat or in agricultural land at the northern and southern lake margins. Snipe were typically observed in numbers no greater than two individuals, with the exception of a **peak count of 8 Snipe** which were observed foraging at the margins of a small wetland sub-site at the SW of Lough Funshinagh. Snipe are secretive and very widely dispersed in wetland habitats bordering lakes and rivers, as well as bogs and fens, where they probe the soft wet substrates for worms and invertebrate larvae. Wet rush grassland, marsh, fen and swamp margins are favoured inland habitats, but snipe do not form flocks like other waders, though small concentrations are frequent in optimal habitats. Flood zones associated with turloughs, and lowland rivers, provide suitable habitat for snipe, especially in the midlands and west. Many of the observations made for Snipe at the NW end of the lough were based solely on auditory cues, which were determined by distinguishing the distinct drumming sound Snipe species produce when performing mating dives and territorial displays (Lemnell, 1978). Additional habitat surveys of this wetland sub-site in the SW corner of Lough Funshinagh noted the presence of Snipe in this area in June and July 2024 with a total of 10 recorded during one survey. Water levels of Lough Funshinagh had receded in July 2024 and this wetland sub-site was predominantly a muddy field with marginal rush habitat. Snipe feeds on insects and larvae in the soft ground. It breeds in wet grasslands in a shallow hallow lined with grass. Lapwing feed on invertebrates around muddy wetlands (Wilson and Carmody, 2009, 2011).

Whimbrel were recorded on one survey date only (01/05/24), in two groups of 40 and 20 at approximately the same location, distributed centrally in a dense flock at the northern end of Lough Funshinagh. These groups flew in from the west and began foraging on agricultural land proximal to the lough waterfront.

Herons and other species

Little Egret and Grey Heron belong to the Ardeidae (Herons) family. Little Egret is a new resident species in the UK and Ireland where the population has grown rapidly and expanded across Ireland from the south-east to northwest and is now widely distributed, predominantly around coastal sites, though its inland distribution is increasing also (Lewis et al, 2019). These species were typically observed singularly, either foraging/roosting at the margins of Lough Funshinagh, or in flight crossing the lough. Single birds were observed at the outer wetland areas. **A total of 28 little egret was recorded** over the entire survey period, and no greater than 4 individuals were recorded for any observation. Additional habitat surveys of the wetland sub-site in the NW corner of Lough Funshinagh noted the presence of Little Egret in this area in June and July 2024 with a total of 35 recorded during one survey. Water levels of Lough Funshinagh had receded in July 2024 and this wetland sub-site was predominantly a muddy field with marginal rush habitat.

Grey heron were typically observed flying and foraging singularly, with exception of some small groups numbering three or less, and the **peak count of 9 Grey heron observed** at the SW waterfront of Lough Funshinagh during April. A total of 40 Heron was observed across the entire survey period, some of which flew in from the surrounding environment to utilize the lough habitat. Grey heron feeds on fish, frogs, insects and small mammals. It nests in colonies in tall trees (Wilson and Carmody, 2011).

Gulls

Black-headed gull is the most abundant and widespread gull species in Ireland, overwintering and breeding at both coastal and inland sites, comprising both resident and migrant populations (Lewis et al, 2019). As such they were the most abundant species recorded, **a total of 222 Black-Headed Gull were recorded**. As with most gulls, it's a very mobile species, opportunistic in its approach to foraging, based on foraging habitat availability, which includes agricultural lands. For this reason, numbers at any given time or site can be sporadic. Black-headed gulls were observed to be prevalent though widely dispersed at Lough Funshinagh, recorded foraging on the wing all around the shore-zone through the survey season; typically, from 10 to 30 birds in most of the 1km squares. **The peak number of 61 black-headed gulls was recorded in May**. This is below the nominal threshold of 1000 birds used to differentiate sites of significance at national level (Lewis et al, 2019). Black-headed gulls mainly breed on marshes, brackish lagoons and islands (Wilson and Carmody, 2011).

Lesser black-backed gull was observed in low numbers overall during the BBS however on one survey in May a total of 16 were observed. Lesser black-backed gull were generally observed in pairs foraging along the shoreline of Lough Funshinagh. This species is generally a summer visitor to Ireland from February to September with an increasing number now over wintering. The breed at coastal areas and inland on islands on lakes (Cabot, 2021).

3.6 Species Account: Common Swift (*Apus apus*)

Swift were observed at the SE corner of Lough Funshinagh during the breeding bird dusk survey on the 22nd of May 2024, likely nesting in an old stone building in the area. The Swift is a summer migrant in Ireland which winters in tropical Africa feeds exclusively on small invertebrate species (e.g. flies, spiders). It commonly breeds in small recesses in buildings, less frequently utilising holes in trees or caves in uplands or coastal areas as breeding grounds (Birdwatch Ireland, 2024), the environment surrounding Lough Funshinagh has an abundance of such habitat. Birds of Conservation Concern in Ireland (BOCCI) 2020-2026 has the swift placed on the national 'red-list'. The International Union for Conservation of Nature (IUCN) has classed the swift as a species of 'least concern' in a more

international context. Trend data obtained from the Countryside Bird Survey (CBS) of Ireland has shown a significant decrease in population for the swift, with a population decrease of 58% over between the years 1972-2016 (44-year trend) and a decrease of 38% recorded between the years 2006-2016 (10-year trend) (Lewis et al., 2019). These declines may be in part due to the global trend in declining invertebrate populations (Didham et al., 2020), however, the loss of available nest sites, particularly cavities in old buildings which have undergone renovation or demolition, may also be contributing to the downward trend in Swift populations observed. As with many other far-ranging bird species, Swift have a high fidelity for previously used nest sites, which means they are slow to colonise new ones when existing sites are destroyed. In recent years, the population has been slowly recovering, this may be in part due to an increase popularity in the erection of nest boxes for the Swift. The closest 1km^2 grid squares to Lough Funshinagh (M9040 & M9060) covered in the CBS survey were analysed, no observations of swift have been previously recorded during the CBS in these areas.

Non target species observed throughout the BBS are shown in **Table 3.2** below. Two species are red listed (Swift and Meadow Pipet) these species were recorded in low numbers and not during each survey.

Table 3. 1 Breeding Bird Survey (BBS) – Species, total counts and peak total number recorded in the survey area.

BTO Sp. Code	Bird Species	Bird Species	Conservation Status: BOCCI4 red-data list; A1=Annex 1	Survey period - Total Counts						Peak total No. recorded
	Common Name	Scientific Name		Apr-04	Apr-18	May-01	May-16	May-22	Jun-12	
BH	Black-headed Gull	*Larus ridibundus*	Amber	23	58	61	58	7	15	**61**
CO	Coot	*Fulica atra*	Amber	0	4	6	10	5	5	**10**
CA	Cormorant	*Phalacrocorax carbo*	Amber	7	12	34	19	2	7	**34**
ET	Little Egret	*Egretta garzetta*	Green	7	4	1	10	6	0	**10**
GG	Great-crested Grebe	*Podiceps cristatus*	Amber	10	12	2	6	25	14	**25**
H.	Grey Heron	*Ardea cinerea*	Green	7	15	6	2	3	7	**15**
GJ	Greylag Goose	*Anser anser*	Amber	19	18	16	22	3	9	**22**
L.	Lapwing	*Vanellus vanellus*	Red	0	14	6	1	0	0	**14**
LB	Lesser Black-backed Gull	*Larus fuscus*	Amber	3	0	2	16	4	0	**16**
LG	Little Grebe	*Tachybaptus ruficollis*	Green	1	0	0	8	1	0	**8**
MA	Mallard	*Anas platyrhynchos*	Amber	11	27	14	19	9	27	**27**
MH	Moorhen	*Gallinula chloropus*	Green	1	2	2	10	0	3	**10**
MS	Mute Swan	*Cygnus olor*	Amber	18	13	15	14	9	13	**18**
SN	Snipe	*Gallinago gallinago*	Red	5	4	12	0	0	1	**12**
SV	Shoveler	Anas clypeata	Red	0	1	0	0	0	0	**1**
T.	Teal	*Anas crecca*	Amber	0	2	0	0	0	3	**3**
TU	Tufted Duck	*Aythya fuligula*	Amber	3	1	6	2	0	0	**6**
WM	Whimbrel	*Numenius phaeopu*	Green	0	0	60	0	0	0	**60**
WN	Wigeon	*Anas penelope*	Amber	3	4	0	1	0	0	**4**

Table 3. 2 Breeding Bird Survey (BBS) – Non target species recorded throughout the survey area.

BTO Sp. Code	Bird Species	Bird Species	Conservation Status: BOCCI4 red-data list; A1=Annex 1	Survey period – Present /Absent Red List Species with No. observed					
	Common Name	Scientific Name		Apr-04	Apr-18	May-01	May-16	May-22	Jun-12
B.	Blackbird	*Turdus merula*	Green	✓	✓	✓	✓	✓	✓
BT	Blue Tit	*Parus caeruleus*	Green	✓	✓	✓	✓	✓	✓
BZ	Buzzard	*Buteo buteo*	Green	✓	-	✓	-	-	✓
CH	Chaffinch	*Fringilla coelebs*	Green	✓	✓	✓	✓	✓	✓
D.	Dunnock	*Prunella modularis*	Green	✓	✓	✓	✓	-	✓
GC	Goldcrest	*Regulus regulus*	Green	-	-	-	✓	-	-
GO	Goldfinch	*Carduelis carduelis*	Green	✓	✓	✓	✓	✓	✓
GT	Great Tit	*Parus major*	Green	✓	✓	✓	✓	✓	✓
GR	Greenfinch	*Carduelis chloris*	Amber	✓	-	-	-	-	-
HM	House Martin	*Delichon urbicum*	Amber	-	-	-	✓	✓	✓
HS	House Sparrow	*Passer domesticus*	Amber	-	✓	✓	✓	✓	-
JD	Jackdaw	*Corvus monedula*	Green	✓	✓	✓	✓	✓	✓
LT	Long-tailed Tit	*Aegithalus caudatus*	Green	✓	✓	-	✓	-	✓
MG	Magpie	*Pica pica*	Green	✓	✓	✓	✓	✓	✓
MP	Meadow Pipit	*Anthus pratensis*	Red	-	1	-	2	-	-
PH	Pheasant	*Phasianus colchicus*	Green	✓	✓	✓	✓	-	✓
PW	Pied Wagtail	*Motacilla alba*	Green	✓	✓	✓	✓	✓	✓
RA	Raven	*Corvus cora*	Green	-	✓	-	✓	-	✓
RB	Reed Bunting	*Emberiza schoeniclus*	Green	✓	✓	✓	✓	-	✓

R.	Robin	*Erithacus rubecula*	Green	✓	✓	✓	✓	✓	✓
RO	Rook	*Corvus frugilegus*	Green	✓	✓	✓	✓	✓	✓
ST	Song Thrush	*Turdus philomelos*	Green	-	✓	✓	✓	-	✓
SG	Starling	*Sturnus vulagaris*	Amber	✓	✓	✓	✓	✓	✓
SL	Swallow	*Hirundo rustica*	Amber	-	-	-	✓	✓	✓
SI	Swift	*Apus apus*	Red	-	-	-	-	2	-
WW	Willow Warbler	*Phylloscopus trochilus*	Green	-	✓	✓	✓	-	-
WP	Woodpigeon	*Columba palumbus*	Green	✓	✓	✓	✓	✓	✓
WR	Wren	*Troglodytes troglodytes*	Green	✓	✓	✓	✓	✓	✓

3.7 Bird Habitats

Habitats of importance to wetland and waterbirds within the survey area may be broken down by their key features and value for use by the range of bird species recorded. Note that habitat types have been surveyed, mapped and described in a separate study in support of the Lough Funshinagh Baseline Surveys. Alpa-numeric habitat type codes follow the categories described by Fossitt (2000) in *A Guide to Habitats in Ireland*. For the purpose in hand, habitat features used by wetland and waterbirds were evaluated,

a) for nesting value;

b) for feeding and refuge value,

c) for roost site value,

d) for connectivity value.

Habitats present within the study area include Turloughs (FL6), Marsh (GM1), Drainage ditches (FW4), Wet grassland (GS4), Improved agricultural grassland (GA1), Dry calcareous and neutral grassland (GS1), Hedgerows (WL1), Treelines (WL2), (Mixed) broadleaved woodland (WD1) and Conifer plantation (WD4). A more detailed description of these habitats and additional habitats found at Lough Funshinagh will be detailed in Habitat Survey carried out as part of the Ecological Baseline Survey of Lough Funshinagh.

The open water within Lough Funshinagh provided significant feeding value for species like cormorant, mute swan, black-headed gull and the grebe species recorded. This open water also provides connectivity for all bird species, allowing them to move freely and mostly undisturbed throughout the Lough Funshinagh habitats. The shoreline of Lough Funshinagh was above normal levels and therefore all marginal and riparian vegetation was submerged. Any reeds were sparsely spaced and would not offer sufficient cover for breeding birds. The constant changes in water levels especially around the islands had scrub, hawthorn and willow submerged with evidence of plant saturation and stress due to the prolonged submergence under water. Shoreline vegetation was therefore not typical of a wetland or lake but of submerged terrestrial habitat with non-aquatic flora such as trees, scrub and grasslands.

(Mixed) broadleaved woodland (WD1), Conifer plantation (WD4) and Treeline (WL2) habitats all provide suitable habitat for bird species which have a preference for nesting in trees and above-ground. Grasslands (GS1) (GS4) and Marsh (GM1) provide suitable nesting habitat for ground-nesting bird species.

As the water level reduced slightly throughout the survey season, some islands reappeared slightly above the water level. The islands within Lough Funshinagh are important to some bird species which were recorded during the breeding bird surveys as this habitat provided nesting and roosting habitat for species such as mute swan. Other birds, mainly mallard, teal and wigeon were noted foraging within proximity to these islands and along the shoreline. The impact on rising water levels was evident on species such as coot and mute swan with nests abandoned and rebuilt at higher locations in the surrounding flooded fields.

The vegetated fringes and emergent vegetation between the lough and the surrounding grasslands and wooded areas were important for a variety of bird species recorded during the breeding bird surveys such as the species listed in **Table 3.2**. Habitats included within these areas include GS4, GA1, GM1, WS1, WL1 and WL2. Lapwing preferred areas near the muddy wetland area in the SW corner of Lough Funshinagh, where they could forage mostly undisturbed. However, mink, fox and badger

were both observed and captured on Trial Camera, given the higher concentration of waterfowl due to the receding water levels and the exposed muddy field in summer. Mink was actively hunting and breeding in this area.

Shoveler was likely migrating and stopped to forage at the flooded fields in the SW area of Lough Funshinagh given the absence of this species throughout the rest of the BBS. The flooded grassland fields likely increased the nutrient enrichment of the water at Lough Funshinagh.

Teal and wigeon used the vegetated fringes and adjoining grasslands for feeding, refuge and roosting also. Other birds like moorhen, coot and little grebe preferred the more sheltered with more emergent vegetation habitats, thus were found frequently at sub-sites surrounding Lough Funshinagh such as Lough Cup and the flooded areas. Little egret and grey heron were observed flying along the muddy shoreline and in the flooded/submerged grassland fields. Dead tree species within Lough Funshinagh were utilised by cormorants throughout the survey season as easily accessible perches and roost sites.

4 EVALUATION OF SURVEY RESULTS

The survey area is of Lough Funshinagh, a medium-large lake, Lough Cup, a small lake and some outlying wetlands and flooded grassland within c.2km. All large waterbodies in this area are classified as Turloughs however Lough Funshinagh water level did not drop significantly during the BBS. Lough Cup water levels dropped slightly during the BBS with aquatic and marginal vegetation cover showing signs of regrowth towards the end of the season.

The site forms one part of a network of lakes, including turloughs, as well as rivers with seasonal flood plains across the west midlands, encompassing Lough Ree, Lough Croan, the rivers Shannon and Suck, and numerous small lakes and sites hosting large numbers of mobile waterbirds which make up the population birds which occupy this lough regularly. This evaluation is made at site level but is likely to be integral to the wider wetland and waterbird habitat network.

Long term monitoring of breeding bird populations, with some species having a wide biogeographical range, shows how numbers fluctuate between years, sometimes relating to significant changes in environmental conditions. Changes have been identified in waterbird distributions at large geographical scales in response to short and long-term changes in weather conditions (Lewis et al, 2019). Research findings illustrate the different reactions of waterbird species to changes in weather and climate, with individual ecology and habitat requirements being important factors. Monitoring by I-WeBS and other internationally coordinated monitoring schemes provides a robust basis for interpretation of waterbird populations and long-term trends. This baseline breeding bird survey is providing accurate data for one breeding season only. The changes in water levels and lack of typical marginal habitat would have an impact on breeding populations of waterfowl at Lough Funshinagh. The lack of vegetation cover and fluctuations in water levels would likely increase predation of breeding birds or delay/impede successful breeding of some species.

4.1 Waterbird Abundance in the Breeding Bird Survey (BBS)

The breeding waterbird assemblage at Lough Funshinagh is composed of both resident and migrant birds, which may involve the same species. However, the waterbird assemblage during the breeding season in Ireland consists primarily of resident species, since migrant waterbird species which utilise

freshwater ecosystems for breeding typically over-winter in Ireland when conditions become colder at higher latitudes. Once the over-wintering season is over, a certain percentage of these over-wintering bird populations do not return to their breeding grounds at higher latitudes, as such they become resident breeding populations in habitats where they were previously transient, the rates of which are dependent on factors such as climate and habitat quality (Meller et al., 2016). The bird species which migrate to Ireland in summer are typically hedgerow species which do not require freshwater ecosystems for breeding. The hedgerow species observed during this BBS are typical species found in woodlands and grasslands of Ireland.

Abundance levels for each of the 19 waterbird species recorded at Lough Funshinagh, Lough Cup and surrounding wetlands over the 2024 Spring and Summer seasons are expressed as season total peak numbers (**Table 3. 1**) for all key waterbird species (**Table 4. 1**).

Whilst not to diminish the importance of the site for all waterbird species recorded in the survey, it is evident that a number of **key species** (**Table 4. 1**) may be highlighted in this report in respect of their significant occurrence at this site and in view of their ecological conservation importance. The following factors regarding species at the Lough Funshinagh and Lough Cup survey site were considered important:

- Abundance reaching numbers of national importance; i.e., exceeding the all-Ireland 1% threshold[2];
- Forming a significant proportion of the flyway population of a migratory species;
- Red data listing in BOCCI4;
- Annex I of the EU Birds Directive.

[2] A site qualifies as being nationally important if it regularly supports more than 1% of a national population of a species. If a site regularly holds 1% of the national population of an Annex I species, then it is deemed internationally important.

Table 4. 1 Key species recorded at Lough Funshinagh BBS site

Bird Species	Significant abundance in BBS	Conservation status (Red-Data, Annex 1)	Qualifying Interest in nearby SPAs
Black-headed Gull	Yes	Amber	No
Cormorant	No	Amber	No
Grey Heron	No	Green	No
Lapwing	**No**	**Red**	**Yes**
Mute Swan	No	Amber	No
Great-crested Grebe	Yes	Amber	No
Mallard	**No**	**Amber**	**Yes**
Teal	**No**	**Amber**	**Yes**
Little Egret	**No**	**Green Annex I**	**Yes**
Little Grebe	**No**	**Green**	**Yes**
Wigeon	**No**	**Amber**	**Yes**
Moorhen	No	Green	No
Coot	**No**	**Amber**	**Yes**
Greylag Goose	No	Amber	No
Snipe	No	Red	No
Whimbrel	No	Green	No
Tufted Duck	**No**	**Amber**	**Yes**
Lesser Black-backed Gull	No	Amber	No
Shoveler	**No**	**Red**	**Yes**

Table 4. 1 highlights a list (bold/shaded) of species which are Qualifying interests in SPA's surrounding the Lough Funshinagh BBS site. No species were identified in this breeding bird survey which occurred in numbers that were significant relative to national bird population trends.

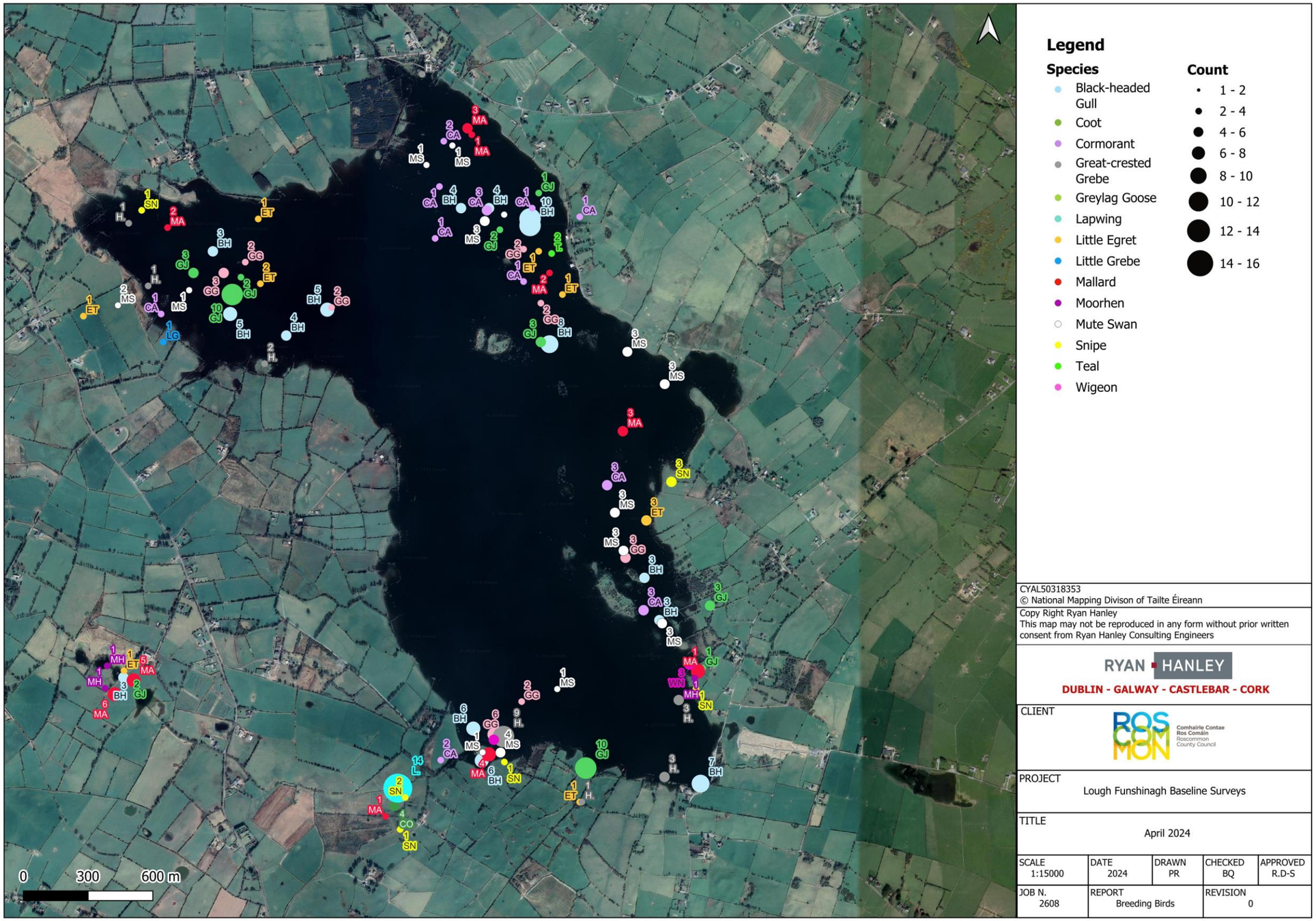

Figure 4. 1 Main Breeding Bird Survey results for April 2024 – total counts of all waterbird species (chart) and distribution of key species on the map

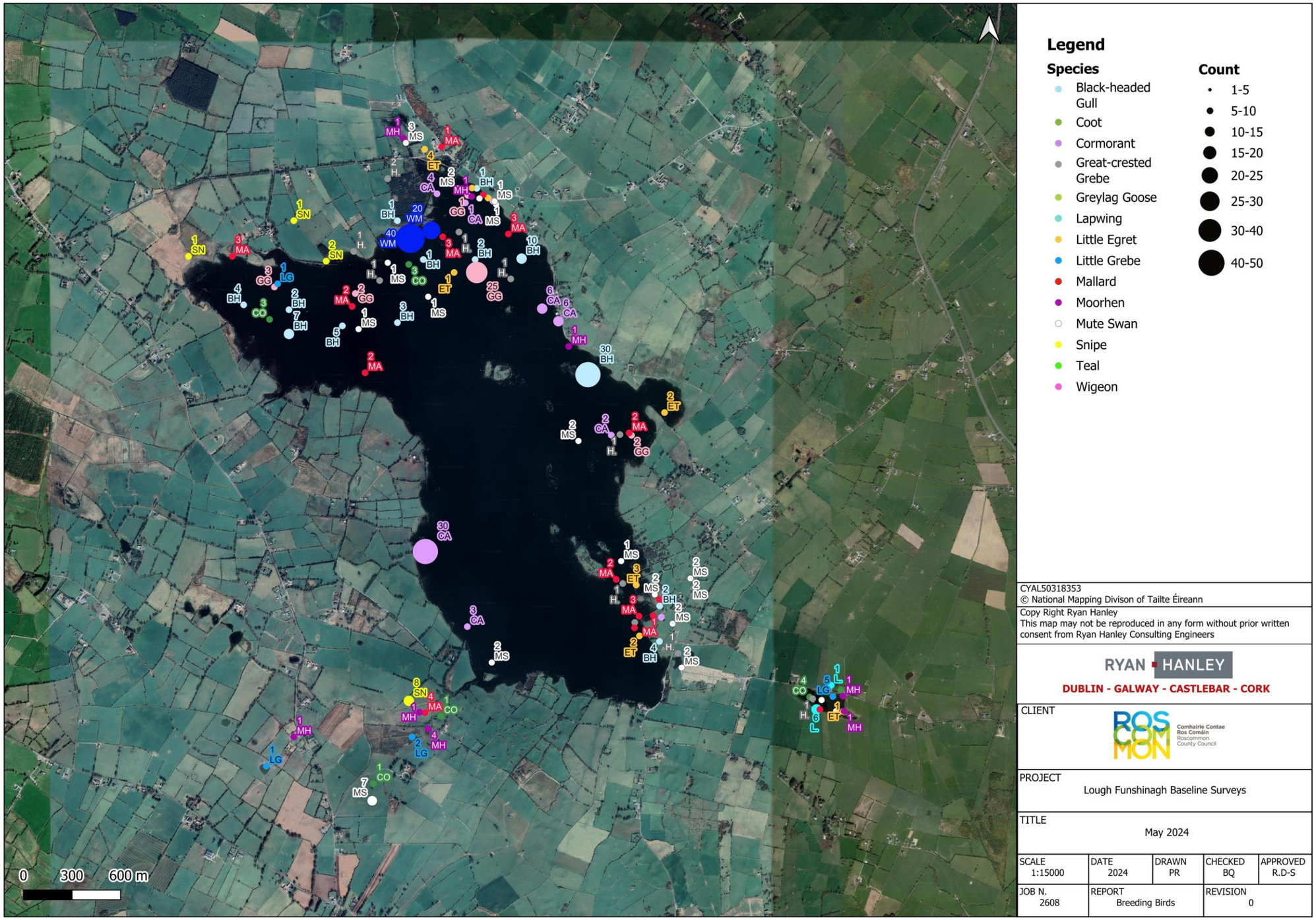

Figure 4. 2 Main Breeding Bird Survey results for May 2024 – total counts of all waterbird species (chart) and distribution of key species on the map

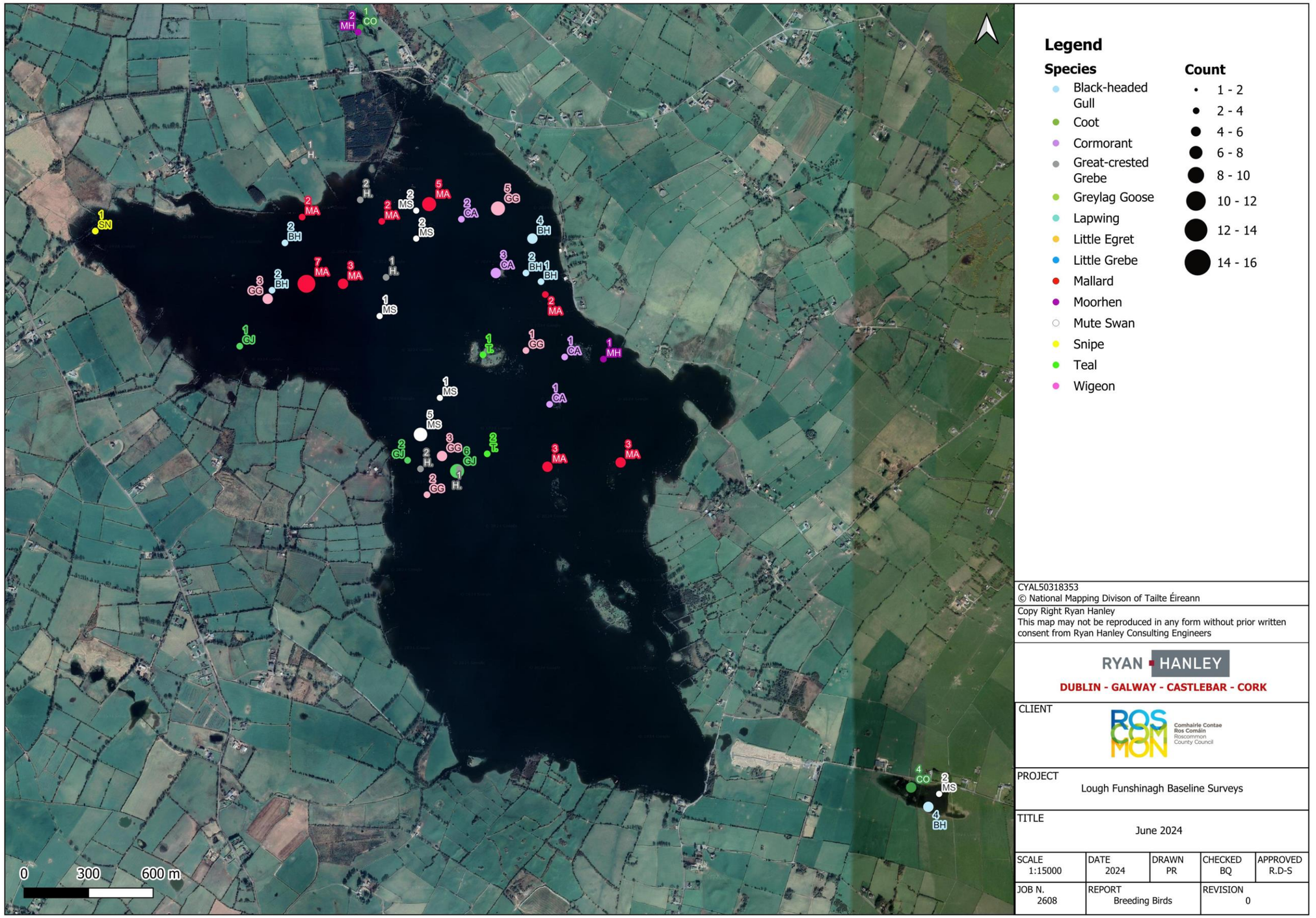

Figure 4. 3 Main Breeding Bird Survey results for June 2024 – total counts of all waterbird species (chart) and distribution of key species on the map

4.2 Spatial distribution of waterbird species at the BBS site

The spatial distribution patterns for each species, which were recorded as ITM coordinates and processed in GIS, demonstrate the relationship with habitat features at site level. Mapping the data, as in **Figure 4. 1**, Figure 4. 2 and Figure 4. 3, shows the importance of shallow inshore areas for a suite of species, ducks, swans, herons and geese associated with secluded bays and recesses, shoreline wetlands including wet grassland (GS4) and marsh (GM1). Areas of reeds were significantly submerged by the high-water levels and therefore not classified as reeds and tall sedge swamp (FS1) habitat. The lack of FS1 or other marginal aquatic vegetation had an impact on breeding birds given the lack of cover from predation and high disturbance. The islets and isolated lake shores at Inchiroe and Gortfree were submerged for most of the BBS. The distribution mapping shows that most parts of the inshore and shoreline habitats all around Lough Funshinagh support a range of species for roosting, foraging and breeding. Deeper open water in the central zone of Lough Funshinagh was occupied by fish feeding species such as great-crested grebe and cormorant. High water levels resulted in island and shoreline habitats being significantly submerged at commencement of this survey, progressively these water levels began to reduce until some island habitats became exposed again towards the end of the survey in June however given the late lowering of water levels the majority of nesting sites were along higher areas along the shoreline of Lough Funshinagh. This may somewhat explain the central spatial distribution of bird species during the June survey, which were more widely dispersed across Lough Funshinagh than that observed for previous survey dates. The change in conditions may affect the balance in habitats available to waterbirds with differing requirements, becoming more for those preferring shallow water and littoral shore areas for both feeding and roosting, and less favourable for deep water species. It appeared that islets and peninsular features, used as secure roost sites by mallard, teal, mute swan, cormorant, waders and others, began returning as a resource for these species' assemblages at the end of the season. Black headed gulls were noted as roosting along the exposed muddy shoreline of Lough Funshinagh however as some islands reappeared these gulls were also observed roosting along the muddy shoreline of the islands.

Within this survey, a strong diversity and abundance of species was observed at the smaller flooded sub-sites surrounding Lough Funshinagh. Overall, there was a considerable presence of Moorhen, Coot, Mute Swan, Mallard, Snipe and Little Grebe found at these sub-sites, which were predominantly located at the southern end of the lake and at Lough Cup. Lapwing, Black-headed Gull, Greylag Goose and Heron were also observed at these sites. There was a notable large presence of flies at the flooded muddy areas. The water here is likely high in nutrients and low in oxygen (this was evident by water colour and by large numbers of juvenile fish at the surface of the water that did not swim away from disturbance). Vegetation cover was sparse in this area with rushes and dock the main flora recovering from prolonged submergence. This combination of factors is likely for the increased presence of birds such as Little egret in this area in the summer months. However, this wetland habitat is transient and mainly suited to foraging given the lack of cover from predation.

Most of the waterbirds preferred roosting and foraging along the outer fringes of the lough and the remaining island edges. The NE and SE of Lough Funshinagh displayed the highest density for overall waterbird abundance in this survey. However, Mute Swan, Cormorant, Mallard, Grebes and gull species were all found making use of the entire site. Snipe were typically observed and/or heard drumming on either the northern or southern ends of Lough Funshinagh. Snipe were typically observed in Marsh (GM1), wet grassland (GS4) habitat, or dry calcareous and neutral grassland (GS1).

4.3 NBDC records of protected bird species in environment surrounding the survey area

Table 4. 2 NBDC records of protected species within polygon* which traverses the following 10km² grid squares: M95, M94, M85 & M84

Common Name	Scientific Name	Conservation Status
Barn Swallow	*Hirundo rustica*	Protected Species: Wildlife Acts || Threatened Species: Amber List
Black-headed Gull	*Larus ridibundus*	Protected Species: Wildlife Acts || Threatened Species: Red List
Black-tailed Godwit	*Limosa limosa*	Protected Species: Wildlife Acts || Threatened Species: Amber List
Common Coot	*Fulica atra*	Protected Species: Wildlife Acts || EU Birds Directive: Annex II, Section I Bird Species; Annex III, Section II Bird Species || Threatened Species: Amber List
Common Kestrel	*Falco tinnunculus*	Protected Species: Wildlife Acts || Threatened Species: Amber List
Common Linnet	*Carduelis cannabina*	Protected Species: Wildlife Acts || Threatened Species: Amber List
Common Pheasant	*Phasianus colchicus*	Protected Species: Wildlife Acts || EU Birds Directive: Annex II, Section I Bird Species; Annex III, Section I Bird Species
Common Pochard	*Aythya ferina*	Protected Species: Wildlife Acts || EU Birds Directive: Annex II, Section I Bird Species; Annex III, Section II Bird Species || Threatened Species: Amber List
Common Redshank	*Tringa totanus*	Protected Species: Wildlife Acts || Threatened Species: Red List
Common Snipe	*Gallinago gallinago*	Protected Species: Wildlife Acts || EU Birds Directive: Annex II, Section I Bird Species; Annex III, Section III Bird Species || Threatened Species: Amber List
Common Starling	*Sturnus vulgaris*	Protected Species: Wildlife Acts || Threatened Species: Amber List
Common Tern	*Sterna hirundo*	Protected Species: Wildlife Acts || EU Birds Directive: Annex I Bird Species || Threatened Species: Amber List
Eurasian Curlew	*Numenius arquata*	Protected Species: Wildlife Acts || EU Birds Directive: Annex II, Section II Bird Species || Threatened Species: Red List
Eurasian Teal	*Anas crecca*	Protected Species: Wildlife Acts || EU Birds Directive: Annex II, Section I Bird Species; Annex III, Section II Bird Species || Threatened Species: Amber List
Eurasian Wigeon	*Anas penelope*	Protected Species: Wildlife Acts || EU Birds Directive: Annex II, Section I Bird Species; Annex III, Section II Bird Species || Threatened Species: Amber List
European Golden Plover	*Pluvialis apricaria*	Protected Species: Wildlife Acts || EU Birds Directive: Annex I Bird Species || Protected Species: EU Birds Directive >> Annex II, Section II Bird Species; Annex III, Section III Bird Species || Threatened Species: Red List
Great Cormorant	*Phalacrocorax carbo*	Protected Species: Wildlife Acts || Threatened Species:

Common Name	Scientific Name	Conservation Status
		Amber List
Great Crested Grebe	*Podiceps cristatus*	Protected Species: Wildlife Acts || Threatened Species: Amber List
House Martin	*Delichon urbicum*	Protected Species: Wildlife Acts || Threatened Species: Amber List
House Sparrow	*Passer domesticus*	Protected Species: Wildlife Acts || Threatened Species: Amber List
Lesser Black-backed Gull	*Larus fuscus*	Protected Species: Wildlife Acts || Threatened Species: Amber List
Little Egret	*Egretta garzetta*	Protected Species: Wildlife Acts || EU Birds Directive: Annex I Bird Species
Little Grebe	*Tachybaptus ruficollis*	Protected Species: Wildlife Acts || Threatened Species: Amber List
Mallard	*Anas platyrhynchos*	Protected Species: Wildlife Acts || EU Birds Directive: Annex II, Section I Bird Species; Annex III, Section I Bird Species
Mute Swan	*Cygnus olor*	Protected Species: Wildlife Acts || Threatened Species: Amber List
Northern Lapwing	*Vanellus vanellus*	Protected Species: Wildlife Acts || EU Birds Directive: Annex II, Section II Bird Species || Threatened Species: Red List
Northern Shoveler	*Anas clypeata*	Protected Species: Wildlife Acts || EU Birds Directive: Annex II, Section I Bird Species; Annex III, Section III Bird Species || Threatened Species: Red List
Red-breasted Merganser	*Mergus serrator*	Protected Species: Wildlife Acts || EU Birds Directive: Annex II, Section II Bird Species
Sand Martin	*Riparia riparia*	Protected Species: Wildlife Acts || Threatened Species: Amber List
Sky Lark	*Alauda arvensis*	Protected Species: Wildlife Acts || Threatened Species: Amber List
Tufted Duck	*Aythya fuligula*	Protected Species: Wildlife Acts || EU Birds Directive: Annex II, Section I Bird Species; Annex III, Section II Bird Species || Threatened Species: Amber List
Water Rail	*Rallus aquaticus*	Protected Species: Wildlife Acts || Threatened Species: Amber List
Whooper Swan	*Cygnus cygnus*	Protected Species: Wildlife Acts || EU Birds Directive: Annex I Bird Species || Threatened Species: Amber List

*Digitally drawn utilising NBDC's 'report by polygon' tool with a buffer not exceeding approximately 5km of Lough Funshinagh.

4.4 Conservation Status (BoCCI4 and Annex 1)

Table 3. 1 shows the conservation status of all key species recorded in the survey, as determined by the fourth assessment of Birds of Conservation Concern in Ireland (BoCCI4) (Gilbert et al. 2021), which updated and replaced existing Red-listing methods (Batten et al. 1990, Whilde 1993). BoCCI has been reviewed approximately every seven years.

BoCCI includes three classifications: Red, Amber and Green conservation concern. The criteria mainly follow previous assessments of conservation status at global and European levels; and within Ireland, include historical decline, trends in population and range, rarity, localised distribution and international importance (Gilbert et al. 2021).

The 19 bird species recorded during this survey consist of: Black-headed Gull, Coot, Cormorant, Great-crested Grebe, Grey Heron, Greylag Goose, Lapwing, Lesser Black-backed Gull, Tufted Duck, Little Egret, Little Grebe, Mallard, Moorhen, Mute Swan, Shoveler, Snipe, Teal, Whimbrel and Wigeon. Lapwing, Shoveler and Snipe (11%) are listed as 'red' on the IUCN BOCCI species list of conservation concern, another eleven of these species (61%) are listed as 'amber', and the remaining five species (28%) are listed as 'green'.

There were six species listed in Annex I of the EU Birds Directive within the surrounding SPA's, of which Lapwing and Shoveler are red listed. This high proportion of 69% red and amber listed species underlines the importance of the site for bird conservation and biodiversity.

4.5 Nature Conservation Sites

Lough Funshinagh is itself designated as an EU site, namely, Lough Funshinagh SAC (000611), for the priority habitat, Turloughs*[3][3180]. There are a number of wetland sites in the locality which are of international importance for breeding and wintering waterbirds and form part of the SPA Natura 2000 network in Co. Roscommon. The following SPAs are relevant in terms of location, distance relative to L. Funshinagh and are designated for many of the same species in common:

- Lough Croan Turlough SPA (004139), 4km to the southwest;
- Four Roads Turlough SPA (004140) 7km to the west;
- River Suck Callows SPA (004097) 10km to the west;
- Lough Ree SPA (004064) 5km to the east.

It is likely that there is movement and interchange of waterbird species between Lough Funshinagh and the above-mentioned sites, especially migratory species which are mobile and gather in large flocks, including species of conservation interest (SCI) which are among the qualifying interests of these sites. In this regard, Lough Funshinagh may be regarded as integral to the network of connected and proximate sites, including the SPAs named above.

[3] * denotes and EU Priority, as defined in the Directive EEC/43/1993

4.6 Summary of the results and outcomes of the Breeding Birds Survey (BBS)

Monthly spatial data of breeding bird species was collected during the Breeding Bird Survey of Lough Funshinagh, Lough Cup and outlying wetland areas from April 2024 to June 2024.

The abundance and distribution of 19 waterbird species was recorded to specific locations, displayed in maps, tables and charts of the survey site, highlighting the peak numbers for each species during the survey (**Table 3. 1**). Nine species were recorded as Qualifying Interests occurring in SPA's surrounding the study site: wigeon, teal, shoveler, little egret, little grebe, mallard, coot, tufted duck and lapwing. The site did not host numbers of breeding bird species which would be considered of national importance when compared to the national threshold or the I-WeBS data collected for Lough Funshinagh.

There were multiple habitat types noted as foraging and roosting areas on Lough Funshinagh, with a disproportionate abundance of most species utilizing inshore and wetland habitats along the shore margins. High water levels submerged a proportion of these areas, and island habitats making them unavailable to species such as plovers and dabbling duck over the course of the season, thereby making conditions less favourable to some species. By contrast diving species including cormorant and great-crested grebe, which forage in open deeper water, were recorded in relatively high numbers. As the breeding bird season progressed, the water levels decreased, thus increasing the exposure of these island habitats.

Lough Funshinagh is part of a network of lake and wetland sites in the surrounding locality and is probably integral to nearby SPAs in terms of supporting the breeding waterbirds which are mobile and dynamic in their use of sites over the season. The high-water levels observed during this breeding bird season were observed as directly impacting on breeding birds. Nesting mute swans and coots were observed rebuilding nests or nesting high above the shoreline as water receded. There was a high presence of Mink in the muddy flooded fields in the SW corner of Lough Funshinagh. There was a significant concentration of waterfowl at this location and were likely predated on by mink given the fluctuating water-levels. The lack of marginal aquatic vegetation and the submergence of reeds would also have limited the breeding habitats for waterfowl. Disturbance and lack of cover for breeding species would limit the successful breeding season of some waterfowl.

Hedgerow and woodland species would be displaced by the gradual decline in nesting habitats and death of trees and scrub along the shoreline. Species such as Cormorant were seen roosting on dead trees along the shoreline, but these trees would have limited nesting value to the majority of birds in Table 3.2 given the high exposure to predation. Given the water level fluctuations observed at Lough Funshinagh there will be a need for the vegetation to reestablish along the marginal zone/shoreline that is suited to the depth and/or tolerance for submergence to enable breeding birds to nest and/or forage in preferred habitats.

5 REFERENCES

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Appendix F – Lough Funshinagh to Cross River Baseline Survey

2024

Lough Funshinagh to Cross River Baseline Survey

Baseline Survey of Lough Funshinagh to Cross River

2024

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Client	Roscommon County Council
Project No.	2608
Project Title	Lough Funshinagh Baseline Surveys
Report Title	Lough Funshinagh to Cross River Baseline Survey Report 2024

Rev.	Status	Authors	Reviewed By	Approved By	Issue Date
1.0	Issue	Breda Quinn/Rémi O'Connell/Ruairi Guthrie	Paola Radolfi	Dr Ross Donnelly-Swift	21/08/2024

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1. INTRODUCTION AND BACKGROUND

Lough Funshinagh is located approximately 12km north-west of Athlone, in Co. Roscommon. Lough Funshinagh is an intermittent turlough which, prior to 2016, would become nearly dry every three or four years and was known as Irelands "disappearing lake" (Parkes, et.al., 2012). It was filled by two small streams entering from the north-west and was drained by a swallow hole in the southeastern corner. Following extreme flooding in 2016, Lough Funshinagh has stopped draining and the surface area has increased significantly (GSI-Groundwater Level Data Viewer).

Ryan Hanley was commissioned by Roscommon County Council to undertake surveys to determine the baseline environment in and around Lough Funshinagh and the Cross river.

The surveys aim to identify any key ecological receptors and establish the condition of the current environment by recording key species of flora and fauna, habitats, including any designated sites in the vicinity of the two main waterbodies mentioned above.

1.1 PURPOSE OF THE REPORT

The purpose of this report is to:

- Establish and evaluate the baseline ecological environment of Lough Funshinagh to the Cross river;
- Provide an assessment of the significance of each key species and habitat in the area.

1.2 STATEMENT OF AUTHORITY

Breda Quinn holds a B.Sc. (Hons) in Wildlife Biology from the Institute of Technology Tralee (Now MTU) and has over four years of ornithological survey experience, ranging from specialised raptor surveys to breeding bird surveys and wintering bird surveys in various habitats. Breda also has three years of habitat and invasive species survey, terrestrial mammal survey and bat survey experience.

Rémi O'Connell has been working as a professional ecologist with Ryan Hanley for over a year. He completed his studies in University College Cork (UCC) where he earned a BSc (Hons) in ecology and environmental biology. During his time working with Ryan Hanley, he has participated in multiple walkovers, invasive plant and bird surveys. He has worked on an array of project reports such as environmental impact assessment (EIA), appropriate assessment (AA) screening, environmental impact assessment (EIA) screening, multi-criteria analysis (MCA), initial assessment report (IAR), natura impact statement (NIS), invasive species management plan (ISMP) and invasive alien plant species (IAPS) reports.

Ruairí Guthrie holds a B.Sc. in Wildlife Biology from Munster Technological University (Kerry) and has been a graduate ecologist at Ryan Hanley for two months. Ruairí has experience in habitat surveys, habitat mapping and report writing.

Paola Rodolfi assisted in the data collection and spatial analysis. Paola holds a B.Sc. in Marine Biology and a Masters in Environmental Management. She has over 12 years' experience in environmental reporting and data analysis. Her focus has been in survey data analysis and geospatial data analysis for environmental purposes. She is proficient with QGIS software and familiar with ArcGIS for mapping. The analyses she performs include species distribution and abundance, calculations on habitats surfaces, and the various layouts and map production skills.

This report was reviewed by Dr Ross Donnelly-Swift, Senior Ecologist with Ryan Hanley. Ross holds a BSc (Hons) Biology from Maynooth University NUI, an MSc Environmental Science from Trinity College Dublin where he researched the hypoxic tolerance of bivalves for his MSc thesis. He also has a PhD in Biosystems Engineering from University College Dublin where he researched monitoring grasslands using proximal and remote sensing. In addition, Ross Lectured at Dundalk Institute of Technology on soil and hydrology and was a Research Fellow in the School of Natural Sciences at Trinity College Dublin. Ross has extensive experience and knowledge in ecological assessments, conducting field experiments, writing scientific reports, habitat surveying and species-specific surveys that include bats, badger, otter, birds (winter and breeding), flora and invasive species.

1.3 Survey Area

For the purposes of this report the survey area of Lough Funshinagh was determined based on criteria established for the various species surveys which include a range of 300 to 500 meters boundary to determine habitat suitability of key species and record any signs or sightings as well as any key environmental factor in the surrounding areas of Lough Funshinagh and the Cross river. The Cross river is c.20km long. A terrestrial walkover survey was conducted surrounding the Cross river for 9km and then again at six bridging points as it moved towards the River Shannon. The six bridging points were surveyed 150m upstream and 150m downstream of the bridges.

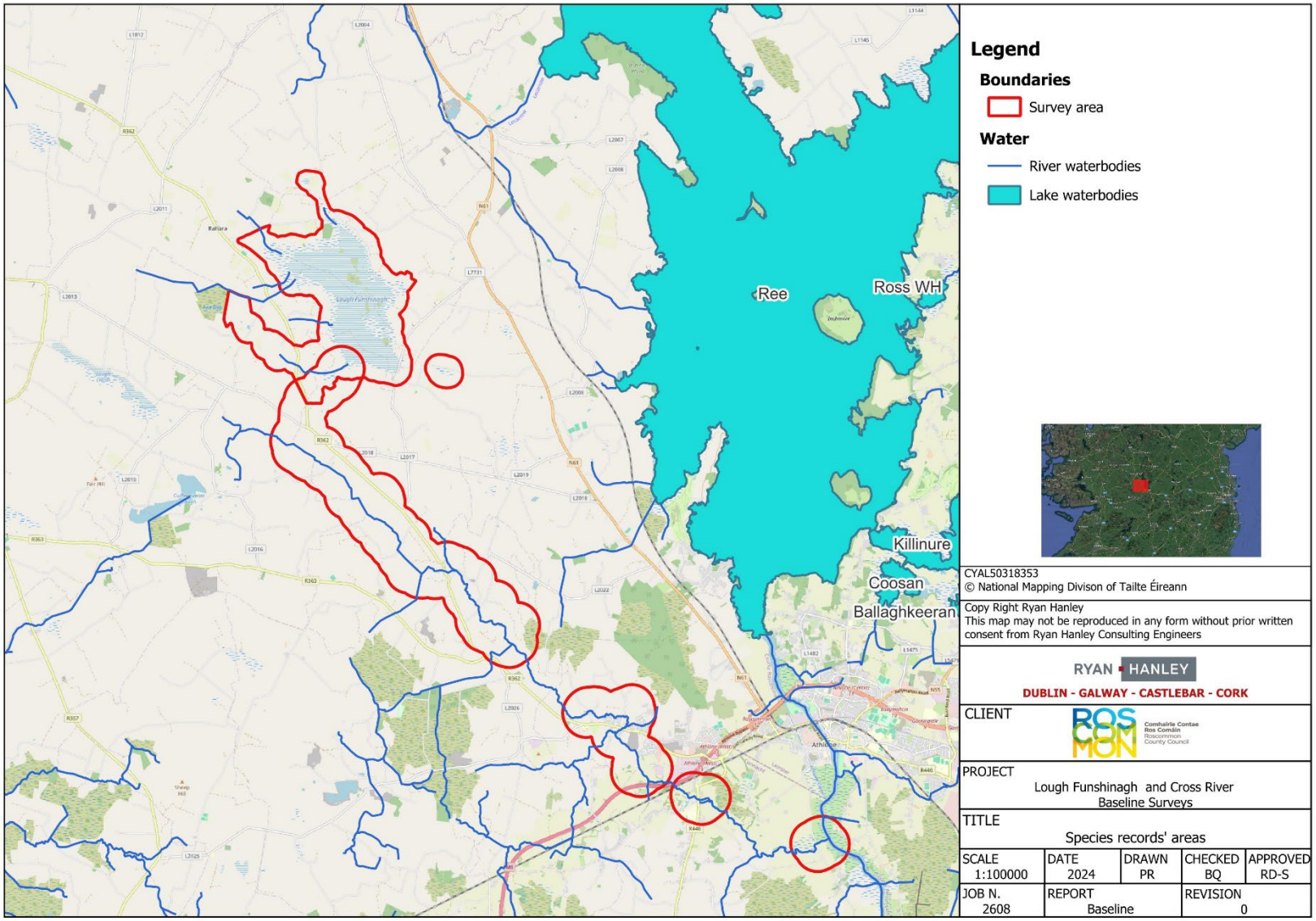

Figure 1. 1 Baseline surveys boundaries and areas

2. METHODOLOGY AND LIMITATIONS

The multi-disciplinary walkover surveys comprehensively covered the footprint of Lough Funshinagh and the Cross river. Walkover surveys were undertaken 28th March 2024, 4th, 11th, 18th and 25th of July 2024 around the perimeter of Lough Funshinagh and on the 2nd, 6th, 7th, 8th and 9th of August 2024 for the Cross river. These surveys were conducted in accordance with National Roads Authority (NRA) Guidelines, '*Ecological Surveying Techniques for Protected Flora and Fauna on National Road Schemes*' (NRA, 2009a). These surveys catered to fulfilling specific ecological objectives relating to habitats, breeding birds, mammals (including badgers, otters and bat species) and aquatic ecology (including fish). Additional habitat identification was done during the Wintering Bird Survey, Breeding Bird Survey and Fauna surveys of Lough Funshinagh from November 2023 to June 2024.

Habitat mapping was undertaken using guidance set out in '*Best Practice Guidance for Habitat Survey and Mapping*' (Smith et al., 2011). Plant nomenclature for vascular plants follows '*New Flora of the British Isles*' (Stace, 2010), while mosses and liverworts nomenclature follow '*Mosses and Liverworts of Britain and Ireland: A Field Guide*' (Atherton et al., 2010). Habitats considered to be of ecological significance and in particular having the potential to correspond to those listed in Annex I of the EU Habitats Directive 92/43/EEC were identified and assessed.

The walkover surveys were designed to detect the presence, or likely presence, of a range of protected species.

During field surveys, a survey for badgers was conducted, adhering to best practice guidance (NRA, 2009), and was cognisant of '*Guidelines for the Treatment of Badger Prior to the Construction of National Roads Schemes*' (NRA, 2006) in order to determine the presence of badger signs along and adjacent to the survey area. Optimal time for undertaking badger surveys is between November and April, when vegetation cover is reduced. The badger survey conducted was not constrained by vegetation or season and a comprehensive survey was conducted in March 2024.

Otter surveys were conducted following '*Guidelines for the Treatment of Otter Prior to the Construction of National Roads Schemes*' (NRA, 2009) in order to determine any potential signs and sightings of otters within the footprint of the Lough Funshinagh and the Cross River.

In addition, trail cameras were placed at key locations to monitor the presence of any key species for several weeks and throughout the duration of the baseline surveys from March to August 2024.

During field surveys, any potential Invasive Alien Species (IAS) listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2015) was recorded.

Seasonal factors that affect distribution patterns and habits of species were taken into account when conducting these surveys and the potential of the site to support certain populations (in particular those of conservation importance that may not have been recorded during the field survey due to their seasonal absence or cryptic nature) was assessed. **Table 2. 1** summarises the field surveys completed to date.

Table 2. 1 Survey dates for Lough Funshinagh

Survey Type	Dates of Survey	Survey Locations
Multi-disciplinary Walkover Survey; Habitat survey Otter survey Badger survey	28th March 2024 5th, 25th June 2024 4th, 11th, 18th, 25th July 2024	Lough Funshinagh
Riparian and terrestrial habitat survey	2nd, 5th to 9th August 2024	Cross river
Hedgerow and PRF survey	28th March 2024 25th June 2024 9th August 2024	South end of Lough Funshinagh following fields to the Cross river outfall
Trail Cameras in operation	March to August 2024	Lough Funshinagh and Cross river

3. DESKTOP STUDY

A desk study was undertaken in order to collate available information on the existing local ecological environment and to inform the initial scope of the ecological surveys. The following sources of information were reviewed as part of this report:

- Ordnance Survey maps of the study area (www.osi.ie);
- Aerial photography of the survey area;
- The National Parks and Wildlife Service (NPWS) site synopses and online database (www.npws.ie) of information on designated sites;
- A Guide to Habitats in Ireland (Fossitt, 2000);
- *New Atlas of the British & Irish Flora* (Preston et al., 2002);
- Bat records from the Bat Conservation Ireland (BCI) databases (All-Ireland Daubenton's Bat Survey, Bat Monitoring Scheme BATLAS);
- The National Biodiversity Data Centre (NBDC) database www.biodiveristyireland.ie for records of rare, protected, threatened and invasive species;
- NPWS Rare and Protected Species Records, Habitat and Species data | National Parks & Wildlife Service (npws.ie);
- Environmental information/data from the Environmental Protection Agency (EPA) website http://www.epa.ie/rivermap/data;
- The Water Framework Directive website www.wfdireland.ie; and
- GeoHive online mapping http://map.geohive.ie/mapviewer.html.
- The International Union for Conservation of Nature (IUCN) red-list: IUCN Red List of Threatened Species
- Geological Survey of Ireland (GSI) database: Data and maps (gsi.ie)
- National Biodiversity Data Centre (NBDC) 'report by polygon' mapping tool http://maps.biodiversityireland.ie/#/Map

3.1 Designated Sites

Lough Funshinagh was formally designated, in 2019, a Special Area of Conservation (SAC), site code 000611, under the European Union's Habitats Directive (92/43/EEC) (as amended). The site is selected for the following habitats/or species listed on Annex I/II of the E.U. Habitats Directive (*=priority habitats; numbers in brackets are Natura 2000 codes):

- [3180] Turloughs* and
- [3270] Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention p.p.* vegetation.

Other sites in the proximity of Lough Funshinagh and Cross River were considered given the potential connectivity between these sites and the corridors provided for species they hold.

3.1.1 European Sites

The European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477/2011) requires the establishment and conservation of a network of sites that are to be termed '*European Sites*' which are known as Special Areas of Conservation (SACs) and Special Protection Areas (SPAs).

The locations of the European sites considered in this report are shown in **Figure 3. 1** and details of each site are provided in Error! Reference source not found. .

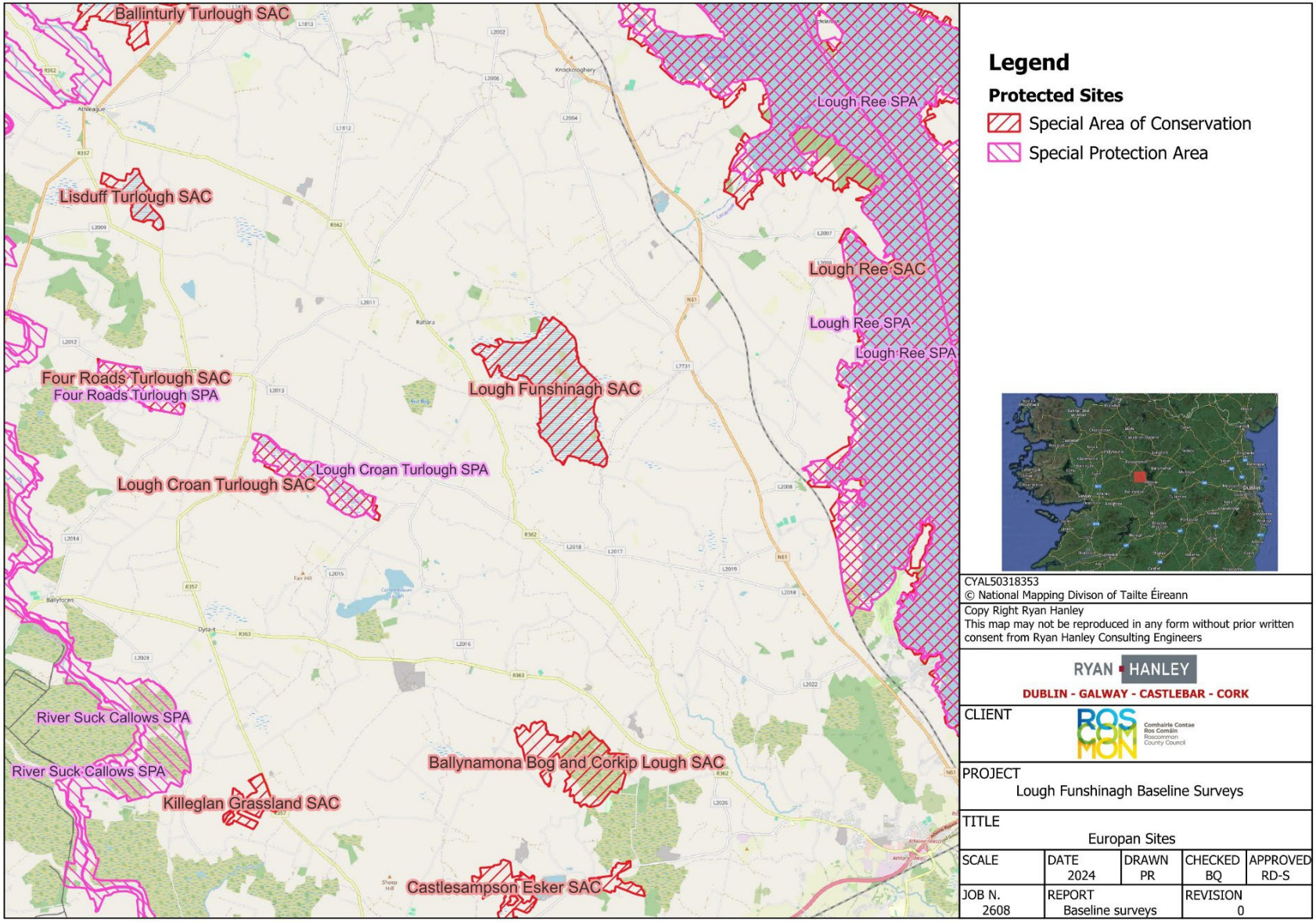

Figure 3. 1 European Sites in the vicinity of Lough Funshinagh

Table 3. 1 Description of European Sites in the survey area and in the vicinity of Lough Funshinagh

Designated site and code	Qualifying Interests (QI's)	Brief Description
Lough Funshinagh SAC (000611)	▪ [3180] Turloughs* ▪ [3270] Rivers with muddy banks with *Chenopodion rubric pp.* and *Bidention pp. vegetation*	"Turloughs" (EU habitat code 3180) is a priority habitat (denoted by *) on Annex I of the EU Habitats Directive. Turloughs are considered to be of high conservation value for their plant, invertebrate (both terrestrial and aquatic) and bird communities. They are grass- or sedge-dominated habitats, often with areas of fen, marsh or permanent pond. Many turloughs show a distinctive zonation of herbaceous perennials which relates to the depth and duration of flooding. Because of the long flood duration at Lough Funshinagh, annual communities of Rivers with muddy banks with *Chenopodion rubric pp.* and *Bidention pp.* vegetation are present. Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention p.p.* vegetation is a dynamic habitat found on damp, fine, mineral soils (typically alluvial muds). Typical species are small, short- lived, fast-growing annuals that are poor competitors. Open water at Lough Funshinagh is colonised by large beds of Common Club-rush (*Scirpus lacustris*). This grades into stands of Tufted-sedge (*Carex elata*), Slender Sedge (*Carex lasiocarpa*) and Bottle Sedge (*Carex rostrata*) in some areas. The shallower parts of the lough contain semi- aquatic plants which are variably exposed in summer. Common here are Sharp-flowered Rush (*Juncus acutiflorus*), Carnation Sedge (*Carex panicea*) and Common Sedge (*Carex nigra*), with Water Spearwort (*Ranunculus flammula*), Water Mint (*Mentha aquatica*), and others. The lough is surrounded by wet grassland which gradually turns into pasture. The Lough's habitat is used by a number of winter waterfowl that include Bewick's Swan, Whooper Swan and Golden Plover, all Annex I of the EU Birds Directive. Other species that use its habitats are Widgeon, Teal, Mallard, Shoveler, Lapwing, among others. Common frog, listed in the Red Data Book as internationally important, breeds within the site. This species is considered vulnerable at a European level. Major threats to this habitat are related to drainage and agricultural intensification. The latter results from the application of fertiliser that leads to eutrophication and general loss of species diversity. (NPWS, 2015 and NPWS, 2018)

Designated site and code	Qualifying Interests (QI's)	Brief Description
Lough Ree SAC (0004400)	▪ Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation [3150] ▪ Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210] ▪ Active raised bogs [7110] ▪ Degraded raised bogs still capable of natural regeneration [7120] ▪ Alkaline fens [7230] ▪ Limestone pavements [8240] ▪ Bog woodland [91D0] ▪ Alluvial forests with Alnus glutinosa and Fraxinus excelsior (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0] ▪ Lutra lutra (Otter) [1355]	Lough Ree is the third largest lake in Ireland. It has a very long, indented shoreline and hence has many sheltered bays. The water of Lough Ree tends to be strongly peat-stained, restricting macrophytes to depths of less than 2 m, and as a consequence, macrophytes are restricted to sheltered bays, where a typical Shannon flora occurs. Species present include Intermediate Bladderwort (*Utricularia intermedia*), pondweeds (*Potamogeton spp.),* Quillwort (*Isoetes lacustris*), Greater Duckweed (*Spirodela polyrhiza*), stoneworts (*Chara spp., including C. pedunculata*) and Arrowhead (*Sagittaria sagittifolia*). Low wet grassland occurs in abundance around the shore and provides breeding and feeding grounds for winter waterfowl. Dry calcareous grassland occurs scattered around the lake shore. Limestone pavement can be found occasionally around its shore, and it is covered by a bryophyte-rich flora. Dry broadleaved semi-natural woodland occurs in several places around the lake. The site supports a number of rare plant species which are listed in the Irish Red Data Book such as Alder Buckthorn and Bird Cherry (*Prunus padus*), narrow-leaved Helleborine (*Cephalanthera longifolia*) and Betony (*Stacchy officinalis*). The lake supports otter populations along its shores. The main threat to the aquatic life in the lake comes from artificial enrichment of the waters by agricultural and domestic waste, and also by peat silt in suspension which is increasingly limiting the light penetration. (NPWS, 2019).
Lough Croan Turlough SAC (000610)	▪ Turloughs [3180] *	It is split into two main parts - the east functions as a typical turlough, with a wet area dominated by Common Reed (*Phragmites australis*) at the centre; at the west is a fen, with floating vegetation in places, which also floods in winter. Outside of these wet areas the turlough bottom is covered with sedge-dominated vegetation, particularly Common Sedge (*Carex nigra*) while around its margin's grassland is the most common habitat, calcareous grassland at the southern end and more nutrient-rich grasslands elsewhere. The vegetation is highly diverse, with a total of 17 different communities occurring, several of which are rare or unusually large in extent. Lough Cron is a Wildfowl Sanctuary with species such as Shoveler, Wigeon, Mallard, Teal, Lapwing, Whooper Swan among others.

Designated site and code	Qualifying Interests (QI's)	Brief Description
		(NPWS, 2013)
Lough Croan Turlough SPA (004139)	▪ Shoveler (*Anas clypeata*) [A056] ▪ Golden Plover (*Pluvialis apricaria*) [A140] ▪ Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395] ▪ Wetland and Waterbirds [A999]	It is a linear wetland with two main parts that function as a typical turlough with reed centre on the east side and a floating fen on the west side which also floods in winter. Lough Croan supports nationally important numbers of Greenland White-fronted Goose which are part of an internationally important flock based along the River Suck. It supports nationally important populations of Shoveler and Golden Plover. It is a site of high ornithological importance. (NPWS, 2010)
Four Roads SAC (001637)	▪ Turloughs [3180] *	It lies below a low scarp of limestone hills and is an open, shallow basin without permanent standing water which seems to flood predictably and dry out early. The turlough has a relatively uniform vegetation structure, with the eastern part predominantly of grass, mostly Creeping Bent (*Agrostis stolonifera*), and the western part consisting mainly of sedges, with Common Sedge (*Carex nigra*) most frequent. The site is undrained, in spite of a few past attempts around the margins, and is fertilized in the eastern half. It is intensively grazed and in some areas, there is poaching of the peaty soil. (NPWS, 2013)
Four Roads SPA (004140)	▪ Golden Plover (*Pluvialis apricaria*) [A140] ▪ Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395] ▪ Wetland and Waterbirds [A999]	Four Roads Turlough is an important site for wintering waterfowl. In most winters it is visited by the nationally important River Suck population of Greenland White- fronted Goose. Other species that occur regularly include Wigeon, Teal, Mallard, Shoveler and Lapwing. The SPA is of ornithological importance because of the nationally important populations of species and the presence of Annex I EU Birds Directive species. (NPWS, 2010)
Ballymona Bog and Corkip Lough SAC (002339)	▪ Turloughs [3180] ▪ Active raised bogs [7110] ▪ Degraded raised bogs still capable of natural regeneration [7120]	The site comprises a relatively small portion of what was once a large bog complex. The high bog consists of a single dome, with a large area of bog woodland and flush in the centre. It is surrounded on three sides by esker ridges and limestone bedrock. These ridges are host to areas of species-rich grassland.

Designated site and code	Qualifying Interests (QI's)	Brief Description
	▪ Depressions on peat substrates of the *Rhynchosporion* [7150] ▪ Bog woodland [91D0]	Cutover bog occurs all around the margins of the high bog, some sections of which flood at times, and there is an area of commercial forestry at the eastern margin. Cranberry is abundant here and the vegetation is lush in places, with many bog moss species occurring. Corkip Lough, a turlough, is fringed by Common Reed (*Phragmites australis*) and sedges (*Carex spp.*), along with many wetland herbs. The lake retains a small area of open water in the summer. It is surrounded by lowland wet grassland which is flooded in the winter. (NPWS, 2014)
River Suck Callows SPA (004097)	▪ Whooper Swan (*Cygnus cygnus*) [A038] ▪ Wigeon (*Anas penelope*) [A050] ▪ Golden Plover (*Pluvialis apricaria*) [A140] ▪ Lapwing (*Vanellus vanellus*) [A142] ▪ Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395] ▪ Wetland and Waterbirds [A999]	The site includes the River Suck itself and the adjacent areas of seasonally-flooded semi-natural lowland wet callow grassland. The River Suck is the largest tributary of the River Shannon. The River Suck Callows SPA is an important site for wintering waterfowl. Of particular note is the nationally important Greenland White-fronted Goose flock. Four other species occur in populations of national importance; Whooper Swan, Golden Plover, Wigeon and Lapwing. (NPWS, 2022)

3.1.2 National Heritage Areas

National Heritage Areas (NHAs) are heritage sites that are designated for the protection of flora, fauna, habitats and geological sites deemed to be of national ecological importance and are afforded protection under Section 16 of the Wildlife (Amendment) Act 2000. Many NHA boundaries overlap with European sites. Proposed National Heritage Areas (pNHAs) have not been statutorily proposed or designated under the Act; however, they do have some protection under schemes such as Agri-Environmental Schemes, Forest Service requirements, Licensing Authorities and County Development Plans.

Lough Funshinagh is a proposed Natural Heritage area, as is Lough Croan Turlough, Lough Ree and Four Roads Turlough. The closest Natural Heritage Area to Lough Funshinagh is the Suck River Callows located c. 10 km west from the Lough.

Suck River Callows NHA

The main habitat of the Suck River Callows is flood meadows of wet grassland and associated aquatic and semi-aquatic habitats linked to drainage ditches. These habitats are followed by species-rich dry and wet calcareous grassland, flooded fen, wet woodland and small raised bog, all of which directly border the callows. Improved grasslands are also present in the upper margin of wet grasslands.

Wet grassland species consist of Common Sedge (*Carex nigra*), Creeping Bent (*Agrostis stolonifera*), Brown Sedge (*Carex disticha*), Marsh Foxtail (*Alopecurus geniculatus*), Reed Canary-grass (*Phalaris arundicacea*), Creeping Buttercup (*Ranunculus repens*), Jointed Rush (*Juncus articulatus*), Common Spikerush (*Eleocharis palustris*) and Floating Sweet-grass (*Glyceria fluitans*).

Internationally important flock of Greenland White-fronted Geese use the River Suck, especially in its middle reaches, as it provides good quality riverine and grassland habitats for foraging and resting. The quality of its habitats also attracts other species like Otter and Irish Hare.

The current land uses include agriculture and active peat-cutting which is more prevalent to the north-west and along the eastern margin of the high bog. Damaging activities associated with these land uses include habitat loss and drainage throughout the site and burning of the high bog. These activities have all resulted in the loss of habitat and damage to the hydrological status of the raised bog and pose a continuing threat to its viability.

The presence of raised bog makes the Suck River Callows an area of considerable conservation significance as it is a rare habitat, and it is becoming increasingly and rapidly scarce.

3.2 Records of Protected, Rare and other Notable Species

The following sections describe the desk study sources consulted, and results obtained during the assessment. Records of rare or protected flora and fauna within the 10km^2 grid square M95, M94, N03 & N04, wherein the survey area is situated, were obtained from the National Parks and Wildlife Service (NPWS), National Biodiversity Data Centre (NBDC), Botanical Society for Britain and Ireland (BSBI) and Bat Conservation Ireland (BCI).

3.2.1 New Flora Atlas

A search was made in the *New Atlas of the British & Irish Flora* (Preston *et al*. 2002) and the *Plant Atlas 2020: Mapping changes and distribution of the British and Irish Flora* (provided by the Botanical Society of Britain and Ireland – BSBI) database to identify if any rare or protected plant species have been previously recorded. The search targeted vascular plants that are listed in Annex II of the EU Habitats Directive, the Flora (Protection) Order (FPO) 2022 and those listed in *The Irish Red Data Book* (Jackson et al. 2016). There

are two records of species listed under the Flora Protection Order, Annex II or the Irish Red List within the 10km grid square (**Table 3.2** below).

Table 3. 2 Rare and protected plant species recorded within and in the proximity of the survey area

Grid reference	Flora Name	Habitats	Conservation Status
M94	Orange foxtail (*Alopecurus aequalis)*	Found on bare mud in areas that are wet in winter but dry out in the summer, including the margins of ponds, ditches, reservoirs, turloughs, and flooded gravel-pits and on bare mud in winter-flooded arable fields and pastures (BSBI Plant Atlas, 2020).	Red List - Near Threatened FPO 2022
M94	Wood Small-reed (*Calamagrostis epigejos)*	Occurs in damp woods, ditches, fens, ungrazed or lightly grazed grasslands, and on sheltered sea-cliffs and sand dunes; also, as a colonist of artificial habitats such as old quarries, roadsides, railway banks and brownfield sites (BSBI Plant Atlas, 2020).	Red List - Vulnerable FPO 2022
M94	Brown Beak-sedge (*Rhynchospora fusca)*	Can be found on wet heaths, acidic mires, shallow pools and soakaways in blanket bogs and mires, favouring bare peat where competition is limited (BSBI Plant Atlas, 2020).	Red List - Near Threatened
M94	Basil Thyme (*Clinopodium acinos)*	Found within disturbed soils in dry grassland, rocky ground and arable fields. In Ireland it is a plant of sandy and gravelly sites, including eskers (BSBI Plant Atlas, 2020).	Red List - Near Threatened
M94	Dense-flowered Orchid (*Neotinea maculata)*	Found growing in a wide range of habitats on base-rich rocky or gravelly substrates. It can be found in the crevices of limestone pavement, in old pastures, hill grasslands, dunes and on road verges (BSBI Plant Atlas, 2020).	Red List - Near Threatened

3.2.2 National Parks and Wildlife Services (NPWS) Records of Protected Species

National Parks and Wildlife Services (NPWS) online records were searched to see if any rare or protected species of flora or fauna have been recorded from hectads M95, M94, N03 & N04. An information request was also sent to the NPWS requesting records from the Rare and Protected Species Database for hectads M95 & M94 (29th of February 2024) and hectads N03 & N04 (30th of July 2024). **Table 3. 3** lists protected species records obtained from these NPWS data requests which has been cross-referenced for their conservation status with the International Union for Conservation of Nature (IUCN) red-list, biodiversity.ie species records and the Flora (Protection) Order (FPO) 2022.

Table 3. 3 Records of protected species

M95		
Common Name	**Scientific Name**	**Conservation Status**
Flora		
Brook-side Feather-moss	*Amblystegium fluviatile*	N/A (not on FPO or red-list)
Round-fruited Rush	*Juncus compressus*	Flora Protection Order (FPO) | NBDC: 'Vulnerable' | IUCN: 'Least Concern'
Gentianella amarella subsp. hibernica	*Gentianella amarella subsp. hibernica*	NBDC: 'N/A'
Fauna		
Red-tailed Bumblebee	*Bombus (Melanobombus) lapidarius*	NBDC: 'near threatened' | IUCN: 'Least Concern'
Eurasian Otter	*Lutra lutra*	NBDC: EU Habitats Directive: Annex II & Annex IV; Wildlife Act | IUCN: 'near threatened'
Eurasian Badger	*Meles meles*	Wildlife Act | IUCN: 'Least Concern'
M94		
Common Name	**Scientific Name**	**Conservation Status**
Flora		
Rusty Bog-moss	*Sphagnum fuscum*	NBDC & IUCN: 'Least Concern'
Papillose Bog-moss	*Sphagnum papillosum*	NBDC & IUCN: 'Least concern'
Lustrous Bog-moss	*Sphagnum subnitens*	IUCN: 'Least Concern' | NBDC: N/A
Orange Foxtail	*Alopecurus aequalis*	Flora Protection Order (FPO) | IUCN: 'Least Concern' | NBDC: 'Near threatened;'
Wood Small-reed	*Calamagrostis epigejos*	Flora Protection Order (FPO) | NBDC: 'Vulnerable'
Brown Beak-sedge	*Rhynchospora fusca*	NBDC: 'Near threatened'
Basil Thyme	*Clinopodium acinos*	NBDC: 'Near threatened'
Dense-flowered Orchid	*Neotinea maculata*	NBDC: 'Near threatened' | IUCN: 'Least Concern'
Fauna		
Desmoulin's Whorl Snail	*Vertigo moulinsiana*	NBDC: EU Habitats Directive: Annex II; Wildlife Act; 'Endangered' | IUCN: 'Vulnerable'.
Irish Hare	*Lepus timidus subsp. hibernicus*	NBDC: N/A
White-clawed Crayfish	*Austropotamobius pallipes*	NBDC: EU Habitats Directive: Annex II & Annex V; Wildlife Acts
N03		
Common Name	**Scientific Name**	**Conservation Status**
Flora		
Reindeer Moss	*Cladina rangiferina*	NBDC: EU Habitats Directive: Annex V
-	*Cladonia ciliata*	NBDC: EU Habitats Directive: Annex V
-	*Cladonia portentosa*	NBDC: EU Habitats Directive: Annex V

Fine Bog-moss	*Sphagnum angustifolium*	NBDC: 'Least Concern'
Brown Beak-sedge	*Rhynchospora fusca*	NBDC: 'Near threatened'
Fir Clubmoss	*Huperzia selago*	EU Habitats Directive: Annex V | IUCN: 'Least Concern'
Green-winged Orchid	*Orchis morio*	NBDC: 'Vulnerable' | IUCN: 'Near threatened'
Fen Violet	*Viola persicifolia*	NBDC: 'Vulnerable'
Shepherd's-needle	*Scandix pecten-veneris*	NBDC: 'Regionally Extinct'
Narrow-leaved Helleborine	*Cephalanthera longifolia*	Flora Protection Order (FPO) | NBDC: 'Endangered'
Bur Chervil	*Anthriscus caucalis*	NBDC: 'Near threatened'
Velvet Feather-moss	*Brachythecium velutinum*	NBDC: 'Endangered' | IUCN: 'Least Concern'
-	*Cladonia ciliata var. tenuis*	NBDC: N/A
Fauna		
West European Hedgehog	*Erinaceus europaeus*	NBDC: Wildlife Act | IUCN: 'least concern'
Eurasian Otter	*Lutra lutra*	NBDC: EU Habitats Directive: Annex II & Annex IV; Wildlife Act | IUCN: 'near threatened'
Common Frog	*Rana temporaria*	EU Habitats Directive: Annex V | Protected Species: Wildlife Acts
White-clawed Crayfish	*Austropotamobius pallipes*	EU Habitats Directive: Annex II & Annex V | Protected Species: Wildlife Acts
Irish Hare	*Lepus timidus subsp. hibernicus*	NBDC: N/A
	N04*	
Common Name	**Scientific Name**	**Conservation Status**
Flora		
Basil Thyme	*Clinopodium acinos*	NBDC: 'Near threatened'
-	*Cladonia ciliata*	NBDC: EU Habitats Directive: Annex V
-	*Cladonia portentosa*	NBDC: EU Habitats Directive: Annex V
Fragrant Agrimony	*Agrimonia procera*	NBDC: 'Near threatened'
Golden Bog-moss	*Sphagnum pulchrum*	NBDC & IUCN: 'Least concern'
Green-winged Orchid	*Orchis morio*	NBDC: 'Vulnerable' | IUCN: 'Near threatened'
Irish Whitebeam	*Sorbus hibernica*	NBDC & IUCN: 'Vulnerable'
Marsh Fern	*Thelypteris palustris*	NBDC: 'Near threatened' | IUCN: 'Least concern'
Narrow-leaved Helleborine	*Cephalanthera longifolia*	Flora Protection Order (FPO) | NBDC: 'Endangered'
Prickly Poppy	*Papaver argemone*	NBDC: 'Vulnerable'
Red Hemp-nettle	*Galeopsis angustifolia*	Flora Protection Order (FPO) | NBDC: 'Endangered'
Red-neck Forklet-moss	*Dicranella cerviculata*	NBDC: 'Near threatened' | IUCN: 'Least concern'

Short-leaved Water-starwort	*Callitriche truncata*	Flora Protection Order (FPO) | NBDC: 'Vulnerable'
Upright Brome	*Bromopsis erecta*	NBDC: 'Near threatened'
Fauna		
Common Frog	*Rana temporaria*	NBDC: EU Habitats Directive: Annex V; Wildlife Acts
Common Lizard	*Lacerta vivipara*	Wildlife Acts | IUCN: 'Least concern'
Desmoulin's Whorl Snail	*Vertigo moulinsiana*	NBDC: EU Habitats Directive: Annex II; Wildlife Acts; 'Endangered' | IUCN: 'Vulnerable'
Eurasian Badger	*Meles meles*	Wildlife Acts | IUCN: 'Least Concern'
Eurasian Otter	*Lutra lutra*	NBDC: EU Habitats Directive: Annex II & Annex IV; Wildlife Act | IUCN: 'near threatened'
Irish Hare	*Lepus timidus subsp. hibernicus*	NBDC: N/A
Irish Stoat	*Mustela erminea subsp. hibernica*	NBDC: N/A
Mallard	*Anas platyrhynchos*	IUCN: 'Least concern' | NBDC: Wildlife Acts; EU Birds Directive: Annex II & Annex III, Section I
Pine Marten	*Martes martes*	IUCN: 'Least concern' | EU Habitats Directive: Annex V | Wildlife Acts
Smooth Newt	*Lissotriton vulgaris*	Wildlife Acts | IUCN: 'Least concern'
Stoat	*Mustela erminea*	Wildlife Acts | IUCN: 'Least concern'
Tufted Duck	*Aythya fuligula*	NBDC: Wildlife Acts; EU Birds Directive: Annex II, Section I & Annex III, Section II; Birds of Conservation Concern: Amber List | IUCN: 'Least concern'
West European Hedgehog	*Erinaceus europaeus*	Wildlife Acts | IUCN: 'least concern'
White-clawed Crayfish	*Austropotamobius pallipes*	NBDC: EU Habitats Directive: Annex II & Annex V; Wildlife Acts

*This 10km^2 grid square also encapsulates a considerable proportion of Lough Ree.

3.2.3 NPWS Article 17 Datasets and Additional Habitat Databases

A review of the NPWS Habitat Directive- Article 17 datasets, Survey of Annex I Alluvial woodland in Lough Ree 2019, Floodplain and Callows Grasslands in Ireland 2023, Irish Semi-Natural Grassland Survey datasets, Grassland Monitoring survey datasets, National Survey of Native Woodland datasets and Long-Established Woodland dataset was conducted in August 2024. The datasets were downloaded and overlain on, and around, the survey area.

Table 3. 4 Records of habitats and species from Article 17 dataset

NPWS Article 17 Data	
Habitats	**Distance of nearest known distribution from Survey Area**
3180 Turlough	Lough Funshinagh is a turlough, and L. Croan is a turlough located c.4.1km east of Lough Funshinagh.
7230 Alkaline fen	c.3.9km east of the Cross river
7110 Active raised bog	c.5.8km south of Lough Funshinagh and c.2.1km SW of the cross river
91E0 Alluvial woodland	c.4km NE of Cross river

91D0 Bog woodland	located c.790m south of the cross river, and c.6.6km south of Lough Funshinagh.
7140 Transition mires	Located c.4.5km NE of the Cross river
6510 Lowland hay meadows	c.3.4km SE of the Cross river
6430 Hydrophilous tall herb communities	c.4.9km north of the Cross river
6410 Molinia Meadows	c.3.7km south of the Cross river
6210 Orchid Rich Grassland Calcareous Grassland	c.1km SE of the Cross river; c.5km SE of Lough Funshinagh
4030 Dry heaths	Within Lough Funshinagh survey boundary, c.2.8km SW of the Cross river
4010 Wet Heath	c.5.2km east of the Cross river
8240 Limestone Pavement	c.3.3km NW of Lough Funshinagh

Species		
Common Name	**Scientific Name**	**Distance of nearest known distribution from Survey Area**
Common frog*	*Rana temporaria*	Point distribution located c.1km NE of the Cross river
White-clawed crayfish*	*Austropotamobius pallipes*	Point distribution located on the Cross river
Marsh fritillary*	*Euphydryas aurinia*	Point distribution located c.170m south of the Cross river
Pine marten*	*Martes martes*	c.1.4km NE of the Cross river
Otter*	*Lutra lutra*	Point distribution is within Lough Funshinagh; otter habitat located within Cross river, and at Lough Ree 4.8km to the east.
Irish hare*	*Lepus timidus*	Point distribution c.2.2km west of the Cross river
Desmoulins whorl snail	*Vertigo moulinsiana*	1km2 distribution is c.2.3km SW of the Cross river
White cushion moss	*Leucobryum glaucum*	c.570m south of the Cross river

*Survey area is also located within common range and/or distribution.

Table 3. 5 Where accurate distribution data is lacking within the NPWS Article 17 dataset, the following lists of habitats and species which have a common distribution and/or common range within the survey area

NPWS Article 17 Data: Common Distribution and Range	
Habitats	**Location of survey area**
7150 *Rhynchosporion* depressions	Within common range.
7120 Degraded raised bogs	Within common range.
3270 Rivers with muddy banks and *Chenopodion rubri*	Within common distribution and range.
7220 Petrifying Springs	Within common distribution and range.

Species		
Common Name	**Scientific Name**	**Location of survey area**
Pollan	*Coregonusautumnalis*	Within common distribution and range.
Brook lamprey	*Lampetra planeri*	Within common distribution and range.
Soprano pipistrelle	*Pipistrellus pygmaeus*	Within common distribution and range.
Pine marten	*Pipistrellus pygmaeus*	Within common distribution and range.
Leislers bat	*Nyctalus leisleri*	Within common distribution and range.
Whiskered bat	*Myotis mystacinus*	Cross River is within common distribution and range.
Brown long eared bat	*Plecotus auritus*	Within common distribution and range.
Natterers_bat	*Myotis nattereri*	Within common distribution and range.
Nathusius pipistrelle	*Pipistrellus nathusii*	Cross river is within common range.
Daubentons bat	*Myotis daubentoni*	Within common distribution and range.
Common pipistrelle	*Pipistrellus pipistrellus*	Within common distribution and range.
Geyers whorl snail	*Vertigo geyeri*	Cross river is within common range.

Table 3. 6 Habitats surrounding the survey area taken from the 'Grasslands Monitoring Survey 2015-2017' NPWS dataset

Grasslands Monitoring Survey 2015-2017	
Grassland Habitat	**Distance of nearest known distribution from Survey Area**
Dry calcareous and neutral grassland (GS1)	c.3.1km SW of the Cross river
Rich fen and flush (PF1)	c.5.5km NE of the Cross river
Wet grassland (GS4)	c.5.5km NE of the Cross river
Dry meadows and grassy verges (GS2)	c.3.4km SE of Cross river

Table 3. 7 Habitats surrounding the survey area taken from the 'Irish Semi-Natural Grassland Survey 2007-2012' NPWS dataset

Irish Semi-Natural Grassland Survey 2007-2012	
Grassland Habitat	**Distance of nearest known distribution from Survey Area**
Dry calcareous and neutral grassland (GS1)	Multiple distributions of this habitat type surrounding the survey area, with the nearest located c.700 Lough Funshinagh and the cross river
Dry meadows and grassy verges (GS2)	c.1.5km north of Cross river
Wet grassland (GS4)	c.160m north of the Cross river

Table 3. 8 Habitats surrounding the survey area taken from the 'Grasslands Monitoring Project 2006' NPWS dataset

Grasslands Monitoring Project 2006	
Grassland Habitat	**Distance of nearest known distribution from Survey Area**
Species-rich Calcareous Grassland	c.3.2km SW of Cross river
Mosaic of scrub/bracken and calcareous grassland	c.6km NE of Lough Funshinagh

Table 3. 9 Habitats and species surrounding the survey area taken from the 'Floodplain and Callows Grasslands in Ireland 2023' NPWS dataset

Floodplain and Callows Grasslands in Ireland 2023	
Floodplain and Callows Grasslands located adjacent to cross river at eastern end.	
Nearest distributions of Wet grassland (GS4), Dry meadows and grassy verges (GS2), Dry calcareous and neutral grassland (GS1) and exposed sand, gravel or till (ED1) habitats are all located within c.2km of the Cross river.	
Species	
Common Snipe (*Gallinago gallinago*)	c.4.7km SE of the Cross river
Hare (*Lepus timidus subsp. Hibernicus*)	c.4.7km SE of the Cross river
Marsh Pea (*Lathyrus palustris*)	c.4.7km SE of the Cross river
Common Meadow-rue (*Thalictrum flavum*)	c.4.7km SE of the Cross river

Table 3. 10 Habitats and species surrounding the survey area taken from the 'Ancient Long-Established Woodland' NPWS dataset

Ancient Long-Established Woodland	
Grassland Habitat	**Distance of nearest known distribution from Survey Area**
Meehan Wood	c.4.6km NE of Cross river
Barry More Shore	c.5.8km NE of Cross river
Warren Point	c.6.7km NE of Lough Funshinagh
St. Johns Wood	c.6.8km NE of Lough Funshinagh

Table 3. 11 Habitats and species surrounding the survey area taken from the 'National Survey of Native Woodlands 2003-2008' NPWS dataset

National Survey of Native Woodlands 2003-2008	
Grassland Habitat	**Distance of nearest known distribution from Survey Area**
Oak-ash-hazel woodland	c.1km east of Cross river, and c.5.8km SE of Lough Funshinagh
Bog woodland	c.2km east of Cross river
Oak-ash-hazel woodland / Wet willow-alder-ash woodland	c.6.5km NE of Lough Funshinagh

3.2.4 National Biodiversity Data Centre Data

A search of the National Biodiversity Data Centre (NBDC) website was conducted with a focus on records of protected fauna from a digitally drawn polygon which traverses Hectads M95, M94, M93, M84, N04 & N03. The results of the database search are provided below in **Table 3. 12.**

Table 3. 12 NBDC records of protected species within polygon* which traverses Hectads M95, M94, M93, M84, N04 & N03

Common Name	Scientific Name	Conservation Status
Amphibians		
Common Frog	*Rana temporaria*	EU Habitats Directive: Annex V || Protected Species: Wildlife Acts
Smooth Newt	*Lissotriton vulgaris*	Protected Species: Wildlife Acts
Birds		
Barn Swallow	*Hirundo rustica*	Protected Species: Wildlife Acts || Birds of Conservation Concern: Amber List
Black-headed Gull	*Larus ridibundus*	Protected Species: Wildlife Acts || Birds of Conservation Concern: Red List
Common Coot	*Fulica atra*	Protected Species: Wildlife Acts || EU Birds Directive: Annex II, Section I|| EU Birds Directive: Annex III, Section II || Birds of Conservation Concern: Amber List
Common Grasshopper Warbler	*Locustella naevia*	Protected Species: Wildlife Acts || Birds of Conservation Concern: Amber List
Common Kestrel	*Falco tinnunculus*	Protected Species: Wildlife Acts || Birds of Conservation Concern: Amber List
Common Linnet	*Carduelis cannabina*	Protected Species: Wildlife Acts || Birds of Conservation Concern: Amber List
Common Pheasant	*Phasianus colchicus*	Protected Species: Wildlife Acts || EU Birds Directive: Annex II, Section I|| EU Birds Directive: Annex III, Section I
Common Pochard	*Aythya ferina*	Protected Species: Wildlife Acts || EU Birds Directive: Annex II, Section I|| EU Birds Directive: Annex III, Section II || Birds of Conservation Concern: Amber List
Common Redshank	*Tringa totanus*	Protected Species: Wildlife Acts || Birds of Conservation Concern: Red List
Common Sandpiper	*Actitis hypoleucos*	Protected Species: Wildlife Acts || Birds of Conservation Concern: Amber List
Common Snipe	*Gallinago gallinago*	Protected Species: Wildlife Acts || EU Birds Directive: Annex II, Section I|| Protected Species: EU Birds Directive >> Annex III, Section III Bird Species || Birds of Conservation Concern: Amber List
Common Starling	*Sturnus vulgaris*	Protected Species: Wildlife Acts || Birds of Conservation Concern: Amber List
Common Swift	*Apus apus*	Protected Species: Wildlife Acts || Birds of Conservation Concern: Amber List
Common Tern	*Sterna hirundo*	Protected Species: Wildlife Acts || EU Birds Directive: Annex I Bird Species || Birds of Conservation Concern: Amber List

Common Name	Scientific Name	Conservation Status
Common Wood Pigeon	*Columba palumbus*	Protected Species: Wildlife Acts || EU Birds Directive: Annex II, Section I|| EU Birds Directive: Annex III, Section I
Corn Crake	*Crex crex*	Protected Species: Wildlife Acts || EU Birds Directive: Annex I Bird Species || Birds of Conservation Concern: Red List
Eurasian Curlew	*Numenius arquata*	Protected Species: Wildlife Acts || EU Birds Directive: Annex II, Section II Bird Species || Birds of Conservation Concern: Red List
Eurasian Oystercatcher	*Haematopus ostralegus*	Protected Species: Wildlife Acts || Birds of Conservation Concern: Amber List
Eurasian Teal	*Anas crecca*	Protected Species: Wildlife Acts || EU Birds Directive: Annex II, Section I|| EU Birds Directive: Annex III, Section II || Birds of Conservation Concern: Amber List
Eurasian Wigeon	*Anas penelope*	Protected Species: Wildlife Acts || EU Birds Directive: Annex II, Section I|| EU Birds Directive: Annex III, Section II || Birds of Conservation Concern: Amber List
Great Cormorant	*Phalacrocorax carbo*	Protected Species: Wildlife Acts || Birds of Conservation Concern: Amber List
Great Crested Grebe	*Podiceps cristatus*	Protected Species: Wildlife Acts || Birds of Conservation Concern: Amber List
House Martin	*Delichon urbicum*	Protected Species: Wildlife Acts || Birds of Conservation Concern: Amber List
House Sparrow	*Passer domesticus*	Protected Species: Wildlife Acts || Birds of Conservation Concern: Amber List
Lesser Black-backed Gull	*Larus fuscus*	Protected Species: Wildlife Acts || Birds of Conservation Concern: Amber List
Little Egret	*Egretta garzetta*	Protected Species: Wildlife Acts || EU Birds Directive: Annex I Bird Species
Little Grebe	*Tachybaptus ruficollis*	Protected Species: Wildlife Acts || Birds of Conservation Concern: Amber List
Mallard	*Anas platyrhynchos*	Protected Species: Wildlife Acts || EU Birds Directive: Annex II, Section I|| EU Birds Directive: Annex III, Section I
Mew Gull	*Larus canus*	Protected Species: Wildlife Acts || Birds of Conservation Concern: Amber List
Mute Swan	*Cygnus olor*	Protected Species: Wildlife Acts || Birds of Conservation Concern: Amber List
Northern Lapwing	*Vanellus vanellus*	Protected Species: Wildlife Acts || EU Birds Directive: Annex II, Section II Bird Species || Birds of Conservation Concern: Red List
Northern Shoveler	*Anas clypeata*	Protected Species: Wildlife Acts || EU Birds Directive: Annex II, Section I|| Protected Species: EU Birds Directive >> Annex III, Section III Bird Species || Birds of Conservation Concern: Red List
Red-breasted Merganser	*Mergus serrator*	Protected Species: Wildlife Acts || EU Birds Directive: Annex II, Section II Bird Species
Rock Pigeon	*Columba livia*	Protected Species: Wildlife Acts || EU Birds Directive: Annex II, Section I Bird Species
Sand Martin	*Riparia riparia*	Protected Species: Wildlife Acts || Birds of Conservation Concern: Amber List
Sky Lark	*Alauda arvensis*	Protected Species: Wildlife Acts || Birds of Conservation Concern: Amber List
Snowy Owl	*Bubo scandiaca*	Protected Species: Wildlife Acts || EU Birds Directive: Annex I Bird Species || Birds of Conservation Concern: Amber List
Spotted Flycatcher	*Muscicapa striata*	Protected Species: Wildlife Acts || Birds of Conservation Concern: Amber List
Tufted Duck	*Aythya fuligula*	Protected Species: Wildlife Acts || EU Birds Directive: Annex II, Section I|| EU Birds Directive:

Common Name	Scientific Name	Conservation Status
		Annex III, Section II || Birds of Conservation Concern: Amber List
Water Rail	*Rallus aquaticus*	Protected Species: Wildlife Acts || Birds of Conservation Concern: Amber List
Whinchat	*Saxicola rubetra*	Protected Species: Wildlife Acts || Birds of Conservation Concern: Amber List
Whooper Swan	*Cygnus cygnus*	Protected Species: Wildlife Acts || EU Birds Directive: Annex I Bird Species || Birds of Conservation Concern: Amber List
Crustaceans		
Freshwater White-clawed Crayfish	*Austropotamobius pallipes*	EU Habitats Directive: Annex II || Protected Species: EU Habitats Directive >> Annex V || Protected Species: Wildlife Acts
Molluscs		
Geyer's Whorl Snail	*Vertigo*	EU Habitats Directive: Annex II || Protected Species: Wildlife Acts || Vulnerable
Moss		
Large White-moss	*Leucobryum glaucum*	EU Habitats Directive: Annex IV || Least concern
Terrestrial mammals		
Brown Long-eared Bat	*Plecotus auritus*	EU Habitats Directive: Annex IV || Protected Species: Wildlife Acts
Daubenton's Bat	*Myotis daubentonii*	EU Habitats Directive: Annex IV || Protected Species: Wildlife Acts
Eurasian Badger	*Meles meles*	Protected Species: Wildlife Acts
Eurasian Pygmy Shrew	*Sorex minutus*	Protected Species: Wildlife Acts
European Otter	*Lutra lutra*	EU Habitats Directive: Annex II || Protected Species: EU Habitats Directive >> Annex IV || Protected Species: Wildlife Acts
Lesser Noctule	*Nyctalus leisleri*	EU Habitats Directive: Annex IV || Protected Species: Wildlife Acts
Pine Marten	*Martes martes*	EU Habitats Directive: Annex V || Protected Species: Wildlife Acts
Pipistrelle	*Pipistrellus pipistrellus sensu lato*	EU Habitats Directive: Annex IV || Protected Species: Wildlife Acts
Soprano Pipistrelle	*Pipistrellus pygmaeus*	EU Habitats Directive: Annex IV || Protected Species: Wildlife Acts
West European Hedgehog	*Erinaceus europaeus*	Protected Species: Wildlife Acts

*Polygon was hand-drawn utilising NBDC's 'report by polygon' tool, it was drawn with a buffering distance of approximately 2km from the entire survey area, which encapsulates Lough Funshinagh and the Cross river.

Table 3. 13 NBDC records of threatened species within polygon* which traverses Hectads M95, M94, M93, M84, N04 & N03

Common Name	Scientific Name	Conservation Status
European Eel	*Anguilla anguilla*	Critically Endangered
Blue Fleabane	*Erigeron acer*	Least concern
Green-winged Orchid	*Orchis morio*	Vulnerable
Dingy Skipper	*Erynnis tages*	Near threatened
Small Blue	*Cupido minimus*	Endangered
Small Heath	*Coenonympha pamphilus*	Near threatened
Scarce Emerald Damselfly	*Lestes dryas*	Near threatened
Large Red Tailed Bumble Bee	*Bombus*	Near threatened
Moss Carder-bee	*Bombus*	Near threatened
Anomalous Flapwort	*Mylia anomala*	Least concern
Bog Notchwort	*Cladopodiella fluitans*	Least concern
Bog-moss Flapwort	*Odontoschisma sphagni*	Least concern
Bristly Fingerwort	*Kurzia pauciflora*	Least concern
Common Pouchwort	*Calypogeia fissa*	Least concern
Forcipated Pincerwort	*Cephalozia connivens*	Least concern
Matchstick Flapwort	*Odontoschisma denudatum*	Least concern
Common Whorl Snail	*Vertigo*	Near threatened
English Chrysalis Snail	*Leiostyla*	Vulnerable

Common Name	Scientific Name	Conservation Status
Heath Snail	*Helicella itala*	Vulnerable
Marsh Whorl Snail	*Vertigo*	Vulnerable
Striated Whorl Snail	*Vertigo*	Near threatened
Whirlpool Ramshorn	*Anisus*	Vulnerable
Archangelic Thread-moss	*Bryum archangelicum*	Least concern
Austin's Bog-moss	*Sphagnum austinii*	Least concern
Bog Groove-moss	*Aulacomnium palustre*	Least concern
Broom Fork-moss	*Dicranum scoparium*	Least concern
Chalk Hook-moss	*Drepanocladus sendtneri*	Near threatened
Dwarf Swan-neck Moss	*Campylopus pyriformis*	Least concern
Feathery Bog-moss	*Sphagnum cuspidatum*	Least concern
Fern-leaved Hook-moss	*Cratoneuron filicinum*	Least concern
Flat-topped Bog-moss	*Sphagnum fallax*	Least concern
Heath Plait-moss	*Hypnum jutlandicum*	Least concern
Heath Star Moss	*Campylopus introflexus*	Least concern
Hooded Bristle-moss	*Orthotrichum cupulatum*	Least concern
Intermediate Hook-moss	*Drepanocladus cossonii*	Least concern
Magellanic Bog-moss	*Sphagnum magellanicum*	Least concern
Papillose Bog-moss	*Sphagnum papillosum*	Least concern
Pointed Spear-moss	*Calliergonella cuspidata*	Least concern
Polytrichum commune var. commune	-	Least concern
Red-stemmed Feather-moss	*Pleurozium schreberi*	Least concern
Rigid Beard-moss	*Didymodon rigidulus*	Least concern
Rusty Bog-moss	*Sphagnum fuscum*	Least concern
Sessile Grimmia	*Schistidium apocarpum*	Least concern
Silky Wall Feather-moss	*Homalothecium sericeum*	Least concern
Soft Bog-moss	*Sphagnum tenellum*	Least concern
Sphagnum subnitens var. subnitens	-	Least concern
Strict Haircap	*Polytrichum strictum*	Least concern
Tall-clustered Thread-moss	*Bryum pallescens*	Least concern
Starry Stonewort	*Nitellopsis obtusa*	Data deficient

*Polygon was hand-drawn utilising NBDC's 'report by polygon' tool, it was drawn with a buffering distance of approximately 2km from the entire survey area, which encapsulates Lough Funshinagh and the Cross river.

3.2.5 Invasive Alien Species Records

A search of the NBDC website was conducted with a focus on records of Invasive Alien Species recorded from the Third Schedule of the European Communities Regulations 2011 (S.I. 477 of 2015) in hectads M94 and M95. The results of the database search are provided below in **Table 3. 14.**

Table 3. 14 Third Schedule non-native invasive species records for hectads M94 and M95

Common Name	Scientific Name	Conservation Status
Roach	*Rutilus rutilus*	Medium Impact Invasive Species || Regulation S.I. 477 (Ireland)
-	*Arthurdendyus triangulatus*	High Impact Invasive Species
Butterfly-bush	*Buddleja davidii*	Medium Impact Invasive Species
Cherry Laurel	*Prunus laurocerasus*	High Impact Invasive Species
Himalayan Honeysuckle	*Leycesteria formosa*	Medium Impact Invasive Species
Indian Balsam	*Impatiens glandulifera*	High Impact Invasive Species || Regulation S.I. 477 (Ireland)
Japanese Knotweed	*Fallopia japonica*	High Impact Invasive Species || Regulation S.I. 477 (Ireland)
Nuttall's Waterweed	*Elodea nuttallii*	High Impact Invasive Species || Regulation S.I. 477 (Ireland)
Pampas-grass	*Cortaderia selloana*	Medium Impact Invasive Species
Sycamore	*Acer pseudoplatanus*	Medium Impact Invasive Species
Traveller's-joy	*Clematis vitalba*	Medium Impact Invasive Species
Wild Parsnip	*Pastinaca sativa*	Medium Impact Invasive Species
Jenkins' Spire Snail	*Potamopyrgus antipodarum*	Medium Impact Invasive Species

Common Name	Scientific Name	Conservation Status
Wrinkled Snail	*Candidula intersecta*	Medium Impact Invasive Species
Zebra Mussel	*Dreissena*	High Impact Invasive Species || Regulation S.I. 477 (Ireland)
American Mink	*Mustela vison*	High Impact Invasive Species || Regulation S.I. 477 (Ireland)
Eastern Grey Squirrel	*Sciurus carolinensis*	High Impact Invasive Species || Invasive Species: Invasive Species >> EU Regulation No. 1143/2014 || Regulation S.I. 477 (Ireland)
Greater White-toothed Shrew	*Crocidura russula*	Medium Impact Invasive Species

3.2.6 Bat Conservation Ireland Database

A search for records of bat activity and roosts within a 10km radius of the study area was conducted using the Bat Conservation Ireland (BCI) database and NPWS records. A number of observations have been recorded within 10km of the survey area (**Table 3. 15** below). From the NBDC bat landscape suitability mapping, a Bat Landscape Suitability Index (Lundy et al., 2011) score of 20.78 on the index (from 0-59) indicates that there are suitable habitats within the study area for bats.

Bat landscape suitability, for all bat species, is between 21.3-28.1 for the Lough Funshinagh survey area. The Cross river survey area traverses 3 zones of bat landscape suitability, ranging between 21.3 to 58.5. The NW area of the Cross river has a landscape suitability index between 21.3 to 28.1, while the SE of this survey area traverses areas with a suitability index between 28.1 to 58.5.

Table 3. 15 BCI data for the survey area in the surrounding area

Survey Type	Location	Species Recorded	Survey
Quadrants	M946469	Common Pipistrelle (*Pipistrellus pipistrellus sensu stricto*)	BATLAS 2020
Quadrants	M950470	Common Pipistrelle (*Pipistrellus pipistrellus sensu stricto*)	BATLAS 2020
Quadrants	M968472	Common Pipistrelle (*Pipistrellus pipistrellus sensu stricto*)	BATLAS 2020
Quadrants	M943496	Soprano Pipistrelle (*Pipistrellus pygmaeus*)	BATLAS 2020
Quadrants	M946469	Soprano Pipistrelle (*Pipistrellus pygmaeus*)	BATLAS 2020
Quadrants	M950470	Soprano Pipistrelle (*Pipistrellus pygmaeus*)	BATLAS 2020
Quadrants	M968472	Soprano Pipistrelle (*Pipistrellus pygmaeus*)	BATLAS 2020
Quadrants	M953511	Lesser Noctule (*Nyctalus leisleri*)	BATLAS 2020

3.3 EPA Water Quality Data

Lough Funshinagh and the Cross River are located on the Upper Shannon catchment. The Cross river flows for c. 20km until it reaches the upper Shannon within this catchment, this then flows into Lough Derg. The Upper Shannon catchment includes the area drained by the River Shannon and traverse the counties Roscommon, Offaly and Westmeath.

The Environmental Protection Agency (EPA) Envision map viewer was consulted regarding the water quality status of the watercourses within the study area. The Biotic Index of Water Quality (BIWQ) was developed in Ireland by the EPA. Q-values are assigned using a combination of habitat characteristics and the structure of the macro-invertebrate community within the waterbody. Individual macro-invertebrate families are classified according to their sensitivity to organic pollution and the Q-value is assessed based primarily on

their relative abundance within a sample. A number of sampling stations occur along the Cross river, however, there are no Q-values recorded for Lough Funshinagh. Q-values for a number of these sampling stations and their locations in regard to the survey area are shown in **Table 3. 16:**

Table 3. 16 EPA water quality sampling stations

Station Code	Station Location	Up or Downstream of the survey area	Date of last Q Value	Q-Value Rating
RS26C100060	Cross River, c.4km south of Lough Funshinagh	Downstream	2023	3-4 (Moderate)
RS26C100070	Cross River, c.4.8km south of Lough Funshinagh	Downstream	2011	4 (Good)
RS26C100100	Cross River, c.5.8km south of Lough Funshinagh	Downstream	2002	4 (Good)
RS26C100200	Cross River, c.8.6km SSE of Lough Funshinagh	Downstream	2023	4 (Good)
RS26M040200	Cross River, c.9.3km SSE of Lough Funshinagh	Downstream	2023	3 (Poor)
RS26C100300	Cross River, c.11.5km SE of Lough Funshinagh	Downstream	2023	4 (Good)
RS26C100400	Cross River, c.14km SE of Lough Funshinagh	Downstream	2023	3 (Poor)
RS26S021730	Cross River, c.13.5km SE of Lough Funshinagh	Upstream	1990	3-4 (Moderate)
RS26S021720	Cross River, c.13km SE of Lough Funshinagh	Upstream	2023	4 (Good)
RS26S021705	Cross River, c.12.8km SE of Lough Funshinagh	Upstream	1990	3 (Poor)

River Basin Management Plans (RBMPs) have been published for all River Basin Districts in Ireland in accordance with the requirements of the Water Framework Directive, now replaced by a National River Basin Management Plan 2018-2021, soon to be superseded by the published Draft River Basin Management Plan 2022-2027 once approved. The online EPA Geo Portal provides access to water quality information at individual waterbody level and at Water Management Unit level for all the River Basin Districts in Ireland. Waterbodies can relate to surface waters (these include rivers, lakes, estuaries [transitional waters] and coastal waters) or to groundwater. See accompanying **Baseline Aquatic Survey of the Cross River** for a full assessment of the water quality.

3.4 Consultation

Information requests were sent to the corresponding bodies related to protected habitats and species within the survey area and its surroundings for the purposes of completeness in establishing the environmental and ecological baseline. The following bodies were contacted for further information:

Table 3. 17 Further information requests for the survey area

Contacted body	Date
NPWS: Cross river & Lough Funshinagh data request	30th July 2024
NPWS: Lough Funshinagh data request	29th February 2024
Birdwatch Ireland: Countryside Bird Survey (CBS) data request for Cross river and Lough Funshinagh	30th July 2024
Birdwatch Ireland: Irish Wetland Bird Survey (I-WeBS) data request for Cross river and Lough Funshinagh	30th July 2024

4. FIELD SURVEYS

4.1 Habitats and Flora

A habitat survey was undertaken within the surrounding habitats of Lough Funshinagh and the Cross river. The habitats identified during these surveys are listed in **Table 3. 18**Error! Reference source not found. below. Habitat classifications and codes correspond to those described in '*A Guide to Habitats in Ireland*' (Fossitt, 2000). The habitats identified during site visits are shown on a habitat map to illustrate the habitats encountered during the field surveys. A detailed description of the region and its flora is also provided below.

Table 3. 18 Habitats recorded during the surveys

Habitat	Code
Arable crops	BC1
Stone walls and other stonework	BL1
Earth banks	BL2
Buildings and artificial surfaces	BL3
Spoil and bare ground	ED2
Recolonising bare ground	ED3
Exposed calcareous rock	ER2
Turloughs	FL6
Depositing/lowland rivers	FW2
Drainage ditches	FW4
Improved agricultural grassland	GA1
Amenity grassland (improved)	GA2
Marsh	GM1
Dry calcareous and neutral grassland	GS1
Dry meadows and grassy verges	GS2
Wet grassland	GS4
(Mixed) broadleaved woodland	WD1
Conifer plantation	WD4
Hedgerows	WL1
Treelines	WL2
Scrub	WS1

4.1.1 Fossitt Habitats

Improved agricultural grassland GA1

This category is used for intensively managed or highly modified agricultural grassland that has been reseeded and/or regularly fertilised and is now heavily grazed and/or used for silage making (Fossitt, 2000). Improved agricultural grassland was found surrounding the Cross river with species including Perennial Rye Grass (*Lolium perenne*), Yorkshire fog (*Holcus lanatus*), Bent (*Agrostis* spp.), False oat grass (*Arrhenatherum elatius*), Cocks foot (*Dactylis glomerata*), Thistle (*Cirsium* spp.), Knapweed (*Centaurea nigra*), Self-heal (*Prunella vulgaris*), Creeping thistle (*Cirsium arvense*), Silverweed (*Potentilla anserina*), Red clover (*Trifolium pratense*), White clover (*Trifolium repens*), Meadow buttercup (*Ranunculus acris*) and Lady's mantle (*Alchemilla mollis*). Other improved agricultural grasslands were mosaiced with wet grassland species including Common rush (*Juncus effusus*), Meadowsweet (*Filipendula ulmaria*) and Docks (*Rumex* spp.).

Improved agricultural grassland surrounding Lough Funshinagh included Perennial Rye Grass (*Lolium perenne*) with some other grass species such as Bent (*Agrostis* spp.), Couch-grass (*Elytrigia repens*), Yorkshire fog (*Holcus lanatus*), Cocks foot (*Dactylis glomerata*), Crested dogs tail (*Cynosurus cristatus*). Other flora found here include Creeping buttercup (*Ranunculus repens*), Greater Plantain (*Plantago major*), Creeping Thistle (*Cirsium arvense*), Spear Thistle (*Cirsium vulgare*), Nettle (*Urtica* dioica), Docks (*Rumex* spp.), Common rush (*Juncus effusus*), Red clover (*Trifolium pratense*) and White clover (*Trifolium repens*). Due to the high-water levels of Lough Funshinagh this habitat was partly submerged with no transitional marginal zone along the shoreline.

Dry calcareous and neutral grassland GS1

This category is used for unimproved or semi-improved dry grassland that may be either calcareous or neutral, but not acid. It is associated with low intensity agriculture and typically occurs on free-draining mineral soils of various depths (Fossitt, 2000). This habitat was recorded surrounding some areas of the Cross river. Species recorded within include Bent (*Agrostis* spp.), Perennial Rye Grass (*Lolium perenne*), Yorkshire fog (*Holcus lanatus*), Cocks foot (*Dactylis glomerata*), Crested dogs tail (*Cynosurus cristatus*), Meadow buttercup (*Ranunculus acris*), Creeping buttercup (*Ranunculus repens*), Ribwort plantain (*Plantago lanceolata*), Hawkweed (*Hieracium hibernicum*), Creeping Thistle (*Cirsium arvense*), Spear Thistle (*Cirsium vulgare*), Nettle (*Urtica* dioica), Docks (*Rumex* spp.), Common rush (*Juncus effusus*), Self-heal (*Prunella vulgaris*), Yarrow (*Achillea millefolium*), Pignut (*Conopodium majus*), Moss (*Bryophyta* spp.), Red clover (*Trifolium pratense*) and White clover (*Trifolium repens*).

Dry calcareous and neutral grassland surrounding Lough Funshinagh included Cock's-foot (*Dactylis glomerata*), Meadow-grasses (*Poa* spp.), Perennial ryegrass (*Lolium perenne*), Yorkshire-fog (*Holcus lanatus*), Common Bent (*Agrostis capillaris*), Timothy (*Phleum pratense*), Crested Dog's-tail (*Cynosurus cristatus*), Sweet vernal-grass (*Anthoxanthum odoratum*), Red clover (*Trifolium pratense*), White clover (*Trifolium repens*), Yarrow (*Achillea millefolium*), Sticky mouse-ear chickweed (*Cerastium glomeratum*), Common Knapweed (*Centaurea nigra*), Selfheal (*Prunella vulgaris*), Ribwort plantain (*Plantago lanceolata*), Field Scabious (*Knautia arvensis*), Hawkweed (*Hieracium hibernicum*), Meadow buttercup (*Ranunculus acris*), Creeping buttercup (*Ranunculus repens*), Silverweed (*Potentilla anserina*), Common daisy (*Bellis perennis*), Creeping Thistle (*Cirsium arvense*), Broad-leaved dock (*Rumex obtusifolius*), Dandelion (*Taraxacum* agg.), Nettle (*Urtica dioica*), Common rush (*Juncus effusus*), Ragwort (*Senecio jacobaea*), Teasel (*Dipsacus* spp.), Chamomile (*Chamaemelum nobile*), Common Bird's-foot-trefoil (*Lotus corniculatus*) and Lady's Bedstraw (*Galium verum*). The majority of fields with this habitat were grazed by livestock. Only a small area of Orchids were observed in a secluded field approximately 40m from the southern shoreline of Lough Funshinagh. This field was less actively grazed by livestock hence the increased flora diversity.

Due to the high-water levels of Lough Funshinagh GS1 habitat was partly submerged with no transitional marginal zone along the shoreline.

Dry meadows and grassy verges GS2

Dry meadows that are rarely fertilised or grazed and are mown only once or twice a year for hay are now rare in Ireland. Most have been improved for agriculture and this type of grassland is now best represented on grassy roadside verges, on the margins of tilled fields, on railway embankments, in churchyards and cemeteries, and in some neglected fields or gardens. These areas are occasionally mown (or treated with herbicides in the case of some railway embankments), and there is little or no grazing or fertiliser application (Fossitt, 2000). This habitat could be found in small pockets surrounding the Cross river with species including Bent (*Agrostis* spp.), Perennial Rye Grass (*Lolium perenne*), Yorkshire fog (*Holcus lanatus*), Cocks foot (*Dactylis*

glomerata), Meadow Foxtail (*Alopecurus pratensis*), False Oat-grass (*Arrhenatherum elatius*), Reed canary grass (*Phalaris arundinacea*), Yellow iris (*Iris pseudacorus*), Marsh woundwort (*Stachys palustris*), Nettle (*Urtica dioica*), Ragwort (*Jacobaea vulgaris*), Meadowsweet (*Filipendula ulmaria*), Docks (*Rumex* spp.), Creeping Thistle (*Cirsium arvense*), Spear Thistle (*Cirsium vulgare*), Great willow herb (*Epilobium hirsutum*), False oat grass (*Arrhenatherum elatius*), Cleavers (*Galium aparine*), False hedge bindweed (*Calystegia sepium*) and Bramble (*Rubus* spp.).

Dry meadows and grassy verges surrounding Lough Funshinagh included Perennial Rye Grass (*Lolium perenne*), Yorkshire fog (*Holcus lanatus*), Bent (*Agrostis* spp.), Cocks foot (*Dactylis glomerata*), Meadow Foxtail (*Alopecurus pratensis*), Nettle (*Urtica dioica*), Burdock (*Arctium*), Thistle (*Cirsium* spp.), Cleavers (*Galium aparine*), Daisy (*Bellis perennis*) and Vetch (*Vicia* spp.). This was not a common habitat around Lough Funshinagh but mostly located along road verges.

Wet grassland GS4

This type of grassland can be found on flat or sloping ground in upland and lowland areas. It occurs on wet or waterlogged mineral or organic soils that are poorly-drained or, in some cases, subjected to seasonal or periodic flooding (Fossitt, 2000). Wet grassland was recorded surrounding the Cross river as well as L. Funshinagh. Species recorded include Yorkshire fog (*Holcus lanatus*), Perennial Rye Grass (*Lolium perenne*), Cocks foot (*Dactylis glomerata*), Bent (*Agrostis* spp.), Sedges (*Carex* spp.), Common Rush (*Juncus effusus*), Articulated Rush (*Juncus articulatus*), Knapweed (*Centaurea nigra*), Yellow iris (*Iris pseudacorus*), Purple vetch (*Vicia benghalensis*), Silverweed (*Potentilla anserina*), White clover (*Trifolium repens*), Horse tail (*Equisetum arvense*), Meadowsweet (*Filipendula ulmaria*), Marsh thistle (*Cirsium palustre*), Nettle (*Urtica dioica*), Creeping buttercup (*Ranunculus repens*), Speedwell (*Veronica* spp.) and Great willow herb (*Epilobium hirsutum*).

Wet grassland surrounding Lough Funshinagh included Yorkshire fog (*Holcus lanatus*), Perennial Rye Grass (*Lolium perenne*), Bent (*Agrostis* spp.), Sedges (*Carex* spp.), Common Rush (*Juncus effusus*), Articulated Rush (*Juncus articulatus*), Knapweed (*Centaurea nigra*), Yellow Iris (*Iris pseudacorus*), Silverweed (*Potentilla anserina*, Horsetail (*Equisetum arvense*), Silverweed (*Potentilla anserina*), Meadowsweet (*Filipendula ulmaria*), Marsh thistle (*Cirsium palustre*), Dock (*Rumex* spp.), Horsetail (*Equisetaceae* agg.), Sweet grass (*Glyceria* sp.), Creeping Cinquefoil (*Potentilla reptans*). This habitat was found around Lough Funshinagh however is not a dominant habitat at Lough Funshinagh.

Marsh GM1

Marsh is found on level ground near river banks, lakeshores, and in other places where mineral or shallow peaty soils are waterlogged, and where the water table is close to ground level for most of the year (Fossitt, 2000). This habitat was found surrounding Lough Funshinagh with species comprising of Common rush (Juncus effusus), Articulated Rush (*Juncus articulatus*), Jointed Rush (*Jancus articultas*), Floating sweet-grass (*Glyceria fluitans*), Water smartweed (*Persicaria amphibia*), Water dock (*Rumex hydrolapathum*), Sedges (*Carex* spp.), Creeping Thistle (*Cirsium arvense*), Marsh Thistle (*Cirsium palustre*), Marsh Bedstraw (*Galium boreale*), Nettle (*Urtica dioica*), Crested Dog's-tail (*Cynosurus cristatus*), Common bent (*Agrostis capillaris*), Creeping buttercup (*Ranunculus repens*), Yorkshire-fog (*Holcus lanatus*), Yellow Iris (*Iris pseudacorus*), Meadowsweet (*Filipendula ulmaria*), Horsetail (*Equisetum arvense*), Moss (*Bryophyta* spp.), Marsh orchid (*Dactylorhiza* spp.), Marsh Woundwort (*Stachys palustris*), Marsh Marigold (*Caltha palustris*), Water pepper (*Persicaria hydropiper*), Water Figwort (*Scrophularia auriculata*), Lesser Marshwort (*Helosciadium inundatum*), Water mint (*Mentha aquatica*) and Clustered Dock (*Rumex conglomeratus*).

Amenity grassland (improved) GA2

This type of grassland is improved, or species-poor, and is managed for purposes other than grass production. It includes amenity, recreational or landscaped grasslands, but excludes farmland. Most areas of amenity grassland have been reseeded and are regularly mown to maintain very short swards (Fossitt, 2000). This habitat was recorded within the surrounding habitats of both the Cross river. It located within the gardens of residential houses around Lough Funshinagh.

Hedgerows WL1

Linear strips of shrubs, often with occasional trees, that typically form field or property boundaries. Most hedgerows originate from planting, and many occur on raised banks of earth that are derived from the excavation of associated drainage ditches (Fossitt, 2000). Hedgerows were found bordering field boundaries surrounding the Cross river, species found included Gorse (*Ulex europaeus*), Bramble (*Rubus* spp.), Nettle (*Urtica dioica*), False hedge bindweed (*Calystegia sepium*), Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*), Willow (*Salix* spp.), Elder (*Sambucus nigra*), Lords and ladies (*Arum maculatum*), Lilac (*Syringa vulgaris*), Snowberry (*Symphoricarpos albus*) and Blueberry (*Vaccinium* spp.).

Hedgerows are along the field boundaries that surround Lough Funshinagh. The tree species comprising of Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*), Willow (*Salix* spp.), Elder (*Sambucus nigra*), Holly (*Ilex aquifolium*), Elm (*Ulmus* sp.), Hazel (*Corylus avellana*), Sycamore (*Acer pseudoplatanus*), Ash (*Fraxinus excelsior*) and Cypress (*Cupressus* spp.). With Dog-rose (*Rosa canina* agg.), Gorse (*Ulex europaeus*), Snowberry (*Symphoricarpos albus*), Privet (*Ligustrum* sp.), Honeysuckle (*Lonicera periclymenum*), Bramble (*Rubus* spp.), Nettle (*Urtica dioica*), Ivy (*Hedera helix*), Foxglove (*Digitalis purpurea*), Bindweed (*Calystegia* spp.), Herb-Robert (*Geranium robertianum*), Hogweed (*Heracleum sphondylium*), Lords-and-ladies (*Arum maculatum*), Primrose (*Primula vulgaris*), Bracken (*Pteridium aquilinum*), Buckler-fern (*Dryopteris* spp.), Hart's Tongue Fern (*Asplenium scolopendrum*), Wild raspberry (*Rubus idaeus*), Cleavers (*Galium aparine*), Cow Parsley (*Anthriscus sylvestris*) and Lesser Stitchwort (*Stellaria graminea*). The hedgerows along the shoreline of Lough Funshinagh are dead or dying due to prolonged submersion under water or submersion of the root zone. Hawthorn and Willow are less susceptible to stress from submersion however Gorse, Bramble and Ivy were showing signs of stress due to submersion of the root zone.

Treelines WL2

A treeline is a narrow row or single line of trees that is greater than 5m in height and typically occurs along field or property boundaries. This category includes tree-lined roads or avenues, narrow shelter belts with no more than a single line of trees, and overgrown hedgerows that are dominated by trees (Fossitt, 2000). This habitat was commonly found along the Cross river, along field boundaries and lining the river itself. Species found included Ash (*Fraxinus excelsior*), Hawthorn (*Crataegus monogyna*), Beech (*Fagus sylvatica*), Ivy (*Hedera helix*), Horse Chestnut (*Aesculus hippocastanum*), Rowan (*Sorbus aucuparia*), Sycamore (*Acer pseudoplatanus*), Willow (*Salix* spp.), Elder (*Sambucus nigra*), Alder (*Alnus glutinosa*), Poplar (*Populus* spp.), Birch (*Betula* spp.), Blackthorn (*Prunus spinosa*), Cherry laurel (*Prunus laurocerasus*) and Sitka spruce (*Picea sitchensis*). Other species including Lime (*Tilia* spp.), Norway maple (*Acer platanoides*) and Japanese Cherry (*Cerasus serrulate*) were recorded planted within GA2.

Treelines were also found around Lough Funshinaghs with species including Ash (*Fraxinus excelsior*), Oak (*Quercus* spp.), Scots Pine (*Pinus sylvestris*), Sitka spruce (*Picea sitchensis*), Alder (*Alnus glutinosa*), Larch (*Larix decidua*), Sycamore (*Acer pseudoplatanus*), Beech (*Fagus sylvatica*), Crab Apple (*Malus sylvestris*), Cypress

(*Cupressus* spp.), Monkey Puzzle (*Araucaria araucana*), Rowan (*Sorbus aucuparia*), Hawthorn (*Crataegus monogyna*) and Horse Chestnut (*Aesculus hippocastanum*). There are a large number of deadline treelines along the shoreline of Lough Funshinagh due to prolonged submersion under water.

Exposed calcareous rock ER2

This category is used for all natural and artificial exposures of calcareous bedrock and loose rock, and any other exposures of basic rock (Fossitt, 2000). This minor habitat was recorded in the surrounding environment of Lough Funshinagh, with flora such as Moss (*Bryophyta*), Herb-robert *(Geranium robertianum*) and Spline wort (*Hypericum* spp.) covering this habitat. Bracken (*Pteridium aquilinum*) was dominant around this habitat.

Spoil and bare ground ED2

This category includes heaps of spoil and rubble, and other areas of bare ground that are either very transient in nature or persist for longer periods of time because of ongoing disturbance or maintenance. Spoil is generally associated with the excavation or construction of roads and buildings, or with drainage and dredging activities. Once the disturbance ends, spoil is readily colonised by plants (Fossitt, 2000). This habitat was founded within farms surrounding the Cross river, with little to no species present except for Pineappleweed (*Matricaria discoidea*).

Recolonising bare ground ED3

This category is used for any areas where bare or disturbed ground, derelict sites or artificial surfaces of tarmac, concrete or hard core have been invaded by herbaceous plants (Fossitt, 2000). This habitat was recorded in some areas surrounding Lough Funshinagh that was previously disturbed and included flora such as Colt's Foot (*Tussilago farfara*), Nettle (*Urtica dioica*), Dandelion (*Taraxacum* spp.), Pineappleweed (*Matricaria discoidea*), Silverweed (*Potentilla anserina*), Red clover (*Trifolium pratense*), White clover (*Trifolium repens*), Ribwort plantain (*Plantago lanceolata*), Chickweed (*Stellaria media*), Cudweed (*Gnaphalium* spp.), Red shank (*Persicaria maculosa*), Ribwort Plantain (*Plantago lanceolata*), Sow-thistle (*Sonchus* spp.), Common Fumitory (*Fumaria officinalis*), Knotgrass (*Polygonum aviculare*) and Speedwell (*Veronica* spp.).

Arable crops BC1

Agricultural land that is cultivated and managed for the production of arable crops, including cereals (wheat, barley, oats, maize), and root, leaf, energy or fibre crops such as sugar beet, turnips, rape and flax (Fossitt, 2000). Arable crops recorded surrounding the Cross river included White mustard (*Sinapis alba*), Common flax (*Linum usitatissimum*), and Rapeseed (*Brassica napus*). This habitat was not found along the shoreline of Lough Funshinagh.

Stone walls and other stonework BL1

This category incorporates stone walls and most other built stone structures in rural and urban situations (Fossitt, 2000). This habitat included old stone walls found within and bordering field boundaries, stone bridges, stone ruins and old stone monuments which were all found surrounding the Cross river. Bryophyta, Lichen and Ivy were found within this habitat.

Stone walls and other stonework is a dominant feature in the landscape that is found field boundaries surrounding Lough Funshinagh, flora within included Lichens, Bryophyta, Ivy (*Hedera helix*), Spleenwort

(*Asplenium* spp.) and Herb-robert *(Geranium robertianum)*. This habitat was completely submerged in numerous locations around Lough Funshinagh.

Earth banks BL2

Earth banks are a common type of field boundary in many parts of Ireland. Constructed from local materials such as peat, earth, gravel or stone, these narrow linear ridges are often bordered by drainage ditches (Fossitt, 2000). This minor habitat was found in the surrounding environment of Lough Funshinagh.

Buildings and artificial surfaces BL3

This broad category incorporates areas of built land that do not fit elsewhere in the classification. It includes all buildings (domestic, agricultural, industrial and community) (Fossitt, 2000). This habitat was commonly found surrounding the Cross river, in the form of roads, private dwellings and farms. This habitat was found along Lough Funshinagh (residential dwellings, farm buildings, walls and roads). This habitat was submerged by high water levels during the start of the survey season with some areas such as roads, walls and farm building submerged throughout the survey.

Scrub WS1

This broad category includes areas that are dominated by at least 50% cover of shrubs, stunted trees or brambles. The canopy height is generally less than 5m, or 4m in the case of wetland areas (Fossitt, 2000). Small pockets of scrub were recorded surrounding the Cross river, with species including Willow (*Salix* spp.), Bramble (*Rubus* spp.) and False hedge bindweed (*Calystegia sepium*).

Scrub was also recorded along the shoreline of Lough Funshinagh. Flora was dominated by Gorse (*Ulex europaeus*), Blackthorn (*Prunus spinosa*), and Bramble (*Rubus* spp.) with Vetch (*Vicia* spp.), Nettle (*Urtica* dioica), Rosebay Willowherb (*Chamerion angustifolium*) and Bracken (*Pteridium aquilinum*). Scrub along the shoreline of Lough Funshinagh are dead or dying due to prolonged submersion under water or submersion of the root zone.

(Mixed) broadleaved woodland WD1

This general category includes woodland areas with 75-100% cover of broadleaved trees, and 0-25% cover of conifers (Fossitt, 2000). This habitat was recorded in small areas surrounding the Cross river and Lough Funshinagh. Species recorded include Ash (Fraxinus excelsior), Blackthorn (*Prunus spinosa*), Hawthorn (*Crataegus monogyna*), Alder (*Alnus glutinosa*), Sycamore (*Acer pseudoplatanus*) and Elder (*Sambucus nigra*). Mixed broadleaved woodland along the shoreline is showing signs of stress, with species that are water tolerant such as Alder showing sings of prolonged submersion therefore the root zone is not receiving any oxygen.

Conifer plantation WD4

This category is used for areas that support dense stands of planted conifers where the broadleaved component is less than 25% and the overriding interest is commercial timber production. Conifer plantations are characterised by even-aged stands of trees that are usually planted in regular rows, frequently within angular blocks. Species diversity is low and single species stands are common (Fossitt, 2000). Spruce (*Picea* spp.) and Fir (*Abies* spp.) plantations were observed at different locations around Lough Funshinagh. The

edges of the woodlands were submerged with dead trees and more recent flooding starting to stress the plants due to prolonged submergence.

Turlough FL6

Turloughs are ephemeral lakes that occupy basins or depressions in limestone areas, and where water levels fluctuate markedly during the year. They are virtually unique to Ireland and their greatest concentration is in counties Clare, Galway and Roscommon. The general pattern is to flood in winter and dry out in summer, but there may be other sporadic rises in response to high rainfall (Fossitt, 2000). Lough Funshinagh is classified as a Turlough, although it hasn't fully drained since 2016. This corresponds to the Annex I habitat "Turloughs (3180)". The Turlough habitat at Lough Funshinagh was fully submerged with only aquatic flora observed. Fine-leaved Water-dropwort (*Oenanthe aquatica*), Reed Canary-grass (*Phalaris arundinacea*) and Common Club-rush (*Schoenoplectus lacustris*) were observed growing at different locations along the shoreline however they were fully submerged early in the growth season with some plants breaking during strong winds later in the season due to a drop in water levels and the length of the plants. Pondweed (*Potamogeton natans*) was observed in deeper areas of the lough and Amphibious Bistort (*Persicaria amphibia*) in shallow areas. Duckweed (*Lemna* spp.) was prevalent along the shoreline and dominant in areas with less disturbance. The shoreline around Lough Funshinagh was predominately grasslands (GA1) and (GS1) with no transitional zone or marginal aquatic flora. Some previously inundated fields were showing sings of regrowth of recolonising flora such as Dock. There was a thick layer of decomposing vegetation mixed with Bryophyta and exposed soil on the shoreline as the water level dropped.

Drainage ditches FW4

This category includes linear water bodies or wet channels that are entirely artificial in origin, and some sections of natural watercourses that have been excavated or modified to enhance drainage and control the flow of water (Fossitt, 2000). Drainage ditches were recorded and mapped leading into the Cross river at nearly every field boundary. Some of the ditches were narrow and stagnant, while others were as wide as the cross river with a good flow.

The watercourses around Lough Funshinagh were either completely submerged or had extremely low flow within them. Given the modified nature of the channels and the vegetation growth these would be classified as drainage ditches. The flora along the banks that were not submerged included Lesser Celandine (*Ficaria verna*), Wild Angelica (*Angelica Sylvestris*), Willowherb (*Epilobium* spp.), Butterbur (*Petasites hybridus*), Climbing nightshade (*Solanum Dulcamara*), Creeping Yellow-cress (*Rorippa sylvestris*) and Common Valerian (*Valeriana officinalis*). Flora found growing in the drainage ditches included Bulrush (*Typha latifolia*), Duckweed (*Lemna* spp.), Hemlock Water Dropwort (*Oenanthe crocata*), Lesser Water-parsnip (*Berula erecta*), Reeds (*Calamagrostis* spp.), Sweet grass (*Glyceria* sp.), Water mint (*Mentha aquatica*), Fool's-water-cress (*Apium nodiflorum*), Water-cress (*Rorippa nasturtium-aquaticum*), Water forget-me-not (*Myosotis scorpioides*), and Brooklime (*Veronica beccabunga*). Some drainage ditches located further away from the Lough showed signs of hypoxic conditions given the dark colour of the water and biofilm.

Depositing/lowland rivers FW2

This category includes watercourses, or sections of these, where fine sediments are deposited on the riverbed. Depositing conditions are typical of lowland areas where gradients are low, and water flow is slow and sluggish (Fossitt, 2000). The Cross river is an Order 2 river which ultimately drains into the River Shannon. The Cross river has a variety of vegetation within it including Yellow Iris (*Iris pseudacorus*) and Reed canary grass (*Phalaris arundinacea*). Other vegetation recorded surrounding the river includes Meadowsweet (*Filipendula ulmaria*), Water mint (*Mentha aquatica*), Angelica archangelica, Purple loosestrife (*Lythrum salicaria*), Valerian (*Valeriana* spp.), Silverweed (*Potentilla anserina*), Horsetail (*Equisetum arvense*), Blue water speedwell (*Veronica anagallis-aquatica*), Common Rush (*Juncus effusus*), Articulated Rush (*Juncus articulatus*), Cow vetch (*Vicia cracca*), Water forget me-not (*Myosotis scorpioides*), Great willow herb (*Epilobium hirsutum*), Tormentil (*Potentilla erecta*) and Field scabius (*Knautia arvensis*).

The Cross river commenced as a narrow and shallow river, dominated by reed canary grass and yellow iris and as it moved towards the River Shannon it grew wider and deeper. The water was noted as clear throughput the survey and the riverbed as gravelly. There were a number of locations along the Cross river where cows and/or sheep has access to the river, small algal blooms were noted in these areas due to the eutrophication. Generally, the water flow was recorded as slow and during the terrestrial walkover of the river there were some fish (likely Brown trout) were observed within, although this was not the main focus of the survey.

Plate 4. 1 Examples of Improved Agricultural Grassland (GA1) (left) and Wet Grassland (GS4) (right) adjacent to the Cross river

Plate 4. 2 Cross river with stone bridge and stone building (left) and Cross river banks surrounded by agricultural lands (right)

Plate 4. 3 Drainage ditch (FW4) discharging into the Cross river (left) and an example of Stone wall (BL1) adjacent to the Cross River (right)

Plate 4. 4 Sand Martin flying over the Cross river

Plate 4. 5 Example of Agricultural grassland (GA1) with hedgerows (WL1) at the edges of the field (left) and Marsh Thistle (*Cirsium palustre*) (right)

Plate 4. 6 Example of Dry Calcareous Grassland (GS1) and dead water-logged treeline in the Lough (left) and a mature beech treeline bordering a field boundary between L. Funshinagh and the Cross river.

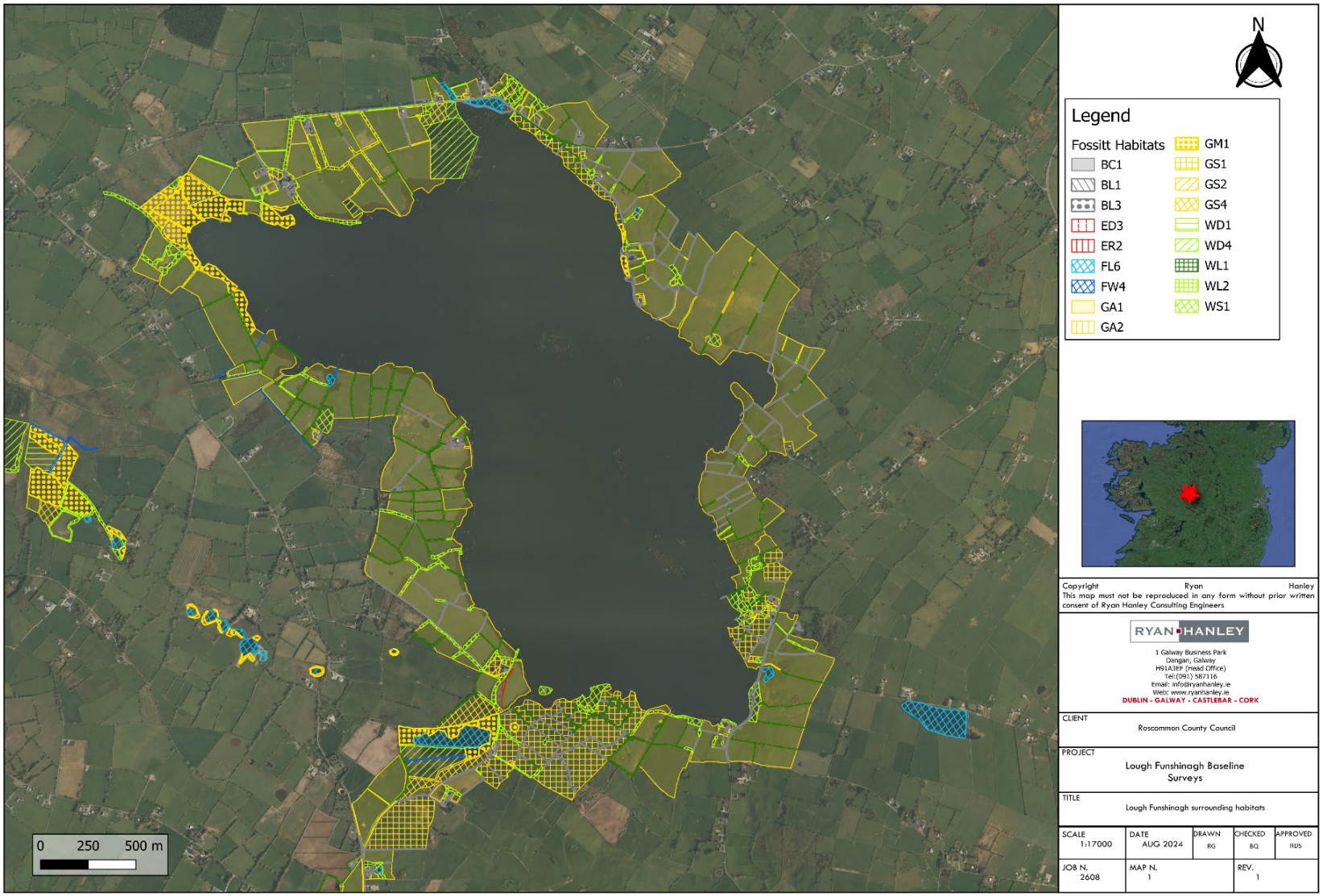

Figure 4. 1 Main Fossitt Habitat classification in the Lough Funshinagh area

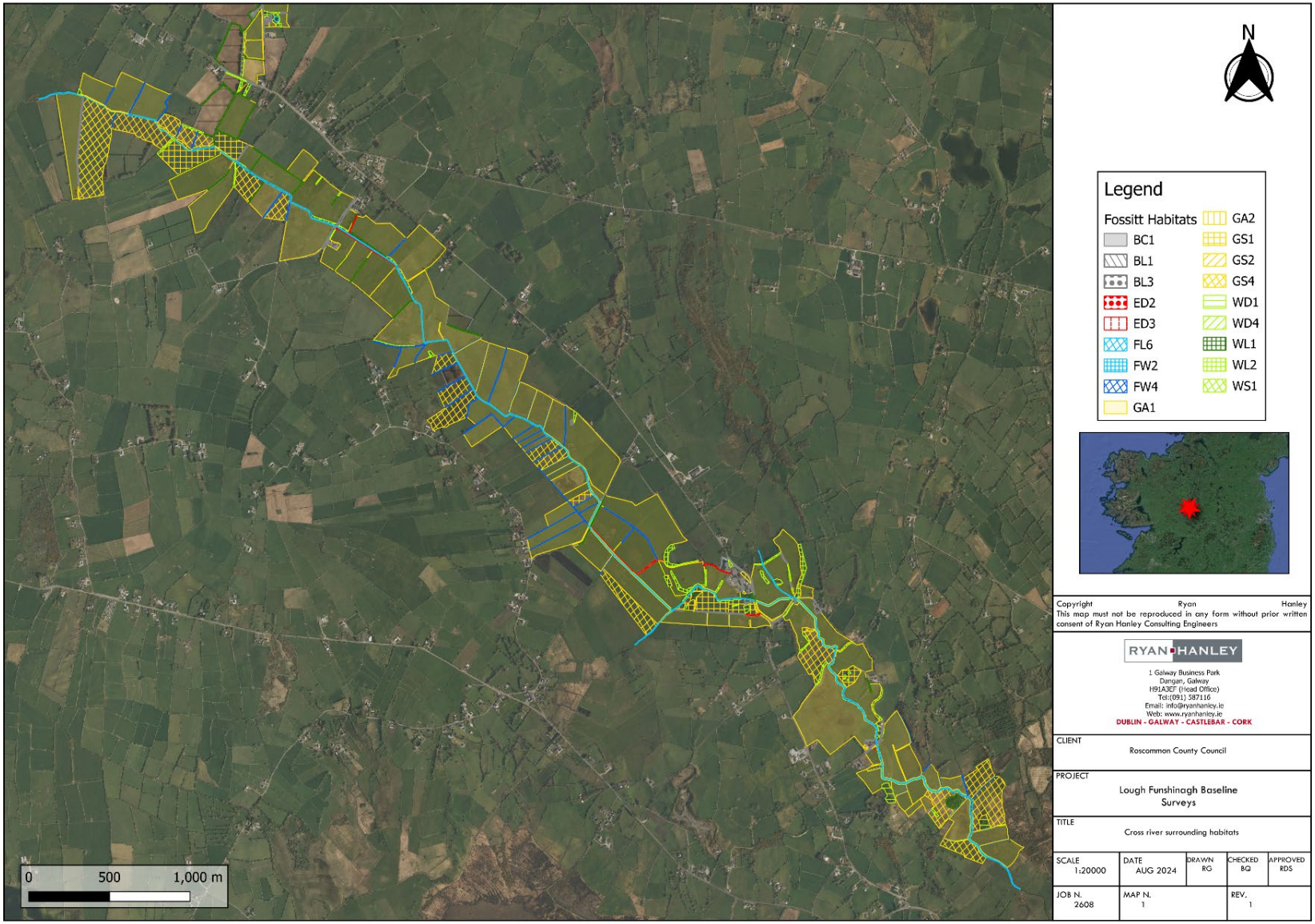

Figure 4. 2 Main Fossitt Habitat classification along a section of the Cross River

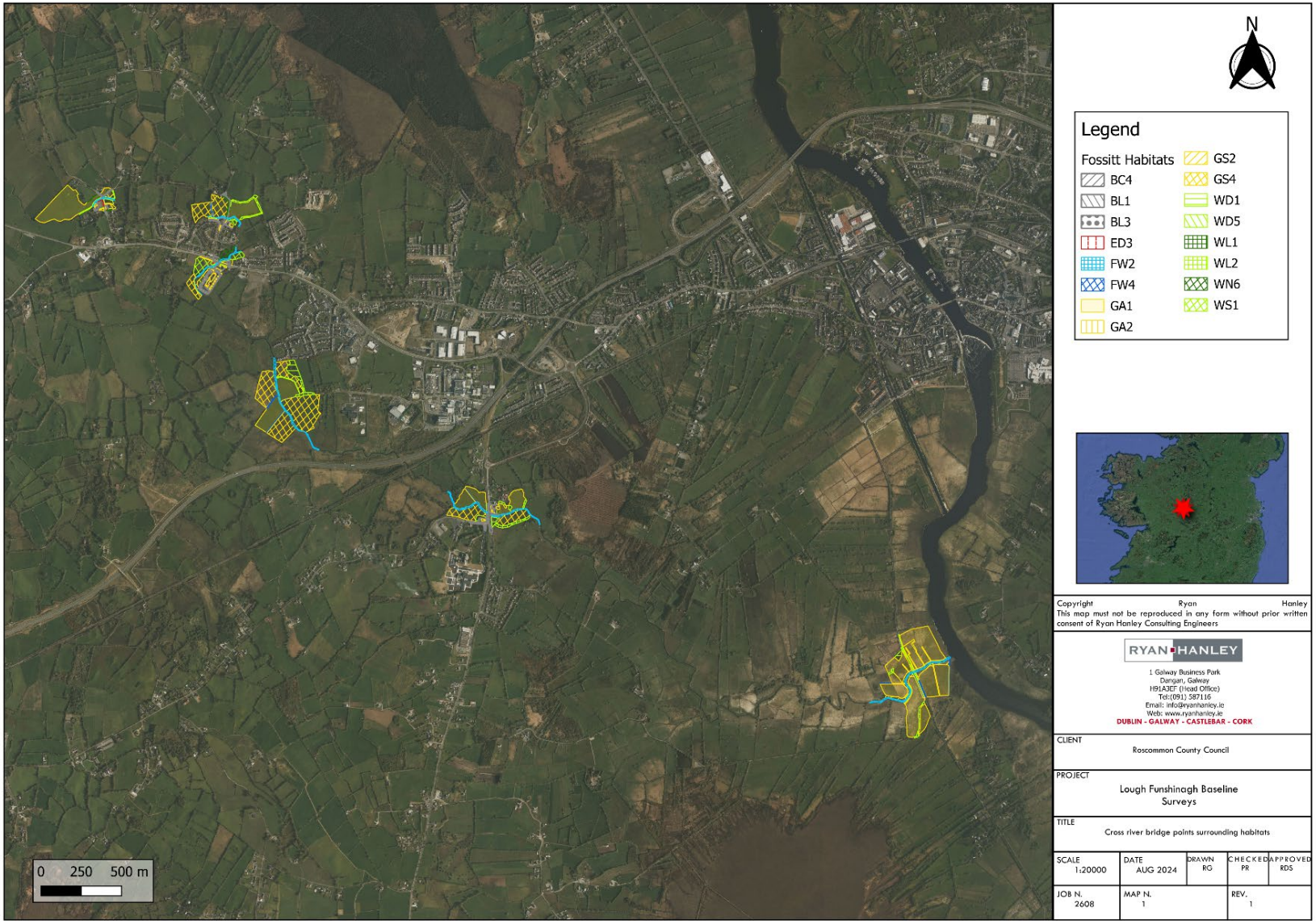

Figure 4. 3 Main Fossitt Habitat classification on bridging points along a sections of the Cross River

4.1.2 Flora Species Present

Given that the study area is dominated by highly modified habitats including improved agricultural grassland, buildings and artificial surfaces, no protected flora species were identified during the walkover survey. There are some areas of relatively greater habitat diversity which support a fair diversity of plant species and communities, as described, which areas are located along and adjacent to the Cross river watercourse and fringing environments of Lough Funshinagh. No species listed on Annex II of the EU Habitats Directive or additional flora listed in the Flora (Protection) Order (2022) or the Irish Red Data Book were recorded during the walkover surveys.

4.1.3 Invasive Alien Species (IAS)

During field surveys, no observations of Invasive Alien Plant Species (IAPS) listed under the Third Schedule of the European Communities Regulations 2011 (S.I. 477 of 2011) were recorded.

4.2 Significance of Habitats and Flora

Lough Funshinagh is a turlough, which corresponds to habitats listed on Annex I of the EU Habitats Directive "Turloughs (3180)" and is therefore assigned **International Importance**. See accompanying **Baseline Aquatic Report** for full assessment of aquatic ecology. Flora listed in under typical turlough plant species in NPWS Article 17 are also found in habitats GM1, GS4, ED3 and WL2 surrounding Lough Funshinagh.

GM1 habitat in the south west corner is predominately exposed soil with dominance of Rushes and Dock. The prolonged submersion of this area that was likely GS4 habitat previously has changed this habitat and would be classified as transitioning to GM1. The water table is still high in this area.

Lough Funshinagh is designated for the habitat [Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation [3270]]. Some of the flora associated with this habitat are found in habitats GM1, GS4 and ED3 surrounding Lough Funshinagh. As per NPWS Article 17 this is a difficult habitat to quantify accurately due to its seasonality and variable of water levels. Areas of GM1 with exposed mud could potentially contain this habitat (Sheehy Skeffington et al, 2006) however given the prolonged submergence of some areas and continued increase in water levels, the establishment of this habitat in these areas will likely require the water levels of Lough Funshinagh to stabilise during the growth season and seasonally change in depth.

The hedgerows, treelines, broadleaved woodland, scrub, dry calcareous and neutral grassland, wet grassland, depositing/lowland rivers, drainage ditches, stone walls and other stonework, marsh within the surveyed areas were assigned **Local Importance (Higher Value)**. These features provide potential habitat for a range of specialised or protected fauna including bat species listed on IV of the EU Habitat Directive, as well as species protected under the Wildlife Acts 1976-2023 and provide semi-natural habitats with high biodiversity in a local context and connectivity to the wider area.

The Cross river is an Order 2 river which drains into the River Shannon. Drainage ditches form several of the field boundaries are generally shallow and well vegetated. The Cross river is currently assigned "Moderate" WTD status and is "At Risk" of not achieving good status.

As such, the watercourses and drainage ditches within the study area have been assigned **Local Importance (Higher Value)** as they have the potential to provide habitats for fish, amphibians and other species. See accompanying **Baseline Aquatic Report** for full assessment of aquatic ecology.

Amenity grassland and improved agricultural grassland habitats have been assigned **Local Importance (Lower Value)** on the basis that these habitats are largely intensively managed and thus are subject to regular anthropogenic disturbance and modification.

The remaining habitats recorded included highly managed arable lands and built areas, earth banks, spoil and bare ground, recolonising bare ground and exposed calcareous rock, which were assigned **Local Importance (Lower Value)** and are not classified as Key Ecological Receptors (KER).

Floral species of conservation concern were not recorded within the survey areas. **Table 4. 1** provides a summary of the habitat importance valuation and identifies the habitats classified as KER's.

Table 4. 1 Summary of Habitat Significance

Habitat Name	Habitat Code	Receptor Importance/Ecological Value	Key Ecological Receptor
Arable land	BC3	Local importance (lower value)	No. This habitat is of low botanical importance. It may provide foraging habitat for some fauna.
Stone walls and other stonework	BL1	Local importance Higher value)	Yes, this habitat is niche for specialist species of flora including ferns and provides nesting or breeding sites for birds such as dipper and grey wagtail and mammals such as stoats or bat species. Other stonework may be used by roosting bats.
Earth banks	BL2	Local importance (lower value)	No. While usually vegetated, this habitat provides no cover for fauna.
Buildings and artificial surfaces	BL3	Local importance (lower value)	No. Habitat of limited ecological importance; some buildings may provide habitat for roost or breeding sites for bats or bird species.
Improved agricultural grassland	GA1	Local importance (lower value)	No. This habitat is of low botanical importance; however, it does provide foraging habitat for some species such as badger and birds.
Amenity grassland (improved)	GA2	Local importance (lower value)	No. This habitat is of low botanical importance. It may provide foraging habitat for some fauna.
Dry calcareous and neutral grassland	GS1	Local importance (higher value)	Yes. Dry calcareous and neutral grassland may comprise a wide range of grasses and broadleaved herbs. This habitat is present in the survey area adjacent to Lough Funshinagh and the Cross river.
Dry meadows and grassy verges	GS2	Local importance (higher value)	Yes. Dry meadows and grassy verges may comprise a wide range of grasses and broadleaved herbs. This habitat is present in the survey area adjacent to the Cross river.
Wet grassland	GS4	Local importance (higher value)	Yes. Wet grassland may comprise a wide range of grasses and broadleaved herbs. This habitat is present in the survey area adjacent to Lough Funshinagh and the Cross river.
Spoil and bare ground	ED2	Local importance (lower value)	No. Habitat of poor ecological importance.
Recolonising bare ground	ED3	Local importance (lower value)	No. Habitat of poor ecological importance.
Exposed calcareous rock	ER2	Local importance (lower value)	No. Habitat of poor ecological importance.

Habitat Name	Habitat Code	Receptor Importance/Ecological Value	Key Ecological Receptor
Scrub	WS1	Local importance (higher value)	Yes. Scrub occurs in patches in the survey areas. Scrub can provide habitat for birds and refuge for fauna.
Marsh	GM1	Local importance (higher value)	Yes. This habitat is present surrounding Lough Funshinagh. Area of high fauna activity due to exposed mud and transitional habitat.
Hedgerows	WL1	Local importance (higher value)	Yes. The hedgerows in the survey areas are largely comprised of native species and provide suitable features for commuting and feeding species including bats, badger and a wide variety of invertebrates. Such habitat provides a suitable feature for nesting birds, within a largely agricultural landscape, in additional to providing connectivity throughout the site and in the wider landscape.
Treelines	WL2	Local importance (higher value)	Yes. Treelines provide habitat for birds and mammals (including potential roost or foraging habitat and commuting routes for bats) in addition to providing connectivity in the landscape and habitat linkage.
(Mixed) broadleaved woodland	WD1	Local importance (higher value)	Yes. Broadleaved woodland provides habitat for birds and mammals (including potential roost or foraging habitat for bats). This habitat is present in smaller pockets within the survey areas surrounding Lough Funshinagh and the Cross river.
Conifer plantation	WD4	Local importance (lower value)	No. Habitat of poor ecological importance, understory is devoid of vegetation.
Turloughs	FL6	International Importance (Annex I habitat)	Yes. Lough Funshinagh is classified as a Turlough and is designated as an SAC for is Turlough habitat and vegetation.
Depositing/lowland rivers	FW2	Local importance (higher value)	Yes. The Cross river is an order 2 river which discharges into the River Shannon. It is heavily vegetated and provides good foraging habitat for birds, including sand martins, barn swallows and grey wagtails.
Drainage ditches	FW4	Local importance (higher value)	Yes. Drainage ditches are part of the surface water network and a habitat for wetland flora and amphibians/ invertebrate fauna and influence the quality of water downstream.

4.3 Fauna

4.3.1 Birds

Winter Birds

A winter bird survey was undertaken by Ryan Hanley during the 2023/2024 period and used the survey method for wetland and waterbirds as described by (Bibby, 2000) as a 'look-see' approach which is an instantaneous count from one or more (or continuous) viewpoints. The Lough Funshinagh survey area, including selected small outlying turlough with fringing wetland habitats (see Figure 2), was surveyed from November 2023 to March 2024.

A total of 26 species were recorded during the winter survey across all habitats. Over-wintering bird families recorded in this survey include (1) Anatidea, (2) Scolopacidae, (3) Podicipedidae, (4) Phalacrocoracidae, (5) Accipitridae, (6) Charadriidae, (7) Scolopacidae, (8) Laridae, (9) Alcedinidae, (10) Rallidae, (11) Ardeidae. The survey found that Golden plover and Lapwing were the most abundant species. A Winter Birds Survey (2023 -2024) of Lough Funshinagh was produced by Ryan Hanley in June 2024 and contains further details on the survey findings.

Breeding Birds

A breeding bird survey was conducted by the Ryan Hanley team during 2024. The delimitation of the survey area was set in accordance with the habitat's potential importance to breeding bird species of the area. As well as Lough Funshinagh, other smaller adjacent lakes have been included in the survey area, following CBS survey methodology. Six bird survey visits were undertaken as part of the survey for breeding birds during April and June 2024.

A total of 19 wetland species were recorded during the breeding bird survey across all habitats. The combination of the turlough and wetland habitat types with mixed farmland within the survey area and its location between various SPAs, are factors which underlie the broad range of taxonomic groups of bird families recorded in this survey; these include (1) Anatidea, (2) Scolopacidae, (3) Podicipedidae, (4) Phalacrocoracidae, (5) Charadriidae, (6) Laridae, (7) Rallidae, (8) Ardeidae. The survey found that Black-headed Gull, Cormorant, Mallard, Greylag Goose and Great-Crested Grebe were, overall, the most abundant species observed.

A Breeding Bird Survey (2024) for Lough Funshinagh was prepared by Ryan Hanley in August 2024 and contains further details on the survey findings.

Cross River Survey

The Cross river and its surrounding lands were surveyed from the 2nd – 9th of August. Buzzards (*Buteo buteo*) were recorded foraging in the survey area as well as perching at bridging points and a nesting site is suspected within a corridor of broadleaved woodland adjacent to the Cross river. Kestrels (*Falco tinnunculus*) were also recorded hunting in the area and were seen getting mobbed by corvids. Sand martins (*Riparia riparia*) were spotted in large numbers foraging above the Cross river, as well as a few grey wagtails (*Motacilla cinerea*). Swifts (*Apus apus*) were also recorded in the area, foraging within the grasslands adjacent to the Cross river. Common passerines and corvid species were also recorded utilising the hedgerows and treelines adjacent to the cross river.

4.3.2 Mammals

The survey area was searched for signs of mammal activity with dedicated surveys undertaken for badger and otter, considering the habitats used by these species. Other species that are likely to occur in the area but were not recorded include Eurasian Pygmy Shrew (*Sorex minutus*).

Fox (*Vulpes vulpes*), Rabbit (*Oryctalagus cuniculus*), Hedgehog (*Erinaceus europaeus),* Irish Hare *(Lepus timidus subsp. Hibernicus)* and Mink (*Neovison vison*) were directly observed during the field surveys. Hedgehog (*Erinaceus europaeus)* was only observed at dawn.

Common rat (*Rattus norvegicus*), Wood Mouse (*Apodemus sylvaticus*) and Pine Marten (*Meles meles*) were only detected on trail camera.

Mink (*Neovison vison*) was actively observed hunting and cubs were observed in the same area. Mink is listed as a Third Schedule listed species under Regulations 49 & 50 in the European Communities (Birds and Natural Habitats) Regulations 2011 (See **Appendix 1** for trail camera photos).

The NBDC showed no record of Fallow deer (*Dama dama*) within the survey area surrounding the Lough. Fallow deer was recorded on the camera trap on the 30th of April to the west of the Lough adjacent to a conifer plantation (WD4). There were no signs of deer recorded during the walkover surveys around Lough Funshinagh or along the Cross river. The NBDC shows records of Fallow deer within 20km of the Lough, with the last record dating from 2015 as part of the Atlas of Mammals in Ireland 2010-2015. (See **Appendix 1** for trail camera photos).

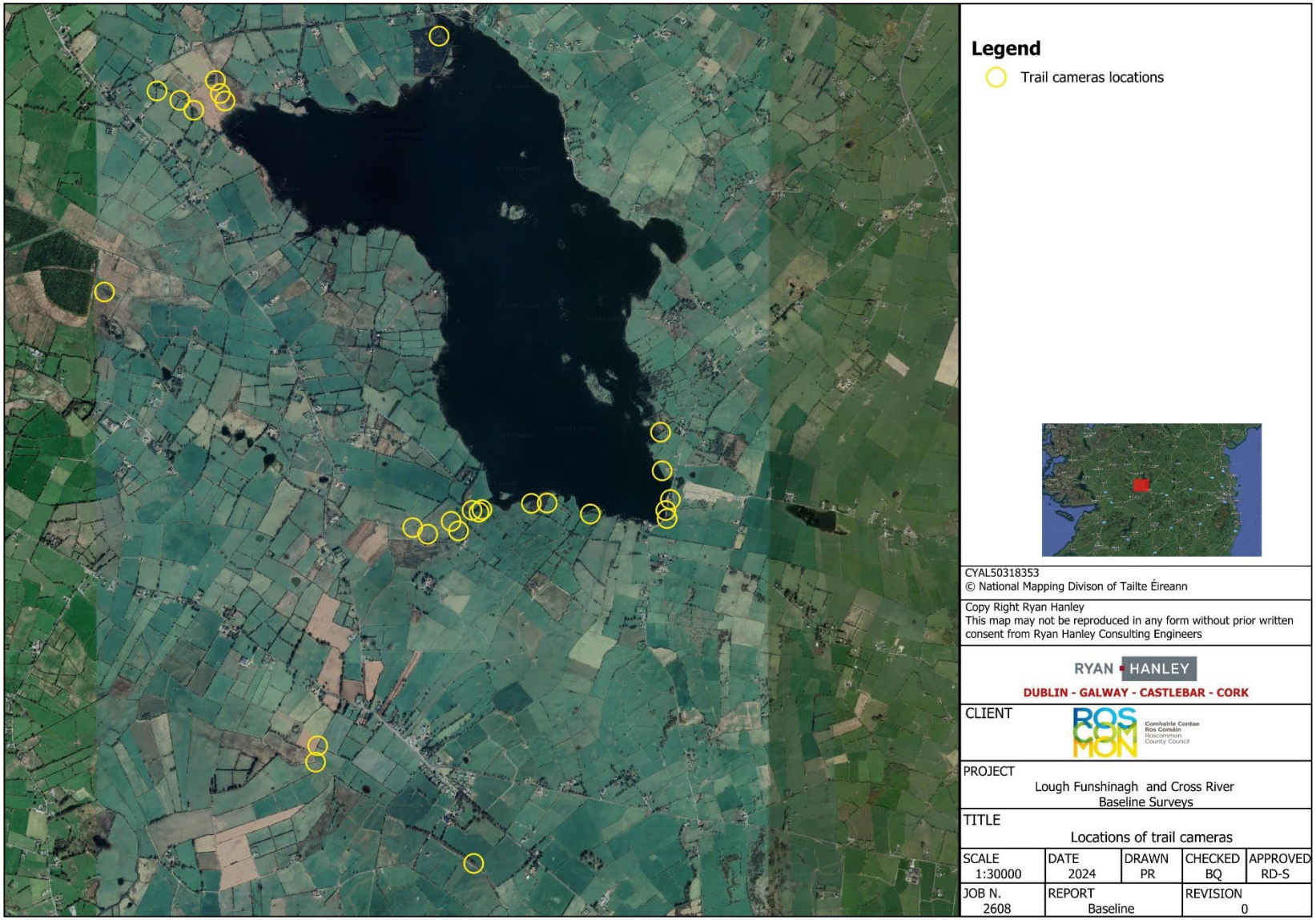

Figure 4. 4 Trail Camera locations during survey work

Badger

During the walkover surveys undertaken in 2024 the survey area was searched for signs of badger. The area was checked for physical evidence of badgers including setts, latrines and paths. One large sett was recorded within a scrub habitat area (WS1) at the southern end of Lough Funshinagh. A trail camera was left at the location which confirmed badger activity in the area.

Another large sett was found and confirmed by the trail camera records, at the northwestern end of the Lough. The sett was recorded located along a hedgerow (WL1) between two agricultural fields, approximately 400 metres from the Lough's approximate shoreline.

A badger sett was recorded c.1.8 km southwest of Lough Funshinagh, located within a hedgerow line (WL1) just 100 meters before reaching the Cross river. Badger signs in the form of dead snails and other invertebrates confirmed recent badger activity in the area.

A trail camera located within a treeline (WL2) running along the Cross river confirmed the presence of badger in the habitat. Further badger signs were also found at this location (See **Appendix 1** for trail camera photos).

Bats

During the walkover surveys undertaken during the 2nd – 9th of August along the Cross river the area was searched in terms of landscape suitability for bat habitat. No bat activity surveys were undertaken as part of this survey. Areas of woodland, treelines and hedgerows as well as rivers and associated riparian habitat were assessed as Moderate suitability for foraging and commuting bats. Vegetated drains and areas of scrub were assessed as Low suitability, agricultural grassland habitats which dominate the study area were considered to offer Negligible suitability.

The suitability of the Cross river site for bats was considered and while the site is likely to be used by foraging and commuting bats however, no tree roosts were identified from the ground.

Stone ruins and abandoned buildings along the Cross river have been assigned Moderate suitability for roosting bats.

Bat boxes have been recorded in a mature beech treeline between Lough Funshinagh and the Cross river.

Lough Funshinagh

Bat roost potential of Lough Funshinagh was assessed throughout the baseline surveys. Areas with high bat roost potential are indicated in **Figure 4.5**. These areas had mature trees with potential crevices, thick ivy growth and away from potential light pollution. Old derelict buildings have the potential for bat roosts, but this can only be determined upon a bat activity survey (emergence/re-entry). Bats were observed during the Breeding Bird Survey dawn surveys at some locations around Lough Funshinagh. It is highly likely there are bat roosts around Lough Funshinagh given the availability of mature trees, old stone buildings, dead trees and abundance of insects.

Otter

The NBDC showed records of Otters signs (spraints and mucous) and sightings within the survey area surrounding the Lough. The last record from this database dates from 2015 as part of the Atlas of Mammals in Ireland 2010-2015. The presence of otter was recorded at Lough Funshinagh by a trail camera located at the south end of the Lough in shallow waters with prominent rocks (a semi submerged stone wall). The

area is surrounded by Scrub (WS1), Dry calcareous and neutral grassland (GS1) and Treelines (WL2) (See **Appendix 1** for trail camera photos).

Fallow deer

The NBDC showed no record of Fallow deer (*Dama dama*) within the survey area surrounding the Lough. Fallow deer was recorded on the camera trap on the 30th of April to the west of the Lough adjacent to a conifer plantation (WD4). There were no signs of deer recorded during the walkover surveys around Lough Funshinagh or along the Cross river. The NBDC shows records of Fallow deer within 20km of the Lough, with the last record dating from 2015 as part of the Atlas of Mammals in Ireland 2010-2015. (See **Appendix 1** for trail camera photos).

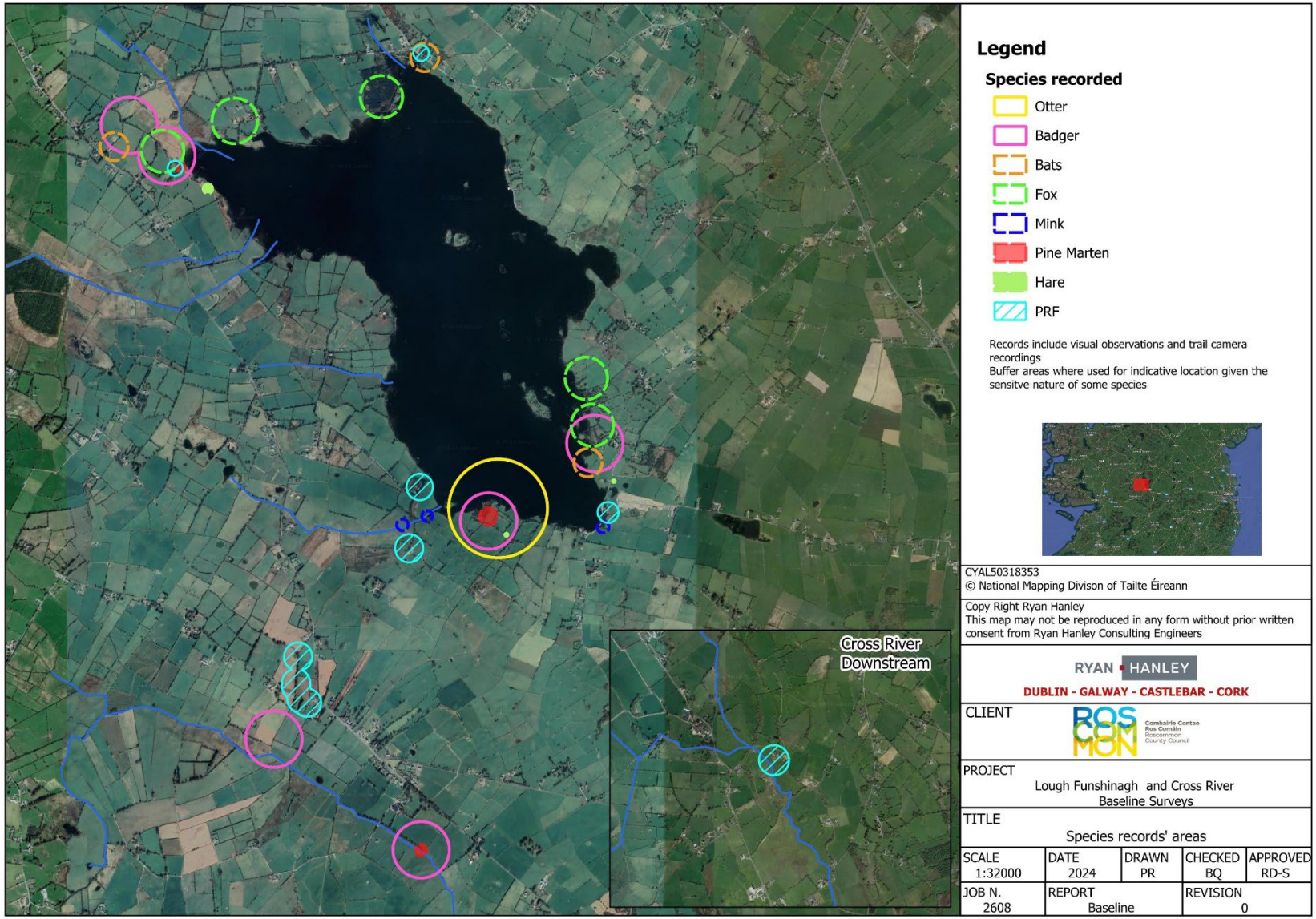

Figure 4. 5 Main species and features recorded during the field surveys

4.3.3 Reptiles and Amphibians

Smooth newt (*Lissotriton vulgaris*), while not recorded during site surveys, may occur within the study area. Common frog (*Rana temporaria*) was recorded during the walkover survey of Lough Funshinagh and the Cross River and is likely present in most areas of standing waters, wet grassland, and other damp areas surrounding the Cross river. Viviparous lizard are known to occupy damp or wet areas with abundant grass tussocks in high densities and can be found on grassland, hedgerows and road embankments (Edgar, et al., 2010).

4.3.4 Invertebrates

Invertebrates were considered in the initial screening assessment of the site, including a desktop review of rare and protected invertebrates. The desktop study of the area revealed that one invertebrate species is classified as Endangered; the Small Blue butterfly (*Cupido minimus*). This species is quite rare, and it is found only a few scattered colonies in Ireland. Its habitat comprises coastal dunes, limestone grasslands and quarries.

Other invertebrate species found in the area that are Near Threatened include two species of butterflies, the Dingy Skipper (*Erynnis tages*) and Small Heath (*Coenonympha pamphilus*), the Scarce Emerald Damselfly dragonfly (*Lestes dryas*), and two hymenopteran species, the Large Red Tailed Bumble Bee (*Melanobombus lapidaries*) and Moss Carder-bee (*Thoracombus muscorum*).

The habitats surrounding Lough Funshinagh, comprising grasslands, scrubs, meadows and farmlands, including the temporary waterbodies which provide suitable breeding habitat, promote the diversity of invertebrates in the area.

4.4 Significance of Fauna

Fauna evaluation in this section was assessed in accordance with the receptor importance classification methodology outlined in NRA (2009c), "*Guidelines for Assessment of Ecological Impacts of National Roads Schemes*".

Otter was recorded withing the habitats surrounding Lough Funshinagh, this species is of **International Importance**. Otter is listed under Annex II and Annex IV of the EU Habitats Directive and is also protected under the Wildlife Act (as amended) and is evaluated as being Near Threatened in the most recent Red Data list for mammals (Marnell *et al*., 2019).

Otter is present surrounding Lough Funshinagh; this species is therefore identified as a Key Ecological Receptor (KER).

Pine martin is protected under the Wildlife Acts 1976 to 2023 and the Habitats Directive (92/43/EEC), Annex V. Pine martin was recorded in the form of trail camera evidence withing the surrounding habitats of Lough Funshinagh and the Cross river. Pine martin as an ecological receptor has been assigned **Local Importance (Higher value)** on the basis that the habitats within the area are utilised by a regularly occurring Pine martin population of Local Importance. Pine martin is identified as a KER.

Badger is protected under the Wildlife Acts 1976 to 2023. Evidence of badger was recorded in the form of trail camera records, setts and trails. Four areas within the surrounding habitats of Lough Funshinagh and the Cross river have recorded evidence of badger activity and setts. Badger as an ecological receptor has been assigned **Local Importance (Higher value)** on the basis that the habitats within the area are utilised by a regularly occurring badger population of Local Importance. Badger is identified as a KER.

It is not anticipated that large bat roosts are present within the surrounding habitats of the Cross river. Some areas have moderate potential for bat roosts around Lough Funshinagh. The hedgerows, treelines and watercourses within the surveyed areas will likely act as foraging and commuting habitats for bat species in the wider area and as such bats are classified as **Local Importance (Higher value)**.

There was a significant number of Frogs observed in the northern section of Lough Funshinagh. This is likely due to a population increase given the abundance of invertebrates found along the shoreline. There was high insect activity such as flies along the shoreline. Water snails (alive and empty shells) were observed in abundance along the shoreline. Water snails can thrive in polluted water, grazing on the superabundant growth of algae stimulated by excess nutrients. Given the indirect observation of nutrient enrichment (high concentration of algae and duckweed) and proliferation of these invertebrates is the likely factor for the abundance of juvenile Frogs around Lough Funshinagh.

The bird species recorded along the Cross river are classified as **Local Importance (Higher level)**, while some waterbird species recorded over the wintering and breeding bird season within, and surrounding Lough Funshinagh are classified as **International Importance**. These species include Golden Plover, Whooper swan, Little egret and Kingfisher. All other waterbird species recorded within, and surrounding Lough Funshinagh are classified as **Local Importance (Higher level)**.

The medium quality of habitats within the area surveyed overall, coupled with the records of fauna species protected under the Wildlife Acts 1976-2023 from both the desktop study and field walkovers, would suggest that no additional fauna species populations utilise the Lough Funshinagh and Cross river areas in higher than local significance. As such other fauna species recorded are not considered key ecological receptors.

5. CONCLUSIONS

Lough Funshinagh and the Cross river have both been surveyed in the context of their habitats, surrounding habitat, terrestrial fauna, and flora.

Lough Funshinagh is a turlough, which corresponds to habitats listed on Annex I of the EU Habitats Directive "Turloughs (3180)" and is therefore assigned **International Importance**.

The hedgerows, treelines, broadleaved woodland, scrub, dry calcareous and neutral grassland, wet grassland, depositing/lowland rivers, drainage ditches, stone walls and other stonework, marsh within the surveyed areas were assigned **Local Importance (Higher Value)**.

The Cross river watercourse and drainage ditches within the study area have been assigned **Local Importance (Higher Value)** as they have the potential to provide habitats for fish, amphibians and other species.

Otter was recorded withing the habitats surrounding Lough Funshinagh, this species is of **International Importance**. Otter is present surrounding Lough Funshinagh; this species is therefore identified as a Key Ecological Receptor (KER).

Pine martin was recorded in the form of trail camera evidence within the surrounding habitats of Lough Funshinagh and the Cross river. Pine martin as an ecological receptor has been assigned **Local Importance (Higher value)** and is identified as a KER.

Evidence of badger was recorded in the form of trail camera records, setts and trails. Four areas within the surrounding habitats of Lough Funshinagh and the Cross river have recorded evidence of badger activity and setts. Badger as an ecological receptor has been assigned **Local Importance (Higher value)** and is identified as a KER.

Hedgerows, treelines and watercourses within the surveyed areas may act as foraging and commuting habitats for bat species in the wider area and as such bats are classified as **Local Importance (Higher value)**.

The bird species recorded along the Cross river are classified as **Local Importance (Higher level)**, while some waterbird species recorded over the wintering and breeding bird season within, and surrounding Lough Funshinagh are classified as **International Importance**. These species include Golden Plover, Whooper swan, Little egret and Kingfisher. All other waterbird species recorded within, and surrounding Lough Funshinagh are classified as **Local Importance (Higher level)**.

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Appendix G – Ecological Impact Assessment

ARUP

Roscommon County Council

Lough Funshinagh Interim Flood Relief Scheme

Ecological Impact Assessment

Reference:

Issue | September 2024

Job number 303666-00

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1. Introduction

1.1 Overview

Ove Arup & Partners Ireland Ltd (Arup) has been appointed by Roscommon County Council (RCC) to prepare this Ecological Impact Assessment (EcIA) report for a proposed interim flood relief scheme for Lough Funshinagh, Co. Roscommon.

The proposed interim flood relief scheme referred to hereafter as the 'proposed scheme' relates to the construction, operation and decommissioning of a scheme (pumps, pipeline and outfall) to provide interim flood relief for Lough Funshinagh. The proposed scheme relates to all preparatory and ancillary works associated with the construction of the scheme and its subsequent operation and decommissioning. The location of the proposed scheme is shown in Appendix H. The area comprising the proposed scheme is referred to hereafter as the 'Site'.

1.2 Ecological Impact Assessment

EcIA is the process of identifying, quantifying and evaluating the potential effects of a project on ecological features based on objective assessment of the best information available[1]. An ecological feature is defined as a species, habitat or ecosystem that has the potential to be affected by a proposed project.

The aim of the EcIA is therefore to describe the existing ecological environment within and surrounding the proposed project; to identify potential ecological features; to identify the potential impacts associated with the proposed project during construction, operation and decommissioning; to evaluate the likely significance of effects on the ecological features; to apply the mitigation hierarchy to avoid, mitigate and compensate for ecological impacts; and to highlight potential opportunities for ecological enhancement[1].

The EcIA has been written in accordance with the Chartered Institute of Ecology and Environmental Management (CIEEM) *Guidelines for Ecological Impact Assessment in the UK and Ireland*[1].

[1] CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.2. Chartered Institute of Ecology and Environmental Management, Winchester.

2. Project Description

2.1 Proposed Scheme Design

The main elements of the proposed scheme consist of:

- Intake pump system (located within the lough)
- Intake compound
- Pipeline route from the lough to the Cross River
- Pipeline outfall at the Cross River.

2.1.1 Intake Pump System

The intake pump system consists of:

- Floating pump pontoon incorporating 2 No. high capacity hydraulically driven pumps housed in a floating container with integrated fish screens
- 2 No. hydraulic power units (HPUs) (located in the bunded intake compound) to power the pumps
- 4 No. 3,000 L double skinned fuel tanks (located in the bunded intake compound; and
- Floating access pontoon to provide safe access to the pontoon and support the hydraulic hoses which link the pumps to the HPUs.

Refer to Figure 2-1 for the layout of the intake pump system.

The intake pump system will include a facility to alter the pump flow rate as necessary, refer to Section 2.1.1.3 *Pumping Controls*.

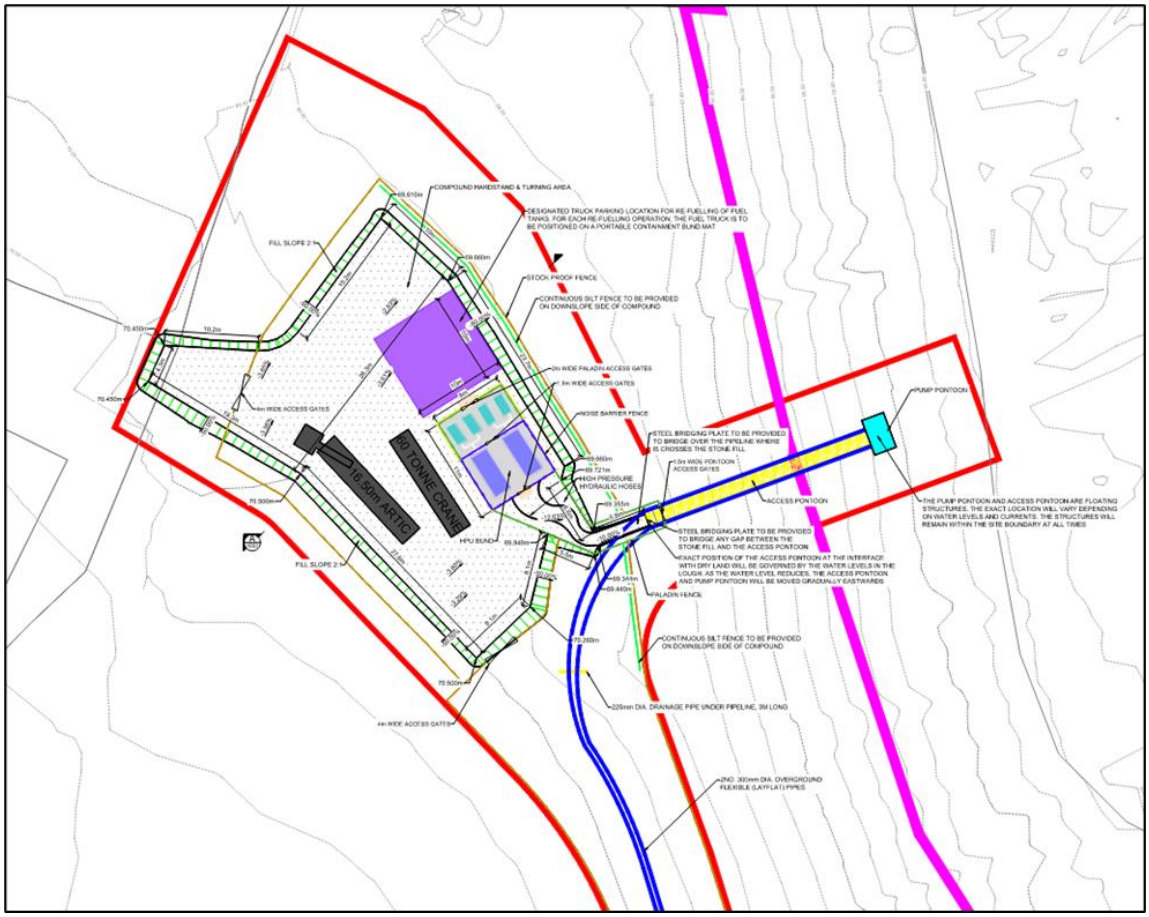


Figure 2-1 Proposed intake compound and pump layout. Source Dwg 24821-MWP-00-00-DR-C-1001 (MWP) | not to scale

2.1.1.1 Floating Pump Pontoon

The floating pump pontoon will consist of two submerged pumps enclosed in a container (2 m x 1.2 m x 4 m), refer to Figure 2-2 from Drawing No. 24821-MWP-00-00-DR-C-1005 (MWP).

One vertical side of the container will be fitted with a $2m^2$ mesh fish screen with a maximum opening of 10 mm. The approach velocity of the water entering through the mesh screen will be a maximum of 150 mm/second, at a total flow rate of 300 litres/second. This will ensure that juvenile fish can swim away against the current and not get entrained on the mesh.

The container will float due to the buoyancy tanks fitted and will also be stabilised in position by four 100mm diameter poles with baseplates. As the poles are not for vertical support, minimal settlement of the poles into the ground is anticipated (less than 150 mm).

The pump pontoon will be accessible from land via the floating access pontoon.

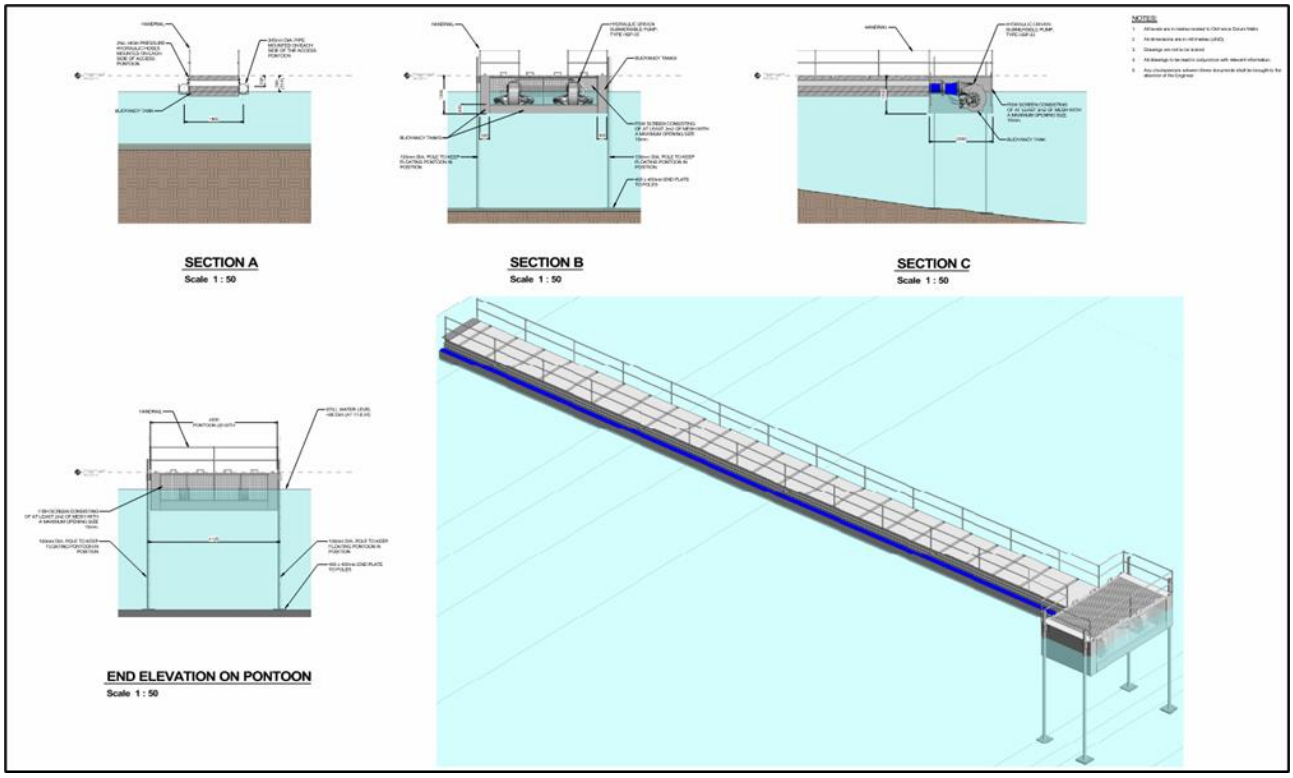


Figure 2-2 Design details of the pump pontoon (intake system). Source Dwg. 24821-MWP-00-00-DR-C-1005 (MWP) | not to scale

2.1.1.2 Floating Access Pontoon

The pump pontoon (and screen) will be accessible from land via a floating access pontoon, approximately 25.6 meters long that will extend from the lough edge, refer to Figure 2-3 below.

The access pontoon will support two pipes (305mm diameter each) mounted on either side of the pontoon that will run from the pump pontoon and will be jointed to the two 300 mm diameter flexible 'layflat' pipelines.

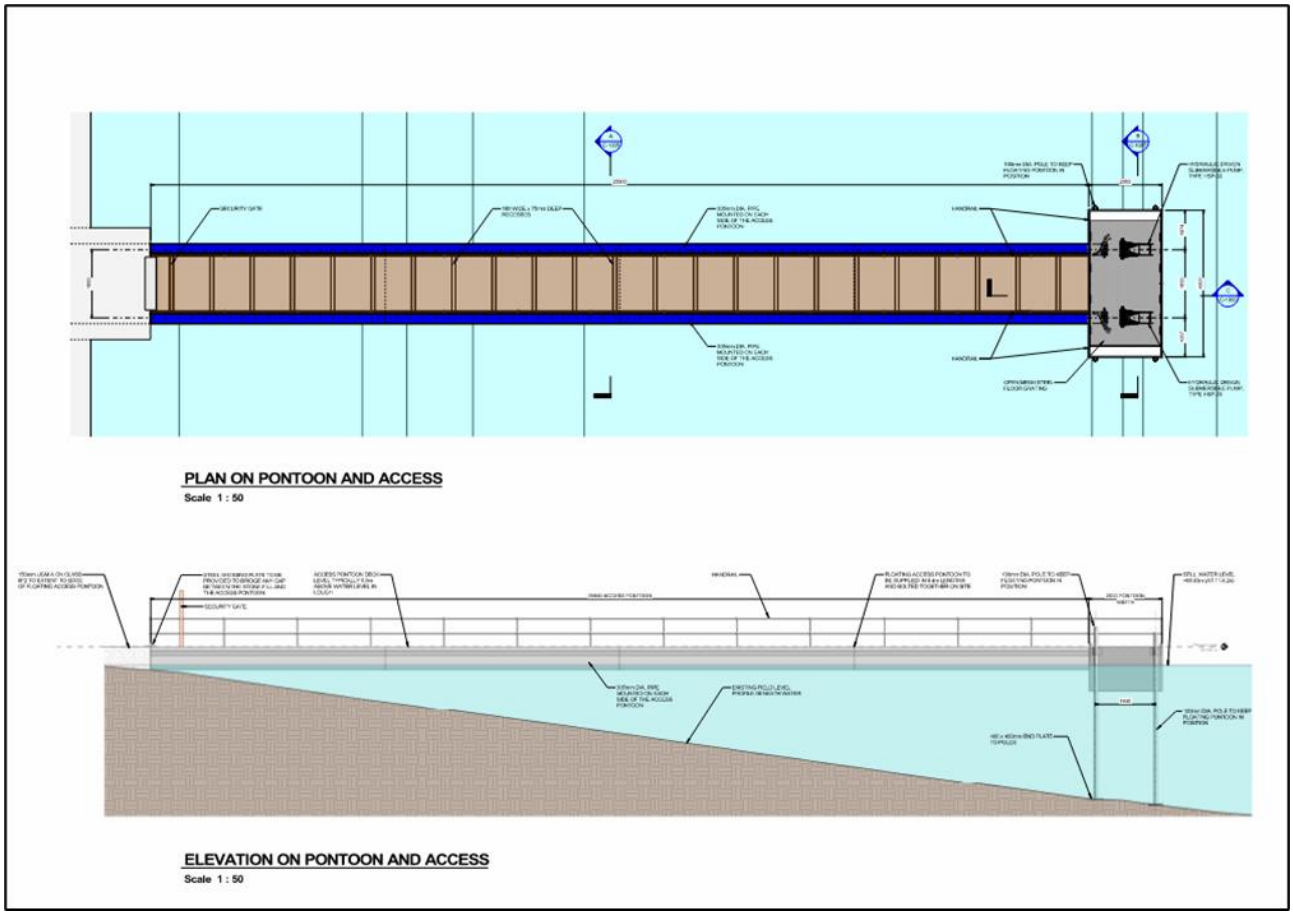


Figure 2-3 Configuration of the 2 pumps and floating pump pontoon. Source Dwg. 24821-MWP-00-00-DR-C-1004 (MWP) | not to scale

2.1.1.3 Pumping Rate and Pump Controls

The maximum flow rate has been selected taking consideration of the expected volume that needs to be removed from the lough in order to have a short-term meaningful beneficial impact and based on the flood risk assessment of the Cross River reach as well as with regard to the availability of the necessary high-capacity pumps.

Pumping will be undertaken only when the water level in the lough is above 67.5 mOD. As noted in the Engineering Report (Section 2.3, MWP 2024), the rationale for selecting a level of 67.50 mOD is that this is still above the pre-2016 "normal" maximum flood level indicated by the Lough Funshinagh Technical Subgroup (2024) and GSI (2016).

The two submersible pumps will operate in parallel with a total flow rate not exceeding 300 l/s.

The pump system together with the lake level and the flow in the Cross River will be monitored over the full duration of the scheme by Roscommon County Council.

2.1.2 Intake Compound

The overall area of the compound will be c 1,150 m^2. The intake compound is required to provide safe access for the delivery of the pump system components and to provide for safe and secure operation of the pumping system with appropriate protections in place to prevent contamination from a potential fuel spillage from the HPUs or storage tanks.

The intake compound consists of:

- 2 x 600kW hydraulic power units (HPUs)
- 4 x 3,000 litre double skinned fuel tanks, 2 for each HPU
- Concrete bund for HPUs and fuel tanks (11 m x 8 m) and secured with paladin fencing.

The intake compound will be located on private agricultural land located on the lough's edge. The design and location of the compound has been chosen to eliminate the risk of inundation of the tanks and pumping machinery (HPUs). The lowest elevation of the compound will be 69.22 mOD. The compound will comprise a combination of a geotextile and geogrid placed directly on the grass over which a minimum thickness of 450 mm of stone will be placed as the compound base to ensure all plant and machinery will be above the peak flood height of March 2024 (69.37 mOD), refer to Figure 2-4 below.

In addition, the two 500kW hydraulic pumping units (HPUs) and four 3,000 litre diesel storage tanks will be located within a concrete bund with a minimum finished floor elevation of 70.50 mOD. The HPUs will each be placed on concrete plinths within the concrete bund, refer to Figure 2-5 below.

The HPU model to be employed will be a D600/A4VSO500 manufactured by Holland Special Pumps. Each unit measures approximately 4 m x 1.8 m x 2.35 m. The units are diesel powered with a fuel tank capacity of 100 litres housed within the HPU unit.

The HPUs will be connected to the pumps by two hydraulic hoses each via the access pontoon, refer to Figure 2-4 below.

The HPU sound level produced per unit is approximately 76 dBA at 7 metres. To provide noise mitigation a 4 m high solid noise barrier will surround the HPUs, with an acoustically absorptive material facing the power packs.

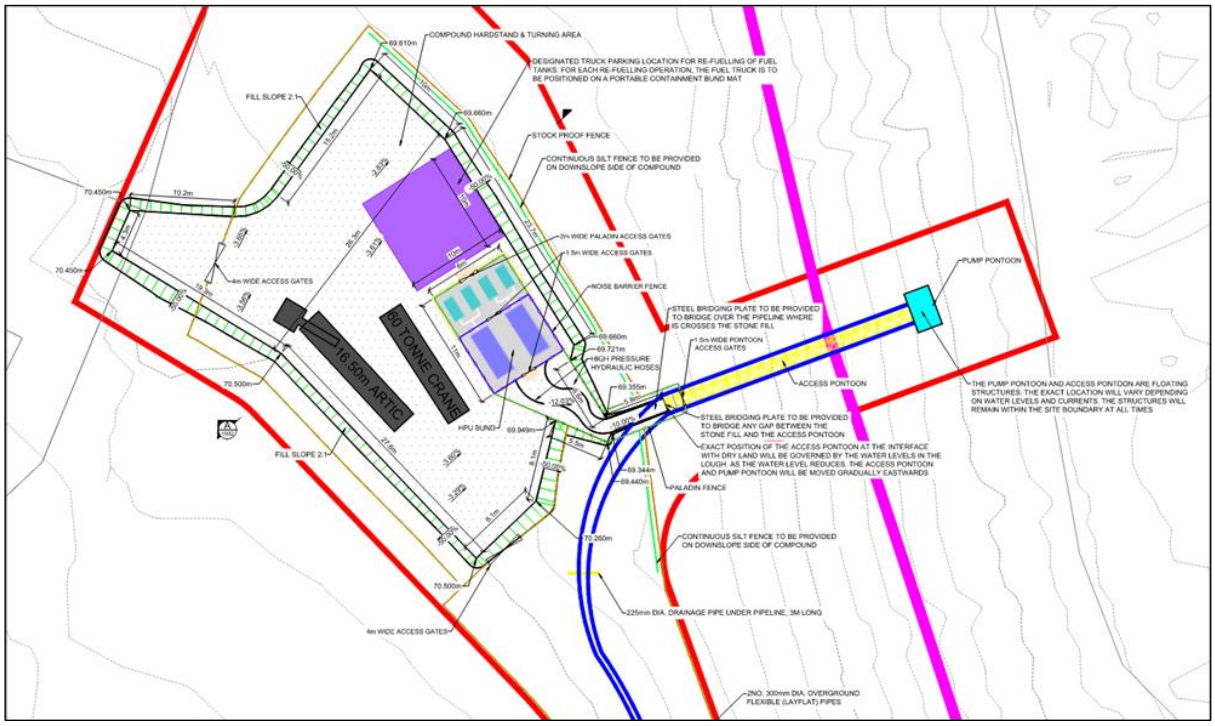


Figure 2-4 Intake compound, floating access pontoon and pump pontoon. Source Dwg. 24821-MWP-00-00-DR-C-1001 (MWP) | not to scale

2.1.2.1 Concrete Bund

As outlined above, both the HPUs and the four fuel tanks will be located within a reinforced concrete bund (11m x 8m base) with upstand walls to contain any fuel in the case of a spillage or leak. All fuel tanks are double skinned and in addition the bund will provide at least 110% storage capacity for 2 No. fuel tanks (i.e. 6,600 litres) plus an additional allowance for 75 mm of rainfall accumulation.

The finished floor level of the concrete bund will be 70.58 mOD, reducing to 70.50 mOD at the sump to allow for rainwater accumulation, refer to Figure 2-5 below. The sump will be provided at the lowest corner of the bund to enable rainwater to be pumped out at regular intervals during the operational phase. The upstand walls also serve as a wheel stop to prevent vehicles accidentally impacting the fuel tanks during turning manoeuvres.

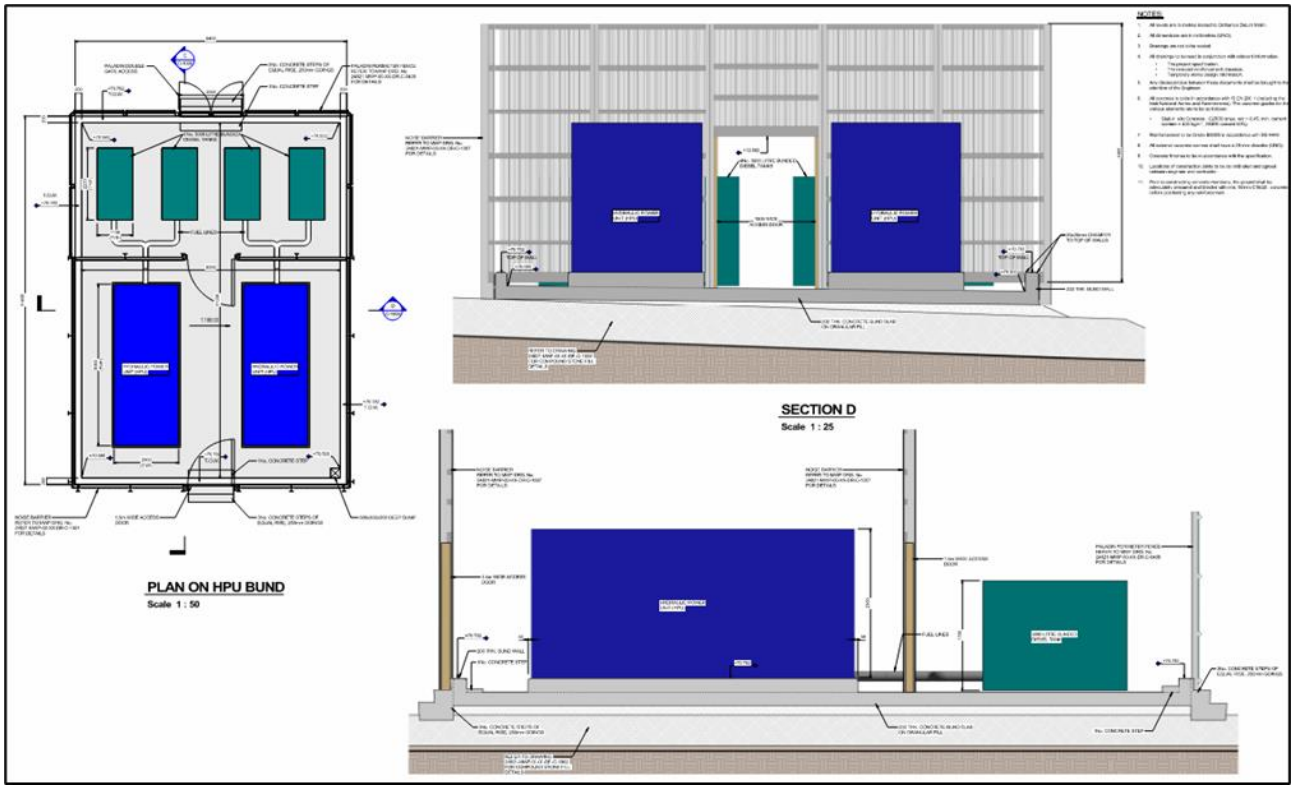


Figure 2-5 Configuration of concrete bund containing 4 no. fuel tanks and 2 no. HPUs. Source Dwg. 24821-MWP-00-00-DR-C-1006 (MWP) | not to scale

2.1.2.2 Compound Base

The compound base will be made up of a minimum thickness of 450mm stone hardstand area suitable for vehicular traffic, including loading/unloading of delivery vehicles and fuel trucks. The total footprint of the hardstand area will be c. 1150 m^2. The hardstand area is sized to provide for safe truck turning within the compound. During construction the articulated delivery lorry (16.5m long) and 60-tonne crane used to deliver and place the plant into position will utilise the hardstand area within the compound, refer to Figure 2-1 above.

2.1.2.3 Fencing and Security

A stock proof fence will be installed around the perimeter of the compound. An agricultural access gate (Figure 2-6) will be provided at the northern end of the compound to facilitate access. An additional gate will be provided at the southern end of the compound to enable the landowner to access the agricultural lands to the south.

For security and safety reasons, a paladin fence will be erected to secure the perimeter of the HPU/tank bund and access point to the floating access pontoon.

Access for the landowner to their lands will be maintained at all times.

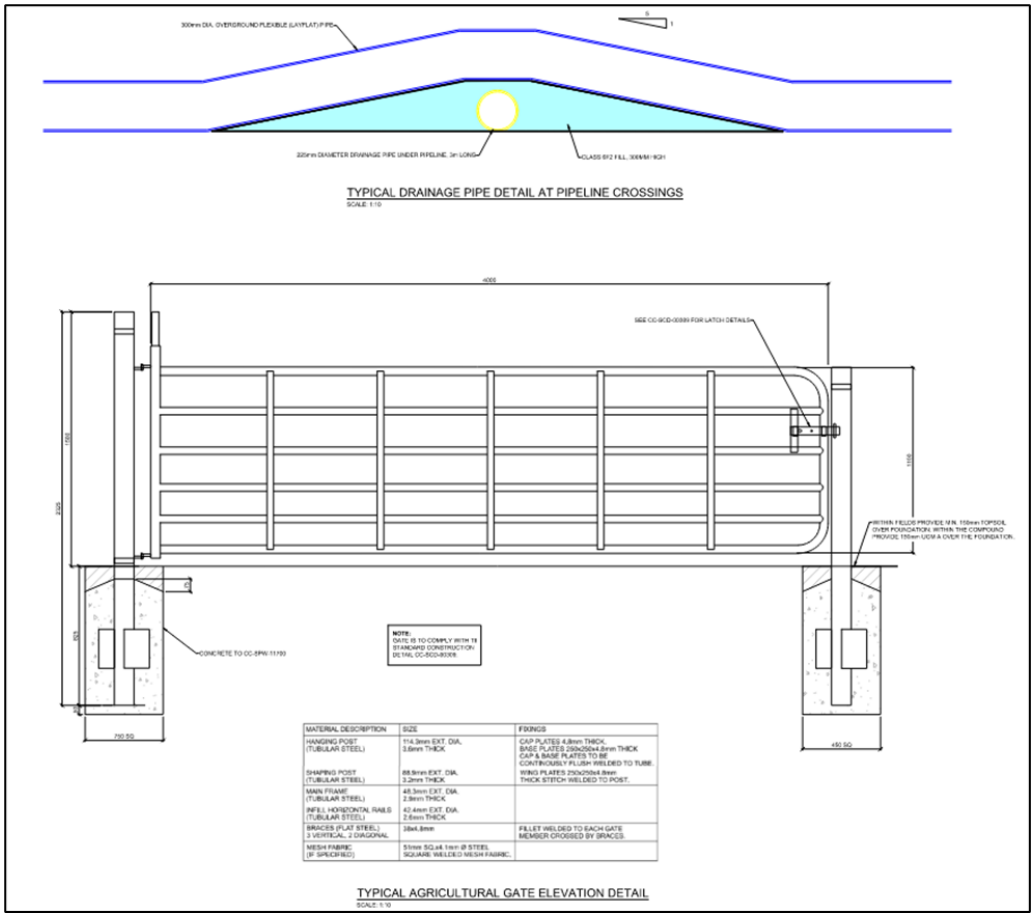


Figure 2-6 Agricultural gate design. Source Dwg. 24821-MWP-00-00-DR-C-0404 (MWP) | not to scale

2.1.3 Pipeline Route to the Cross River

The purpose of the pipeline is to convey the water from the pump intake system to the outfall at the Cross River. The route of the pipe has been selected so that it runs along property boundaries for the majority of its length as this will minimise disruption to landowners.

The total length of the pipeline will be 2.7 km:

- From the pump pontoon to the 2 No. 300mm diameter flexible pipes – c. 0.25 km
- From the 2 No. 300mm diameter flexible pipes to the PE ribbed pipe – 2.13 km
- From PE ribbed pipe to outfall at the Cross River (500mm diameter PE ribbed pipe) – 0.32 km.

The pipe between the pump intake system and PE ribbed pipe will consist of two parallel 300 mm diameter flexible pipes covering a length of c. 2 km from the intake system to a point 160 m south of the L2013 road and will comprise 50 m to 200 m lengths (typically 200 m) of flexible pipe. These flexi pipe lengths will be jointed using bolted collars and placed on the ground and will operate under pressure with full bore flow. At full capacity each flexible pipe will weigh 77kg per meter length. The pipeline will cross 10 existing hedgerows/ fences and at each crossing a 5 m gap will be cleared.

At the transition point south of the L2013, the flexible pipes will be connected via a manifold to a single PE ribbed pipe 500 mm in diameter (c. 320 m long) which will terminate at the outfall to the Cross River.

The PE ribbed pipe will operate under gravity flow and will flow half full at a velocity of c. 4.10 metres/second when the pumps are discharging at a rate of 300 litres/second.

The PE ribbed pipe will consist of lengths varying between 5 m and 12 m of jointed pipe laid directly on the ground and will operate under gravity along the downhill approach to the outfall which has a gradient of approximately 3%. At full capacity the PE pipe will weigh 109 kg per meter length. Settlement is not likely to exceed 50 mm for flexi pipe and the PE ribbed pipe.

Due to badger activity in the field where the PE ribbed pipe will be placed, a provision will be made for badgers to cross the PE ribbed pipe by constructing a ramp over the pipe.

Sections of pipe will also be provided through the fencing to facilitate movement of badgers in the area across the stock proof fencing.

2.1.3.1 Fencing

The pipeline route will where possible be located parallel and adjacent to property boundaries and existing fencing and hedgerows to minimise the disruption to landowners. The route will be fenced off with wooden post and wire fencing to prevent livestock and people from interfering with the pipeline. The fencing will provide a clearway of 5 m to 7 m wide to allow for a vehicle to access the pipeline route for routine inspections.

All fencing will be removed on completion of the pumping works.

The pipeline will be inspected daily to check for leaks or damage.

2.1.3.2 Road Crossings

The pipes will run overground throughout except at road crossings, which will be required at three locations:

- Private access road adjacent to the R362 road
- R362 regional road
- L2013 local road.

These road crossings will consist of two 600 mm diameter PE ribbed carrier pipes laid under the road, through which the pair of flexible pipes can be routed. These will be installed by open excavation followed by backfilling of the trench and reinstatement of the road. A short section of open excavation will remain on both sides of each crossing. The existing hedgerow will be removed on both sides of the road over a width of approximately 5 m.

The pipeline will be installed in two segments such that only partial road closure will be required for up to two days at each public road crossing location. One lane of traffic will be kept open to maintain traffic flow.

2.1.4 Outfall

The outfall at the Cross River has been designed to prevent potential erosion of the riverbanks and bed. The outfall consists of the following key features (Figure 2-7 below):

- A geotextile layer will cover the riverbed and extend up both the sides of the riverbanks
- Rock armour will be used to hold the geotextile in position, prevent erosion and dissipate energy from the pipeline
- A diffuser tee fitted will be fitted at the end of the PE ribbed pipe to dissipate energy and distribute the flow over a larger area of riverbank. The tee will have a series of 36 no. 80 mm diameter holes drilled at 120 mm spacing on the side opposite to the PE ribbed outfall pipe
- Rock armour will be built up around the ends of the diffuser tee to further dissipate the energy from water discharging from the ends of the tee.
- A 1.60 metre width of the riverbed will be covered with natural flag stones to hold the geotextile in place and to allow unhindered fish passage, as recommended by Inland Fisheries Ireland. The top of the flag stones will have an exposed aggregate finish. The leading edge and tail edge flag stones at the upstream and downstream interfaces with the existing riverbed will be level with the existing riverbed to avoid localised erosion.

At the outfall location, as detailed above, a geotextile layer will cover the riverbed and extend up the side of the riverbanks on both sides to protect the integrity of the riverbed from potential erosion from the outflow. The central part of the riverbed will remain free from rock armour so as not to impede fish passage.

The geotextile will extend over a length of 10 m, centred on the outflow location (5m upstream and 5m downstream of outflow).

Natural flag stones with an exposed aggregate finish will be placed over a 1.6m width of the riverbed with the leading edge and tail edge of the flags at the upstream and downstream interfaces placed level with the existing riverbed to avoid localised erosion.

The geotextile will be held in place by rock armour which consists of 200 kg rocks approximately 0.5 m in diameter. The types of rock used will be strong, inert rock, free from cracks/ joints to ensure the rock will not break down and affect the river environment.

The water from the outfall pipe will run onto the rock armour on the north (left) bank and this will dissipate the energy of the flow and allow it to enter the river in a controlled manner without causing erosion. Due to the significant depth of the channel, the diffuser tee will remain well above the water level in the river when pumping is being carried out.

The geotextiles, flags and rock armour will remain in place for the duration of the interim scheme. The geotextiles, flags and rock armour will be removed on the completion of the scheme.

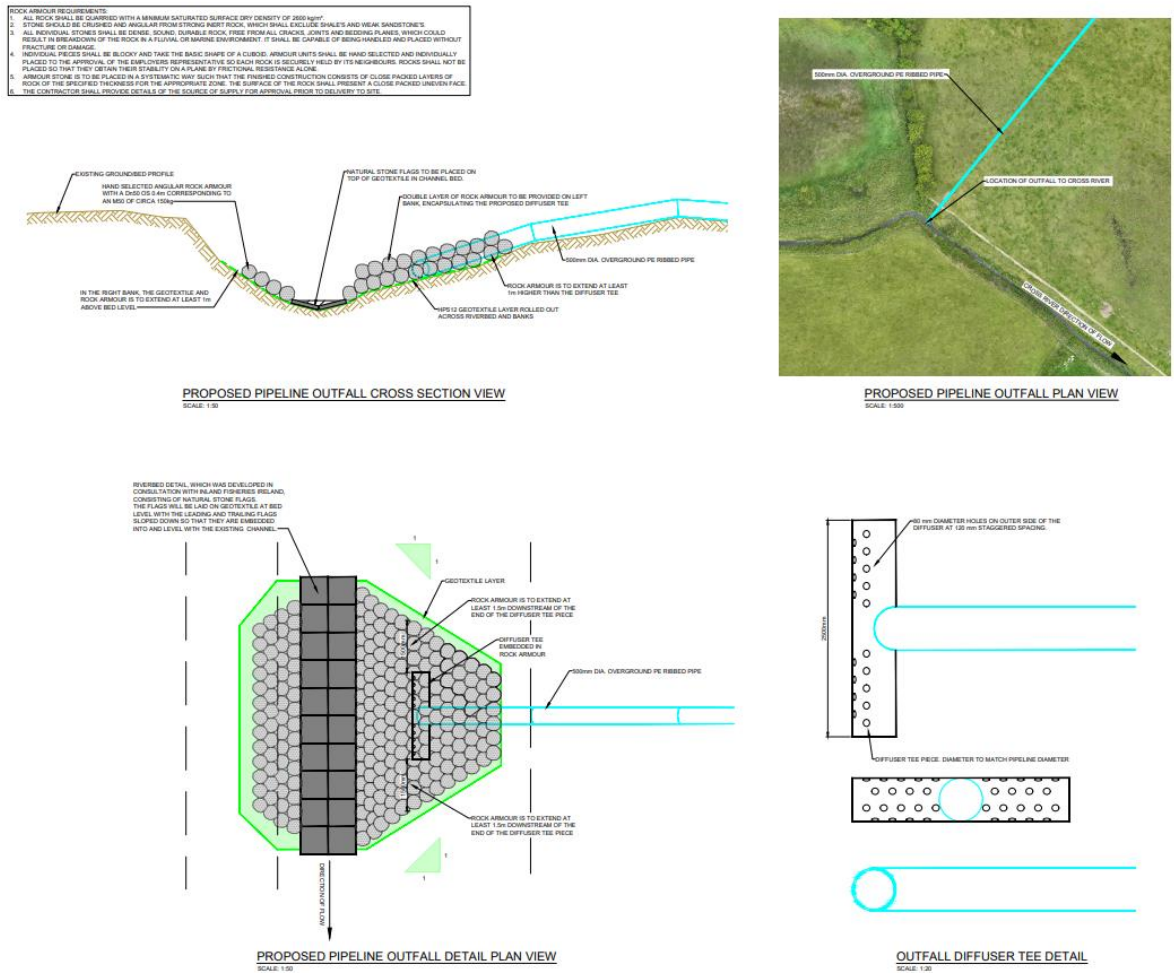


Figure 2-7 Outfall design. Source Dwg. No. 24821-MWP-00-00-DR-C-1003 (MWP) | not to scale

2.2 Construction of the Proposed Works

This section describes the works required to construct, install and commission the proposed scheme.

2.2.1 Phasing of works

Some works may be carried out concurrently where possible however the overall phasing of the works will likely be as follows:

- Construction of the intake compound
- Installation of the pump intake system i.e. HPUs, pump pontoon and floating access pontoon
- Laying of pipeline along the pipeline route including road crossings and fencing
- Installation of outfall; and
- Equipment installation and setup.

It is anticipated that the construction works will take approximately one month to complete. It is expected that the civil works will be completed in 3-4 weeks and that the installation and setting up of equipment will take one week.

2.2.2 Intake Compound

The compound will be constructed without excavating the existing ground. A combination of geogrid and geotextile will be placed over the vegetation on the existing surface within the footprint of the compound. A minimum thickness of 450 mm of imported stone (Class 6F or similar) will be placed on top of the geogrid and geotextile. The total footprint of the hardstand area at the will be c. 1,150 m^2.

A site inspection by the design engineering team and landowner knowledge of the land have determined the ground conditions to be suitable for the size and nature of compound designed for the proposed scheme.

2.2.2.1 Intake Compound

The construction of the intake compound will involve the following sequence:

- The appointed contractor will mark out the line of the proposed compound using a GPS / total station
- A layer of geogrid / geotextile will be rolled out by hand along the line of the proposed compound
- The stone aggregate used to construct the compound will be imported from a local quarry using trucks. The trucks will reverse tip the stone onto the geogrid / geotextile and an excavator will be used to spread the stone before compaction. Compaction of the stone material will be completed using the Transport Infrastructure Ireland (TII) Specification for Roadworks. This is typically completed in layers with the use of a vibratory roller or similar
- The compound will be constructed with a minimum crossfall of 3% to ensure that water can flow off the surfaces and to reduce the risk of rutting / potholes occurring
- Surface water runoff from the compound will be discharged directly over the edge of the stone embankment and a continuous silt fence will be constructed on the downslope side to capture any sediment that may run off the surfaces
- The timber posts in the stockproof fence will be driven into the existing soil without any excavation.

2.2.2.2 Concrete Bund

- A concrete bund measuring 11 m x 8 m will be constructed inside the compound to support the HPUs and fuel tanks and to contain any fuel in the event of a spillage. The slab will be cast directly onto the imported stone used to construct the compound. The slab will include reinforcement to prevent leakage. The upstand walls will be cast in-situ using conventional formwork
- The acoustic barrier, 4m in height, will be fixed directly to the HPU bund upstand walls or slab

- The paladin fence posts will be secured to concrete blocks (Kelley Blocks or equivalent) so as to avoid disturbance of the underlying ground. Refer to the drawing in Figure 2-8 for details of fences.

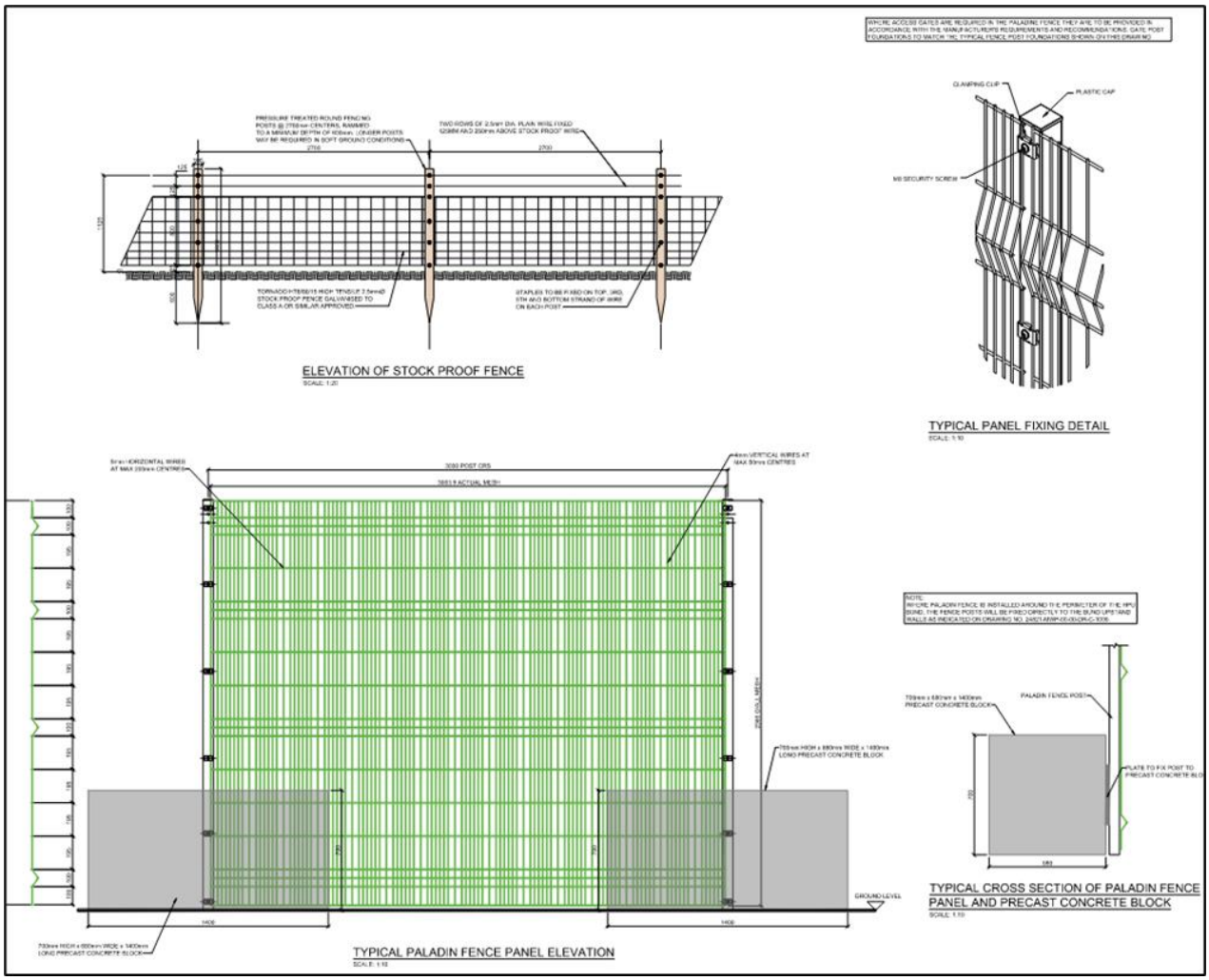


Figure 2-8 Design detail of paladin fence installation. Source Dwg. 24821-MWP-00-00-DR-C-0403 (MWP) | not to scale.

2.2.3 Pump Intake System

The construction of the pump intake system will involve the following sequence:

- The pump pontoon and access pontoons will be manufactured in the Netherlands and will be transported to site on an articulated truck. The HPUs and fuel tanks will also be transported from the Netherlands on an articulated truck. The trucks will deliver all these components to the intake compound
- A 60-tonne mobile crane will be used to lift the pump pontoon (with the pumps already installed within it) from the truck in the compound to the lough. The pump pontoon will be floated into its final position and held in place horizontally using 4 no. spud legs (100 mm diameter) fixed with end plates, which will rest on the ground beneath the water. A small boat will be in the water to assist with positioning
- The same crane will lift the HPUs and fuel tanks into position within the HPU bund
- The floating access pontoons will be transported to the site in 5 no. 6.4 m lengths. Each section will be lifted into position in the lough using the crane and bolted together
- The hydraulic hoses and 2 no. c. 300 mm diameter pipes will be mounted on the sides of the floating pontoons using brackets
- The fuel tanks will be filled with diesel using a fuel truck
- The pump system will be tested and, after installing the remainder of the pipeline, it will be commissioned.

2.2.4 Pipeline Route to the Cross River

2.2.4.1 Laying of Pipeline

Vegetation clearance will be required where the pipes must cross ditches however only space for the two pipes will be required and these locations will be replanted on removal of the temporary pipeline. Similarly, it may be necessary to cut through concrete walls or dismantle stone walls to allow the pipeline through such boundaries. All such boundaries will be reinstated once the pipeline is removed.

The construction of the pipeline will involve the following sequence:

- The flexible layflat hose and PE ribbed pipe system will be supplied from the Netherlands and will be transported to site on articulated lorries
- The layflat hose will be supplied in 50 m to 200 m lengths (typically 200 m) and will be housed in a container for transport. The container will be lifted off the trucks and onto a flatbed trailer which will be attached to a tractor or excavator. The tractor or excavator will drive along the route of the pipeline and deploy the hose directly onto the ground surface. The final positioning of the hose will be done by hand
- The pipeline will need to pass through a number of field boundary fences/hedgerows, as shown on the engineering report drawings (24821-MWP-00-00-DR-C-0100, 24821-MWP-00-00-DR-C-0101, 24821-MWP-00-00-DR-C-0102, 24821-MWP-00-00-DR-C-0103). At each location, the existing boundary fence/hedgerows will be removed over a width of 5 m which is required to allow both the pipeline and a tractor/excavator to pass through
- Cross drains consisting of HDPE drainage pipes will be laid directly on the ground beneath the layflat hose at appropriate intervals to maintain the existing drainage regime on the site. This approach eliminates the need to excavate new drainage channels or alter the existing flow regime
- The PE ribbed pipeline will be supplied in lengths varying between 5 m and 12 m and will be connected using rigid joints. The pipe sections will be loaded from the articulated lorry to a flatbed trailer attached to a tractor or excavator. The tractor or excavator will drive along the route of the PE ribbed pipe and will be followed by an excavator which will be used to lift the pipes from the trailer to the required position on the ground
- Due to the existing surface condition, which has a number of localised humps and depressions, the line of the 500mm diameter PE ribbed rigid pipe will be smoothened out. This will be achieved using an excavator to compact and level out any localised humps/depressions. The maximum depth change will be 150mm which is less that the depth of influence in conventional agricultural tilling
- The layflat flexible pipe will be connected to the PE ribbed pipe using a bespoke fabricated manifold section
- A provision will be made for badgers to cross the PE ribbed pipe by installing ‘Badger Gates’ in the fencing. This consists of sections 300 mm diameter pipe placed through and perpendicular to the wire fencing to allow badgers to travel through.

2.2.4.2 Fencing Installation

A stock proof fence will be provided both sides of the pipeline along the full length of the route and will incorporate timber posts which will be driven into the existing soil without any excavation. The stock-proof fence will consist of wooden post and wire fencing. Refer to Figure 2-8.

2.2.4.3 Road Crossings

There will be two public road crossings along the route (the R362 and L2013) and one crossing of a private road. A shallow trench will be excavated across each road and a concrete pipe installed through which the flexible pipes will subsequently be pulled. It is anticipated that the trenching works will take up to two days for each installation and one lane of traffic will be kept open to maintain traffic flow. It is known that an existing Uisce Éireann watermain and a fibre optic cable are present in the roads.

The construction of road crossings will involve the following sequence:

- On the public roads, in order to allow traffic to continue to use the roads, the pipe will be installed in two segments such that at least one traffic lane remains open at all times
- Prior to undertaking any works, a CAT scan will be undertaken to identify any services in the road
- An 1800 mm wide trench will be excavated across the road to accommodate 2 no. 600 mm diameter HDPE carrier pipes. The overall trench depth will be approximately 2,000 mm to provide sufficient cover to the pipe and to ensure that the existing services can be avoided
- The HDPE carrier pipe will be positioned onto a 100 mm thick layer of pipe bedding material placed at the bottom of the trench. Once the carrier pipe is in position the trench will be backfilled and the road will be reinstated
- The existing hedgerow will be removed on both sides of the road over a width of approximately 3 m. These will be reinstated following installation of the carrier pipes
- At each side of the road, the trench will extend past the pipe into the field and will be sloped upwards to meeting the existing field level as shown Figure 2-9 and Figure 2-10. A handrail will be erected around the trench in the field
- The flexible pipes will be placed through the carrier pipe.

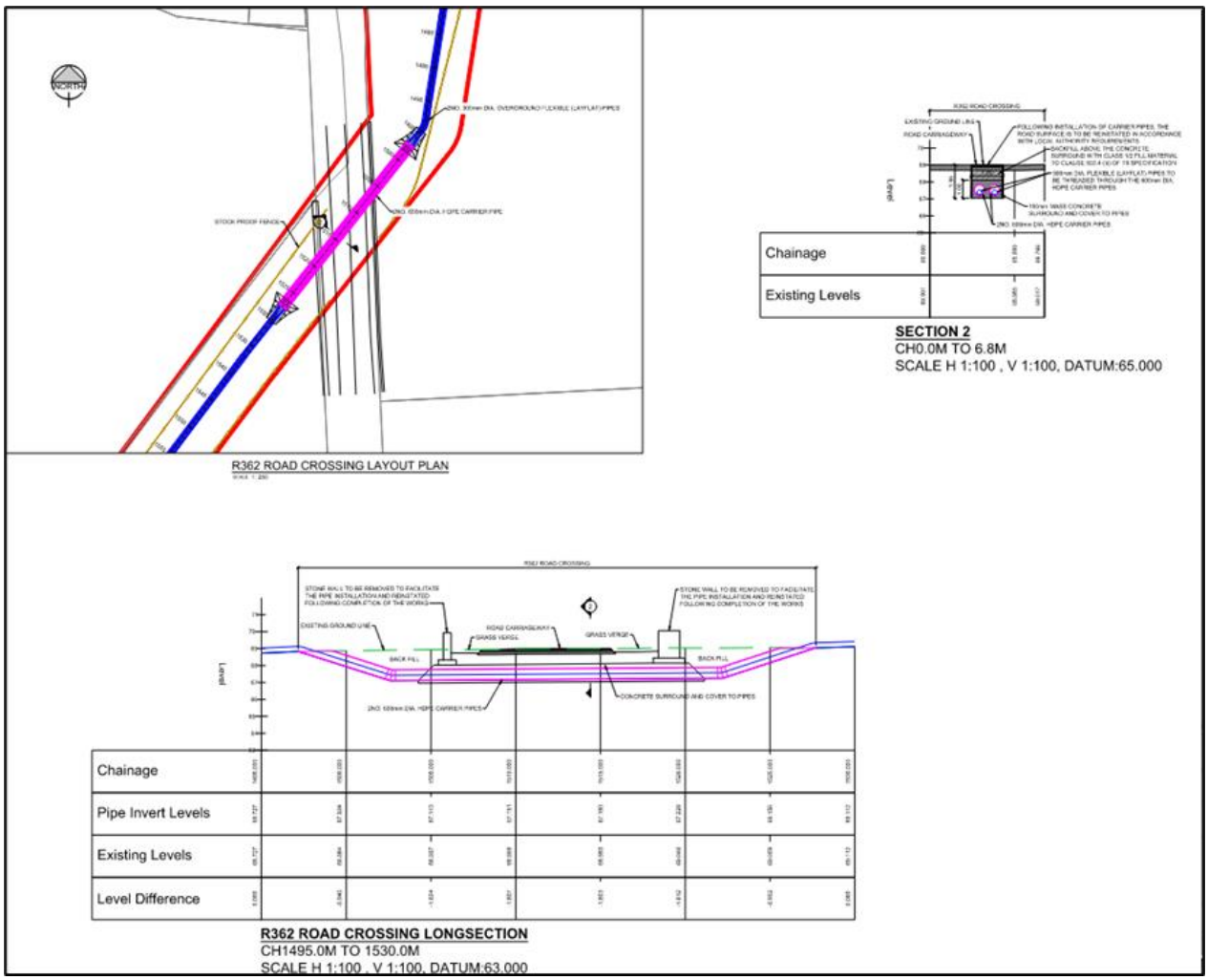


Figure 2-9 Proposed R362 road crossing detail. Source Dwg. 24821-MWP-00-00-DR-C-0401 (MWP) | not to scale

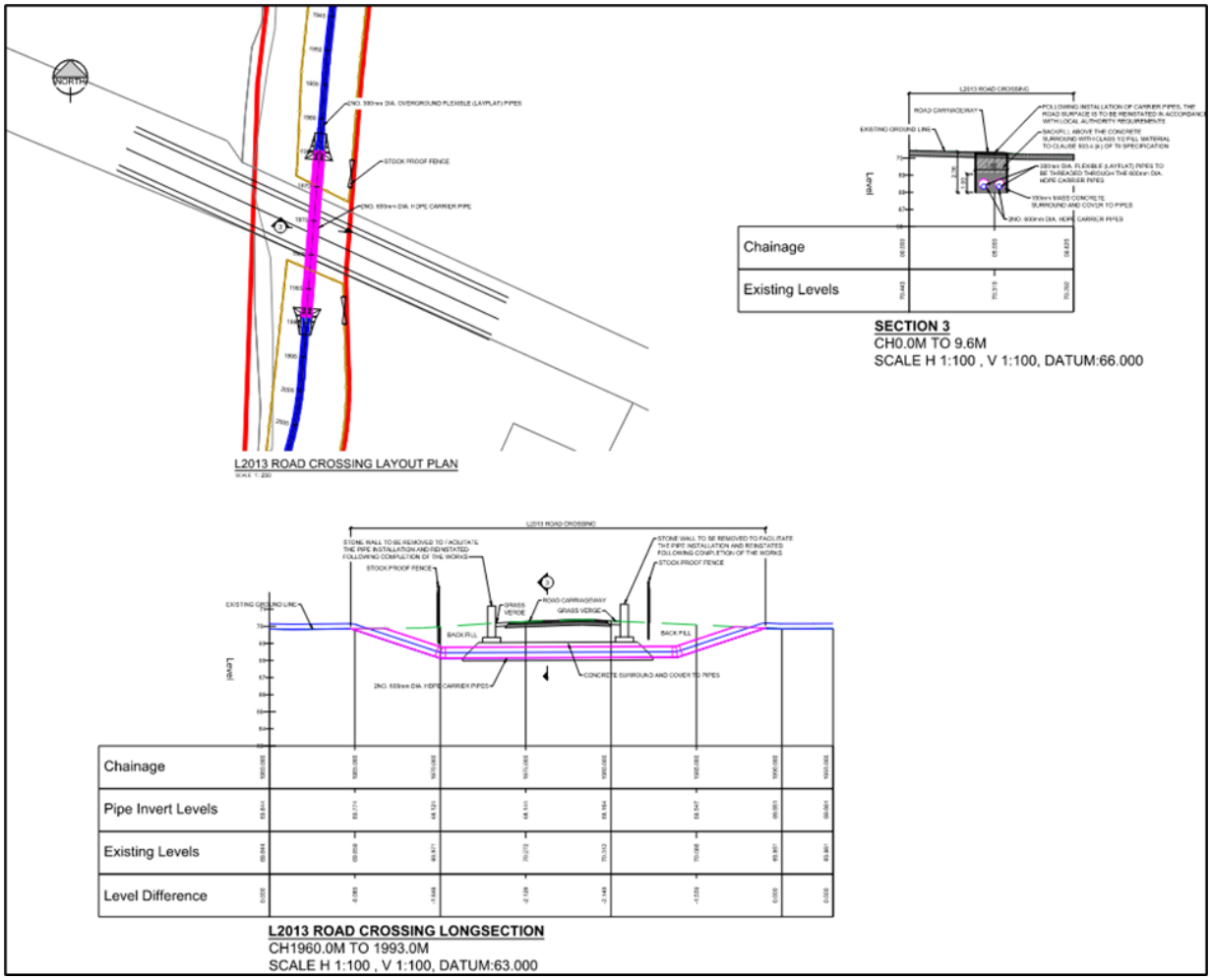


Figure 2-10 Proposed L2013 road crossing detail. Source Dwg. 24821-MWP-00-00-DR-C-0402 (MWP) | not to scale

2.2.5 Outfall

No excavation works or vegetation removal will be required at the outfall location.

The construction of the outfall will involve the following sequence:

- The geotextile will be supplied in a roll and transported to the outfall location by an excavator
- The rock armour and natural flag stones will be transported to the outfall location using a tipper truck or tracked dumper
- As noted on drawing 24821-MWP-00-00-DR-C-1003:
  - All rock shall be quarried with a minimum saturated surface dry density of 2600 kg/m³
  - Stone should be crushed and angular from strong inert rock, which shall exclude shales and weak sandstones
  - All individual stones shall be dense, sound, durable rock, free from all cracks, joints and bedding planes, which could result in breakdown of the rock in a fluvial or marine environment. It shall be capable of being handled and placed without fracture or damage
  - Individual pieces shall be blocky and take the basic shape of a cuboid. Armour units shall be hand selected and individually placed to the approval of the Employers Representative so each rock is securely held by its neighbours. Rocks shall not be placed so that they obtain their stability on a plane by frictional resistance alone

  - Armour stone is to be placed in a systematic way such that the finished construction consists of close packed layers of rock of the specified thickness for the appropriate zone. The surface of the rock shall present a close packed uneven face
  - The contractor shall provide details of the source of supply for approval prior to delivery to site.

- The geotextile will be rolled out across the full width of the channel from top of bank to top of bank
- An excavator will be used to systematically position rock armour and natural flag stones onto the geotextile, starting at the bottom and working upwards to ensure stability is maintained. The finished construction consists of close packed layers of rock of the specified thickness for the appropriate zone
- The PE ribbed pipe will be laid as far as the top of the channel bank using the method outlined in the previous sub-section. The pipe will be mitre cut and jointed to another pipe section by fusion welding a coupler so that the jointed section will be oriented downwards following the riverbank gradient
- The diffuser tee will have been pre-fabricated and will be fixed to the end of the pipe with a rigid joint
- Additional rock armour will be placed around the ends of the diffuser tee to ensure that water discharging from the ends must flow around and through the rock armour before entering the river.

2.2.6 Service Diversions

Services will potentially be encountered during the road crossing works. As noted above in Section 2.2.4.3, the overall trench depth will be approximately 2,000 mm to provide sufficient cover to the pipe and to ensure that the existing services can be avoided.

2.2.7 Traffic Management

As noted in Section 2.2.4.3, traffic management measures will be required during the installation of the pipeline under the public roads. One lane of traffic on the public roads will be maintained at all times.

2.2.8 Environmental Management During Construction

2.2.8.1 General

A construction environmental management plan (CEMP) has been prepared and will be updated throughout the duration of the proposed scheme. The CEMP is included as part of an information pack for the proposed scheme

Every effort will be made to ensure that any detrimental environmental effects will be avoided, prevented or reduced during the construction phase of this project.

The CEMP comprises all of the construction mitigation measures, which are set out in this report and the following reports submitted with the statutory approval application:

- Screening for Appropriate Assessment (AA) and Natura Impact Statement (NIS) Report
- EcIA Report
- Archaeological Impact Assessment Report
- Water Framework Directive (WFD) Assessment.

The CEMP will be updated by RCC with any additional measures which are required by the statutory consent conditions and will be provided to the appointed contractor.

Implementation of the CEMP will ensure disruption and nuisance are kept to a minimum. The plan will have regard to the guidance contained in the handbook published by Construction Industry Research and Information Association (CIRIA) in the UK, Environmental Good Practice on Site Guide, 4th Edition (CIRIA 2015).

2.2.8.2 Waste Arising

All waste arisings during construction will be managed in accordance with the waste hierarchy, in compliance with the provisions of the Waste Management Acts, 1996, as amended, and to contribute to achieving the objectives set out in the Waste Action Plan for a Circular Economy (DECC, 2020).

2.2.9 Landowner and Community Liaison

Roscommon County Council (RCC) will coordinate communications and liaise with affected landowners and the local community during all phases of the proposed scheme. RCC will liaise with residents and the general community during the construction phase to ensure that any disturbance is kept to a minimum and to ensure that all anticipated nuisances are minimised and that the construction activity will have the lowest possible impacts on the residents and other properties.

2.2.10 Construction Management

RCC will have a construction management team on site for the duration of the construction phase. This team will supervise the construction of the scheme including monitoring the contractors' performance to ensure that the proposed construction phase mitigation measures are implemented and that construction impacts and nuisance are minimised.

2.2.11 Construction Safety

All contractors and subcontractors must progress their works with reasonable skill, care and diligence and, at all times, proactively manage the works in a manner most likely to ensure the safety, health and welfare of those carrying out construction works, pedestrians, road users and other interacting stakeholders. Measures related to construction health and safety are detailed in the CEMP.

A Project Supervisor Design Process (PSDP) has been appointed by RCC.

RCC will appoint the Project Supervisor Construction Stage (PSCS) for the construction stage of the project to manage and co-ordinate health and safety matters during the construction stage. The PSCS will be appointed before the construction work begins and remains in that position until all construction work on the project is completed.

2.3 Operations & Maintenance Activities

RCC will appoint an operations contractor to oversee all operations and maintenance activities.

2.3.1 Maintenance Activities

During the operation of the proposed scheme, the following maintenance activities will be required:

- Daily inspection of pumps and fish screen
- Daily inspection of pipeline route and fencing
- Daily inspection of outfall location
- Regular refuelling
- Periodic service of pumps and HPUs
- Weekly check of compound drainage; and
- Daily emptying of rainwater from dry sump.

The pump intake screen will be inspected daily to ensure proper operation of the pumps and to check for any blockages or damage to the fish screens. If the fish screens become blocked, they can be cleared by an operative who can safely reach the screens from the access walkways as required.

2.3.2 Pumping Controls and Monitoring

2.3.2.1 Pumping Duration

It is anticipated that the pumps will operate 24 hours a day at a combined flow rate not exceeding 300 l/s, as necessary to meet the scheme objectives for a period of up to 24 months.

Pumping will also depend on the flow rates of the Cross River which will be continuously monitored. Pumping will be reduced/halted as needed to eliminate any risk of downstream flooding of the Cross River.

2.3.2.2 Monitoring

The following aspects of the proposed scheme will be continuously monitored by RCC and data will be accessible remotely:

- The level of Lough Funshinagh
- Pumping rate of the HPUs; and
- Flow rate of the Cross River.

Currently, hourly readings of the lough's water level are being recorded and monitored daily by GSI[2]. Lake levels will be monitored daily as it is expected that the change in lake level as a result of pumping will be relatively slow.

The pumping control system will be remotely monitored by RCC and if required the pumping flow rates will be adjusted or shut off. The pumping controls will not be automatically regulated based on monitoring data.

The flow in the Cross River will be monitored at three locations by OPW hydrometric gauges at 15-minute intervals for the duration of the interim scheme. One location is an existing EPA flow gauge, Summerhill Station (26221), located approximately 13.7 km downstream from the pipeline outfall.

An additional two hydrometric gauges will be installed and operated by the OPW, one at Curraghboy approximately 0.9 km downstream of the pipeline outfall and one at Atteagh approximately 5.2 km downstream of the pipeline outfall.

The Cross River flow rate will be monitored continuously to assess if the trigger flows have been reached. The details of trigger flows are provided in the MWP Engineering Report (2024). Regional flood warnings will be checked daily.

OPW installations of hydrometric gauges

Two new hydrometric gauges will be installed and operated by the OPW under its own statutory powers, at Curraghboy and Atteagh, Co. Roscommon. Both gauges will be installed on the left bank of the Cross River upstream of the adjacent road bridges. All installation works will be undertaken by the OPW according to their standard procedures (e.g. Activity Risk Assessments, Safe Operating Procedures Preliminary, Safety & Health Plan, and Job Safety Plans.). All installation works will be supervised on site by a OPW Project Supervisor Construction Stage following agreement and planning of works prepared by the OPW Project Supervisor Design Process.

OPW Installation Methodology

The installation of the hydrometric gauges will follow the methodology set by the OPW:

- The location of the station enclosure plinth will be scanned with a Cable Avoidance Tool prior to any excavation taking place
- A small excavation (maximum depth of 0.15m) will be required to facilitate the construction of the concrete plinth (~0.6 m^2)

[2]GSI Groundwater levels available at: https://gwlevel.ie/?place=00011_001_tl_gs

- A prefabricated timber shutter (~ 0.8 m x 0.8 m x 0.15 m) will be positioned and pinned where the concrete plinth is to be cast. The shutter will then be lined with polythene on the base and sides to prevent any cement paste from escaping. Sandbags to be positioned on the riverside of the shutter to contain any residual spillage
- Concrete will be transported from the designated mixing location via barrow on a route protected with polythene. Approximately 0.1m^3 of concrete will be required for the plinth. The concrete is then placed, screed and finished with a steel trowel. Once the concrete is cured shutters are removed
- A staff gauge (~1.2 m high) will be attached to the existing rock armour (Curraghboy) or bridge abutment (Atteagh) using proprietary fittings and mechanical fixings. The staff board itself will be 150 mm x 44 mm untreated timber with staff plates fitted using stainless steel screws or galvanized nails
- The sensor ducting will be extended the river channel and connected the station
- A solar panel will be installed to provide power to the station; and
- Once all installation works are completed, a final check will be carried out to ensure any excess materials or equipment are removed off site.

OPW Maintenance and Calibration

The gauges transmit the data every 15 minutes to a central server that is available to the public to view on OPW's waterlevel.ie. The gauges are typically visited on a six-weekly cycle by a regional team consisting of a Technician and Driver. This team is assigned to the station and carries out all maintenance and calibration duties at the site

2.3.3 Intake Compound

2.3.3.1 Fuel Storage Tanks

A maintenance contractor will be appointed by RCC who will oversee the maintenance of all aspects of the pumping operation.

It is anticipated that the four fuel storage tanks will need to be refilled every fourth day with a fuel tanker making deliveries to the compound. The following maintenance activities will be required during the operational phase at the intake compound:

- **Refuelling**- The hydraulic pumps will each have a running time of about 100 hours on full fuel tanks therefore refuelling will be required every fourth day while pumping is ongoing. This will involve a fuel tanker driving into the Intake Compound and delivering fuel to the tanks which are located within the bunds
- **Emptying of rainwater** - Rainwater from the HPU bund will need to be emptied daily by pumping the rainwater from a dry sump using a light duty puddle pump and discharging the water in a distributed manner onto the grassed surface at a location where the buffer distance is at least 15m to the lough edge
- **HPU Service** - The HPUs will need to be serviced every 500 running hours. A typical service will consist of changing filters and oil. A spill kit will be used to ensure that any spillage is contained
- **Drainage inspection** - The local drainage around the compound and the silt fence on the downslope side of the compound will be checked once per week to ensure adequate function and that there are no signs of blockage.

2.3.4 Pipeline Route

The entire pipeline route will be visually inspected every day by driving the route to identify any signs of damage or distress to the pipeline and to ensure all stock proof fencing remains intact.

The Cross River outfall will be inspected once per day. The purpose of the inspection will be to ensure that the diffuser is working properly and is not blocked, to ensure the rock armour and geotextile has not become dislodged or unstable. The pumps will be shut down immediately in the unlikely event that there is a concern with regard to the integrity of the outfall.

2.3.5 Environmental Management and Monitoring

2.3.5.1 Water Quality Monitoring

A specialist contractor will be appointed by RCC to carry out monthly water quality sampling of the Lough Funshinagh and the Cross River.

A water quality monitoring programme is planned for both Lough Funshinagh and the Cross River for the duration of the interim scheme.

2.3.5.2 Refuelling

Refuelling will take place at the intake compound with the truck parked over a portable PVC containment bund mat. This is designed for use under vehicles and shall act as a containment system to catch any spills which may occur during refuelling. The mat is manufactured from 900gsm PVC-coated hydrocarbon and shall be placed on top of a geotextile layer.

The following measures will be in place during refuelling operations to mitigate the risk of accidental spills:

- Refuelling shall take place with the vehicle parked over a portable PVC containment bund mat. This is designed for use under vehicles and shall act as a containment system to catch any spills which may occur during refuelling. The mat is manufactured from 900 grams per square metre (gsm) PVC-coated hydrocarbon and shall be placed on top of a geotextile layer
- Only designated trained and competent operatives will be authorised carry out refuelling operations
- Spill kits will be kept on site in case of accidental spillages and all designated operatives will be trained in using them
- Fuel tanks will only be filled from transportation tankers under the use of automatic shut off overfill protection
- The fuel tanks shall not be left unattended during refuelling
- Oil booms will be kept on site to deal with any accidental spillage
- Strict procedures for fuel tank and plant inspection, maintenance and repairs shall be detailed in the contractor's method statements and construction machinery shall be checked for leaks before arrival on site
- The plant refuelling procedures described above shall be detailed in the contractor's method statements.

2.3.5.3 Spill Management

A spill kit will be available at the intake compound in case of leaks and spills. All operational staff will be trained on how to use spill kits. In the event of a spill incident, immediate action will be taken to identify and stop the source of the spill.

The appointed operations contractor will be immediately given information on the location, type, and extent of the spill so that they can take appropriate action. If possible, efforts will be made to clean up as much as possible using the spill control materials. The disposal of any used spill control material will be done using a fully licensed waste contractor with the appropriate permits so that further contamination is limited.

2.3.5.4 Waste Arising

Waste may be generated during the operation of the proposed scheme as a result of the screens being cleared and the maintenance of the hydraulic pumping units (old filters, used hydraulic filters etc.). The provision of appropriate waste management at each working area and regular collections as per the existing arrangements on site.

2.4 Decommissioning

2.4.1 Pump Intake System

Decommissioning of the pump intake system will involve the following:

- The pumps will be shut down and disconnected from the pipeline and hydraulic hoses
- A 60-tonne mobile crane will be used to lift the pump pontoon (with the pumps inside) from the lough to an articulated truck parked in the intake compound. A small boat will be in the water to assist
- The floating access pontoons will be dismantled (unbolted) and lifted from the edge of the lough to a truck parked in compound using the 60-tonne crane; and
- The same crane will lift the HPU's and fuel tanks onto the truck.

2.4.2 Intake Compound

Decommissioning of the intake compound will involve the following sequence:

- The stock proof fence and paladin fence will be taken up and loaded onto a flatbed truck for reuse
- The concrete HPU bund will be demolished using an excavator with a rock breaker and removed to a licensed facility
- The Class 6F stone (compound) as well as the geogrid / geotextile used to construct the compound will be taken up and brought to a licensed facility. A reuse for the stone aggregate will be sought where possible following confirmation of acceptability; and
- The ground beneath the footprint of the compound will be rotovated and tilled to reinstate the area to agricultural usage, similar to the surrounding lands.

2.4.3 Pipeline Route

Decommissioning of the pipeline will involve complete removal of all PE ribbed pipe and flexible 'layflat' pipe.

2.4.3.1 Road Crossing

Decommissioning of the road crossings will involve the following sequence:

- The HDPE carrier pipes will remain in place after the pipeline has been removed
- Each end of the pipe will be blocked by filling in the trench at the ends. The redundant pipe beneath the road will not be of concern; and
- The existing hedgerow which was removed will be replanted using native hedge species and/ or walls/ fences will be restored.

2.4.4 Outfall

Decommissioning of the outfall will involve the following sequence:

- The PE ribbed pipe and diffuser tee will have been removed in conjunction with the remainder of the pipeline
- The rock armour and natural flag stones will be carefully removed from the surface of the geotextile using an excavator and placed into a tipper truck or tracked dumper; and

- The geotextile will be pulled across the river and removed by hand without entering the water.

2.4.5 Waste Arising

All waste arising will be managed in accordance with the waste hierarchy, in compliance with the provisions of the Waste Management Act, 1996, as amended, and to contribute to achieving the objectives set out in the Waste Action Plan for a Circular Economy (DECC, 2020).

Opportunities for reuse of materials, by-products and wastes will be sought throughout the decommissioning phase. Where possible, metal, timber, glass and other recyclable material will be segregated and removed off site to a permitted / licensed facility for recycling.

The contractor appointed for the decommissioning of the scheme will record the quantity in tonnes and types of waste and materials leaving the site. The name, address and authorisation details of all facilities and locations to which waste and materials are delivered will be recorded along with the quantity of waste in tonnes delivered to each facility. Records will show the type of material, specifying those that are recovered, recycled, and disposed of. The relevant appropriate waste authorisation will be in place for all facilities that wastes are delivered to (i.e., EPA Licence, Waste Facility Permit or Certificate of Registration).

The following are the expected wastes to be generated during the decommissioning phase:

- Concrete from HPU bund and Paladin post bases to be removed to a licensed facility
- Geotextiles/ geogrid to be taken to licensed facility and reused following confirmation of acceptability
- Stone aggregate to be taken to licensed facility and reused following confirmation of acceptability
- Fencing (posts, wire and paladin) to be gather for re-use
- Rock amour and natural flag stones to be taken to licensed facility
- Pipeline to be gather and re-used where possible.

2.4.6 Nature of any Associated Demolition Works

No demolition works are associated with the proposed scheme. Limited ground works and excavations are required (restricted to the road crossings).

2.5 Hydrological Surveys & Modelling

2.5.1 Surface water

Hydraulic modelling[3] was undertaken to confirm that the proposed pumping will not increase the risk of flooding over the length of the Cross River, and to gain understanding of the possible impact the additional flow due to pumping may have during low flow situations. This involved modelling of approximately 20km of the watercourse from the outfall point of the pipe to the point where the Cross River discharges into the River Shannon south of Athlone.

A high flow analysis was undertaken and showed that while the pumping operation would increase water levels by approximately 50 mm at the outfall location, the water level is still significantly below the bank level, with the channel generally oversized for the flow. This was found to be similar for the majority of the upper end of the reach.

Towards the lower end of the reach, within the area of the Callows, the channel would already be submerged when the River Shannon is in flood, which will tend to dissipate any energy from the Cross River flows. For this reason, and since the Q_{MED} flow in the downstream reach will be far higher than at the outfall, there would be no notable change in water level due to pumping.

[3] MWP, September 2024, Lough Funshinagh Interim Flood Management Measures – Engineering Report [Issue]

2.5.2 Groundwater

Lough Funshinagh is located over a regionally important aquifer which is dominated by conduit flow (Rkc) and within the Funshinagh WFD Groundwater Body (GWB) (IE_SH_G_091). The GWB is monitored under WFD requirements and has maintained 'Good' overall groundwater status since 2007. The GWB undergoes chemical water quality monitoring with the main pressure identified within the results relating to pesticides[4].

The purpose of the proposed scheme is to exact sufficient volume of water from the lough that will negate or partly negate the increase in level and to limit the peak water level. It is anticipated that this action will not have an effect on the wider groundwater body given its area of 354 km^2 in comparison to the area of Lough Funshinagh at 3.783 km^2. The proposed scheme is anticipated to only result in temporary and localised changes to the groundwater body.

2.6 Statements of Competency

The statements of competencies for the contributing authors to this EcIA report are provided in Appendix A.

2.7 Report Layout

This report is structured as follows:

- Section 2 provides the project description
- Section 3 provides the legislation, planning policy and guidance
- Section 4 provides the methodology followed in this EcIA
- Section 5 outlines the baseline ecological conditions for the proposed scheme
- Section 6 identifies the Likely Significant Impacts of the proposed scheme
- Section 7 provides the Ecological Impact Assessment, including proposed mitigation and residual impacts; and
- Section 8 provides the conclusions & summary.

3. Legislation, Planning Policy & Guidance

3.1 Legislation

European and national legislation relevant to the proposed scheme is listed below. These pieces of legislation include offences relating to protected species, habitats and designated sites and requirements for mitigation and licences to allow construction works to proceed.

The European Communities (Birds and Natural Habitats) Regulations set out the requirement for the consideration of the potential effects of a proposed scheme on the Natura 2000 network comprising of Special Areas of Conservation (SACs) and Special Protection Areas (SPAs).

European legislation

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

[4] Lough Funshinagh GWB Water Quality https://www.catchments.ie/data/?_gl=1*886kh3*_ga*MTA4ODQxNzkyMC4xNjQ3MDAzMDM1*_ga_TPK2CK9KEX*MTcyMDQ0ODAxMy4yMDUuMC4xNzIwNDQ4MDEzLjAuMC4w#/waterbody/IE_SH_G_091?_k=zx2d3n Accessed July 2024.

- Council Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds
- Invasive Alien Species of Union concern listed under the EU IAS Regulation [1143/2014]; and
- European Union (Invasive Alien Species) (Freshwater Crayfish) Regulations 2018 [SI 354/2018].

National legislation

- **Wildlife Act 1976** (as amended); hereafter collectively referred to as the Wildlife Acts. The Wildlife Acts are the principal pieces of legislation at national level for the protection of wildlife and for the control of activities that may harm wildlife. All bird species, 22 other animal species or groups of species, and 86 species of flora are protected under these pieces of legislation
- **Planning and Development Act 2000** (and all amendments). This piece of legislation is the basis for Irish planning. Under the legislation, development plans (usually implemented at local authority level) must include mandatory objectives for the conservation of natural heritage and for the conservation of European Sites. It also sets out the requirements in relation to environmental assessment with respect to planning matters, including transposition of the Habitats and Birds Directive into Irish law
- **European Communities (EC) (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477/2011 (as amended)**; hereafter the 'Birds and Habitats Regulations'. This legislation transposes the Habitats and Birds Directives into Irish law. It also contains regulations (49 and 50) that deal with invasive species (those included within the Third Schedule)
- **Flora (Protection) Order, 2015**. This lists species of plant protected under Section 21 of the Wildlife Acts.

3.2 Planning Policy

3.2.1 National Policy

National Development Plan (2021-2030)

The National Development Plan (NDP) 2021-2030[5] aims to enhance amenity and heritage through the strategic investments priorities in national heritage including protecting Ireland's rare and endangered plants, animals and their habitats.

National Biodiversity Action Plan

The 4th National Biodiversity Action Plan (NBAP) of Ireland, covering the period from 2023 to 2030, was published on January 25, 2024. This plan, which sets the national biodiversity agenda for the next seven years, aims to bring about the transformative changes needed to appreciate and safeguard nature. The plan was formulated with the assistance, guidance, and contributions of the interdepartmental Biodiversity Working Group and the independent Biodiversity Forum.

The NBAP advocates for a comprehensive approach to biodiversity governance and conservation, involving all levels of government and society. The goal is to ensure that every individual, community, business, local authority, semi-state, and state agency is aware of biodiversity, its significance, and the consequences of its loss.

The plan builds on the successes of the previous plan and continues to implement actions within the framework of five strategic objectives and comprises 194 actions.

The Wildlife (Amendment) Act 2023 introduced a new public sector duty on biodiversity. The law mandates that every public body, as listed in the Act, are obliged to have regard to the objectives and targets in the National Biodiversity Action Plan. Additionally, local authorities will be required to produce and update local biodiversity action plans and integrate biodiversity into their plans, policies and programmes.

[5] Department of Public Expenditure and Reform. *National Development Plan 2021-2030.*

3.2.1.1 Project Ireland 2040- National Planning Framework

The National Planning Framework (NPF)[5] is the Irish Government's high-level strategic plan for shaping the future growth and development of Ireland to the year 2040. It is a framework to guide public and private investment, to create and promote opportunities for the country's citizens, and to protect and enhance the environment.

Objectives within the NPF considered relevant to this assessment include:

- Flood risk management core objectives:
  - Ensuring effective management of residual risks for development permitted in floodplains
  - Avoiding unnecessary restriction of national regional or local economic and social growth; and
  - Improving the understanding of flood-risk management in accordance with best practice.
- National Policy Objective 59: Enhance the conservation status and improve the management of protected areas and protected species by:
  - Implementing relevant EU Directives to protect Ireland's environment and wildlife
  - Integrating policies and objectives for the protection and restoration of biodiversity in statutory development plans
  - Developing and utilising licensing and consent systems to facilitate sustainable activities within Natura 2000 sites; and
  - Continued research, survey programmes and monitoring of habitats and species.

3.2.2 Regional Policy

The Regional Spatial & Economic Strategy (RSES) 2020 – 2032[6] for the northern and western region provides guidelines for effective regional development. The RSES includes the following regional policy objectives (RPOs) that are considered relevant to this assessment:

- RPO 5.5: Ensure efficient and sustainable use of all our natural resources, including inland waterways, peatlands, and forests, in a manner which ensures a healthy society, a clean environment and there is no net contribution to biodiversity loss arising from development supported in this strategy. Conserve and protect designated areas and natural heritage area. Conserve and protect European sites and their integrity; and
- RPO 5.7: Ensure that all plans, projects and activities requiring consent arising from the RSES are subject to the relevant environmental assessment requirements including SEA, EIA and AA as appropriate.

3.2.3 Local Policy

Whilst the proposed scheme will be located within County Roscommon, given its proximity to potential downstream impacts relevant Westmeath County planning policy has been considered.

Roscommon County Council

The following objectives identified in the Roscommon County Development Plan are considered relevant to the proposed scheme.

- NH 10.1: Ensure the protection, conservation and enhancement of the biodiversity of the county

[6] Northern & Western Regional Assembly. (2020). Regional Spatial and Economic Strategy 2020 – 2023.

- NH 10.5: Ecological Impact Assessment (EcIA) will be required for proposed developments likely to significantly impact on natural habitats and/or species, and which are not subject to Environmental Impact Assessment
- NH 10.7: Implement Article 6(3) and where necessary Article 6(4) of the Habitats Directive and to ensure that Appropriate Assessment is carried out in relation to works, plans and projects likely to impact on European sites (SACs and SPAs), whether directly or indirectly or in combination with any other plan(s) or project(s). All assessments must be in compliance with the European Communities (Birds and Natural Habitats) Regulations 2011
- NH 10.8: Ensure that no plans, programmes, etc. or projects are permitted that give rise to significant cumulative, direct, indirect or secondary impacts on European Sites arising from their size or scale, land take, proximity resource requirements, emissions (disposal to land, water or air), transportation requirements, duration of construction, operation, decommissioning or any other effects (either individually or in combination with other plans, programmes, etc. or projects); and
- NH 10.9: Ensure that any plan or project that could have a significant adverse impact (either alone or in combination with other plans and projects) upon the conservation objectives of any Natura 2000 Site or would result in the deterioration of any habitat or any species reliant on that habitat will not be permitted.

Westmeath County Council

The following objectives identified in the Westmeath County Development Plan are considered relevant to the proposed scheme.

- CPO 12.1: Contribute as appropriate towards the protection of designated sites in compliance with relevant EU Directives and applicable national legislation
- CPO 12.5: Ensure that no plans, programmes, etc. or projects giving rise to significant cumulative, direct, indirect or secondary impacts on European Sites arising from their size or scale, land take, proximity, resource requirements, emissions (disposal to land, water or air), transportation requirements, duration of construction, operation, decommissioning or from any other effects shall be permitted on the basis of this Plan (either individually or in combination with other plans, programmes, etc. or projects)[7] Plan (either individually or in combination with other plans, programmes, etc. or projects
- CPO 12.6: Ensure that any plan or project that could have a significant adverse impact (either by themselves or in combination with other plans and projects) upon the conservation objectives of any Natura 2000 Site or would result in the deterioration of any habitat or any species reliant on that habitat will not be permitted
- CPO 12.7: Assess any plan or project in accordance with Article 6 of the Habitats Directive to determine whether the plan or project is likely to have a significant effect on the site either individually or cumulatively upon the integrity, conservation objectives and qualifying interest of any Natura 2000 Site
- CPO 12.8: Require an ecological appraisal for development not directly connected with or necessary to the management of Natura Sites, or a proposed Natura Site and which are likely to have significant effects on that site either individually or cumulatively
- CPO 12.9: Identify and provide appropriate buffer zones between Designated Sites and local biodiversity features and areas zoned for development
- CPO 12.11: Promote the maintenance and as appropriate, achievement of favourable conservation status of habitats and species and to improve the ecological coherence of the Natura 2000 network, by maintaining and where appropriate, developing features in the landscape which are of major importance for wild fauna and flora; and

[7] Except as provided for in Article 6(4) of the Habitats Directive, viz. There must be a) no alternative solution available, b) imperative reasons of overriding public interest for the project to proceed; and c) Adequate compensatory measures in place

- CPO 12.12: Require that new development proposals affecting designated sites have regard to the sensitivities identified in the SEA Environmental Report prepared in respect of this plan.

3.3 Guidance

The criteria used to assess the ecological value and significance of the site for habitats and species follows the Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine[8].

4. Methodology

4.1 Scope of Assessment

The assessment of potential effects on habitats and species resulting from the proposed scheme was based on the baseline known at the time of writing.

The assessment involved the following stages:

- Identification of the potential important ecological features
- Establishing the ecological zones of influence of the proposed scheme for each important ecological feature identified
- Evaluation of ecological resources and features likely to be affected (baseline environment); and
- Identification of the biophysical changes likely to affect valued ecological resources and features and an assessment of whether these biophysical changes are likely to give rise to a significant ecological effect, followed by refinement of the proposed scheme to incorporate ecological mitigation measures to avoid, reduce or compensate for any significant adverse effects. Predicted residual impacts taking these mitigation measures into account are then assessed.

4.2 Zone of Influence

The Zone of Influence (ZoI) is a distance within which the proposed scheme could potentially affect Key Ecological Receptors (KERs). The ZoI varies by KER and depends on the source of impact, the sensitivity of the receptor, and the presence of a pathway between the two.

In this instance, the key sources of potential impacts are construction activity along the entirety of the proposed scheme, lands immediately surrounding it, the waterbodies by which the proposed scheme is connected, the potential for the proposed scheme to disturb or displace species within the lands, or result in the direct loss of habitat and/or mortality of fauna within the lands, and the potential for discharge of pollutants/nutrients or changes in hydrological regime to local surface waters during operation of the project.

The potential receptors in this instance are designated sites (including European sites), freshwater habitats, terrestrial habitats and fauna and flora within the site, in the immediate vicinity and downstream of the discharge point.

[8] Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. CIEEM (2018). Available on https://cieem.net/wp-content/uploads/2018/08/ECIA-Guidelines-2018-Terrestrial-Freshwater-Coastal-and-Marine-V1.1Update.pdf. Accessed August 2024.

The maximum ZoI of the proposed scheme upon ecological features is anticipated to be:

- International statutory designations – where the Source-Pathway-Receptor (SPR) model has identified a potential pathway for effect, including through hydrological and aerial connectivity, and functionally linked land – this is described in detail within the Screening for Appropriate Assessment (AA) and Appropriate Assessment report for the proposed scheme
- National statutory and non-statutory designations – up to 2km from site
- EU Annex I habitat – up to 500m from site; and
- Protected and notable fauna and flora– up to 100m from site for terrestrial receptors, or where a hydrological impact pathway exists for aquatic receptors.

As KER are identified, the ZoI will be refined based on individual receptor characteristics and potential impact pathways.

4.3 Consultation

4.3.1 Inland Fisheries Ireland

IFI was contacted requesting guidance regarding potential impacts arising from the proposed scheme to the waterbodies of Lough Funshinagh and the Cross River. The purpose was to understand any potential concerns IFI might have about the proposed scheme and obtain advice on the design of the pump intake, screen, and mesh sizes. Additionally, Arup requested any available data for the Cross River and Lough Funshinagh to inform the relevant reports (AA, EcIA and WFD Assessment). In response to Arup's enquiry, IFI sent a letter on August 13th 2024 requesting further information, to which Arup provided a detailed response on August 16th.

In a phone call on 29th August, IFI requested further clarification and information in respect of the intake and the outfall, which was forwarded by email on the same date. On August 30th Arup received a response via email from IFI, suggesting several additional mitigation strategies to prevent erosion and water quality impacts within the proposed scheme. These mitigation strategies are discussed further in Section 7.3.

4.3.2 National Parks and Wildlife Service

Relevant members of the NPWS Ecological Guidance and Advice Unit (EGAU), Development Applications Unit (DAU) and regional management/personnel were consulted regarding the proposed scheme. An online round-table meeting was held on August 22nd 2024, during which NPWS representatives were presented with an overview of the proposed scheme, its design, relevant environmental and ecological baseline parameters, and the current findings of the associated environmental reports, including the AA, EcIA, EIA Screening and WFD Assessment.

4.4 Desk Study

The National Biodiversity Data Centre (NBDC) is a national organisation that collates, manages, analyses and disseminates data on Ireland's biodiversity. It is funded by the Heritage Council and the Department of Housing, Local Government and Heritage. The NBDC provides access to all validated biodiversity data through Biodiversity Maps, the on-line biodiversity data portal.

Biodiversity records and full species accounts can be viewed and scrutinised through an interactive Biodiversity Maps portal[9] . This is a tool that can be used to help make a preliminary assessment of biodiversity issues when considering site-specific proposed scheme.

The chosen search area using the NBDC search tool, illustrated at Appendix B, was customised to capture all records within a minimum 100 m distance of the proposed scheme. The principal purpose of this task is to capture any records of protected species or species of natural heritage importance in close proximity to the site boundary. The ZoI of the proposed scheme for protected species, does not extend further than this.

[9] Biodiversity Maps Ireland. (2024). http://maps.biodiversityireland.ie/#/Home. Accessed July 2024.

National Parks and Wildlife Service (NPWS) GIS habitat data files were used to overlie the site to determine the presence of features of ecological significance.

GIS shapefiles from the Environmental Protection Agency (EPA) Land Cover Map[10] were used to determine which habitat types (to Fossitt[11] Level 2) are present within Lough Funshinagh, the intake compound, the pipeline route plus 100m buffer, and the Cross River from the outfall location to the River Shannon plus 100 m buffer (hereafter the 'study area', shown in Appendix H). Additionally, habitats and species data was requested from NPWS for within the study area, with data received on 19th August 2024.

In addition, available reports from the EPA on the water quality of the relevant waterbodies were reviewed[12], as well as water quality data from the EPA, from four monitoring stations downstream of Lough Funshinagh along the Cross River. Average water quality values are provided as Q values, based on river quality surveys for pollution and biological material[13]. The National Research Survey Programme Rivers 2016 report[14] from Inland Fisheries Ireland (IFI) was reviewed to provide baseline information on fisheries in the vicinity of the proposed scheme.

Irish Wetland Bird Survey (I-WeBS) data was requested from Birdwatch Ireland[15], and received on the 7th August 2024. Data was requested for South Roscommon Lakes (site code: 0E020), Brideswell (site code: 0ES30), and Shannon Callows (site code: 0R303). Data was provided from 2018 – 2024.

4.5 Field Survey

4.5.1 Habitat and Species Surveys

Multi-disciplinary walkover surveys were carried out by Ryan Hanley surveyors, across the footprint of Lough Funshinagh and the Cross River. Walkover surveys were undertaken on 28th March 2024, 4th, 11th, 18th and 25th of July 2024 around the perimeter of Lough Funshinagh and on the 2nd, 6th, 7th, 8th and 9th of August 2024 for the Cross River. The survey area is shown in Appendix H. These surveys were conducted in accordance with National Roads Authority (NRA) Guidelines, 'Ecological Surveying Techniques for Protected Flora and Fauna on National Road Schemes'[16] (NRA, 2009a). These surveys catered to fulfilling specific ecological objectives relating to habitats, breeding birds, mammals (including badgers (*Meles meles)*, otters (*Lutra lutra),* and bat species) and aquatic ecology (including fish). Additional habitat identification was done during the Wintering Bird Survey, Breeding Bird Survey and Fauna surveys of Lough Funshinagh from November 2023 to June 2024.

Habitats

Habitat mapping was undertaken using guidance set out in 'Best Practice Guidance for Habitat Survey and Mapping'[17] . Plant nomenclature for vascular plants follows 'New Flora of the British Isles'[18] , while mosses and liverworts nomenclature follow 'Mosses and Liverworts of Britain and Ireland: A Field Guide'[19]. Habitats considered to be of ecological significance and in particular having the potential to correspond to those listed in Annex I of the EU Habitats Directive 92/43/EEC were identified and assessed.

[10] EPA. (2024). National Land Cover Map. Available at: https://www.epa.ie/our-services/monitoring--assessment/assessment/mapping/national-land-cover-map/ Accessed August 2024.

[11] Fossitt, J.A., (2000) A Guide to Habitats in Ireland. The Heritage Council.

[12] EPA (2024) Upper Shannon Catchment Summary WFD CYCLE 3. Accessed at https://catchments.ie/wp-content/files/catchmentassessments/26G%20Upper%20Shannon%20Catchment%20Summary%20WFD%20Cycle%203.pdf Accessed July 2024.

[13] EPA Maps. (2024). https://gis.epa.ie/EPAMaps/ Accessed August 2024.

[14] IFI. (2016). National Research Survey Programme. Rivers 2016. Accessed August 2024.

[15] https://birdwatchireland.ie/ Accessed August 2024. I-WeBS data has been obtained to inform this assessment but due to the terms and conditions from acquiring this information, it has not been replicated for publication with this report. As contained within the terms and conditions adjoining the data request "*raw data are not to be given verbatim in any presentation, publication, report etc. without prior written permission from the I-WeBS office"*

[16] NRA. (2009) Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes. Available at: https://cieem.net/wp-content/uploads/2019/07/Ecological-Surveying-Techniques-for-Protected-Flora-and-Fauna-during-the-Planning-of-National-Road-Schemes.pdf Accessed August 2024

[17] Smith, G.F., O'Donoghue, P., O'Hora, K. & Delaney, E. (2011). Best practice guidance for habitat mapping and survey. Available at: https://www.heritagecouncil.ie/content/files/best_practice_guidance_habitat_survey_mapping_onscreen_version_2011_8mb.pdf Accessed August 2024

[18] Stace, C. (2010). New Flora of the British Isles. Cambridge University Press; 3rd edition

[19] Atherton, I, Bosanquet, S. & Lawley, M. (2010). Mosses and Liverworts of Britain and Ireland. A field guide.

Amphibians

During the walkover surveys, suitability of habitats within the survey area were assessed for suitability to support amphibians, and presence of any amphibians was noted.

Badger

During field surveys, a survey for badgers was conducted, adhering to best practice guidance[20] , and was cognisant of 'Guidelines for the Treatment of Badger Prior to the Construction of National Roads Schemes'[21] in order to determine the presence of badger signs along and adjacent to the survey area. Optimal time for undertaking badger surveys is between November and April, when vegetation cover is reduced. The badger survey conducted was not constrained by vegetation or season and a comprehensive survey was conducted in March 2024.

Bats

During the walkover surveys undertaken during the 2nd August – 9th August along the Cross River, the landscape was searched in terms of landscape suitability for bat habitat. No bat activity surveys were undertaken as part of this survey.

Otter

Otter surveys were conducted following 'Guidelines for the Treatment of Otter Prior to the Construction of National Roads Schemes' (NRA, 2009) in order to determine any potential signs and sightings of otters within the footprint of the Lough Funshinagh and the Cross River.

Reptiles

During the walkover surveys, habitats within the survey area were assessed for suitability to support reptiles, and presence of any reptiles was noted.

Invertebrates

During the ecology walkover surveys, potential for habitats within the survey area to support notable terrestrial and aquatic invertebrates was appraised.

INNS

During field surveys, any potential Invasive Alien Species (IAS) listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2015) was recorded.

Other notable species

During the walkover surveys, any other notable species not listed above were also recorded, including pine martin (*Martes martes)*.

In addition, trail cameras were placed at key locations to monitor the presence of any key species for several weeks and throughout the duration of the baseline surveys from March to August 2024.

Wintering Bird Surveys

Wintering bird surveys were undertaken by Ryan Hanley between November 2023 and March 2024. The survey area (shown in Appendix D) was determined in accordance with the habitat's potential importance to wintering bird species of the area. As well as Lough Funshinagh, other smaller adjacent lakes have been included in the survey area. Lough Funshinagh and the adjacent lakes formed the focus for the survey, together with associated habitats of the flood plain, wetlands in particular.

[20] NRA. (2009). Ecological Survey Techniques for Protection Flora and Fauna during the Planning of National Road Schemes. National Roads Authority, Dublin, Ireland. Available at: https://www.tii.ie/media/4nthqz3a/ecological-surveying-techniques-for-protected-flora-and-fauna-during-the-planning-of-national-road-schemes.pdf. Accessed August 2024.

[21] NRA. (2006). Guidelines for the treatment of badgers prior to the construction of national road schemes. Available at: https://cieem.net/wp-content/uploads/2019/07/Guidelines-for-the-Treatment-of-Badgers-prior-to-the-Construction-of-a-National-Road-Scheme.pdf. Accessed August 2024.

Preliminary vantage points were estimated at desktop stage but were officially assigned onsite. Some were along public roads, while others involved gaining permission to park and walk through private lands.

A widely used method for wetland and waterbirds is that described by Bibby (2000)[22] as a 'look-see' approach which is an instantaneous count from one or more (or continuous) viewpoints over a subject waterbody or larger wetland area/site. This method is used for national and international surveys including I-WeBS. The Lough Funshinagh survey area, including selected small outlying turlough lakes with fringing wetland habitats, was surveyed on one day visit per month from November 2023 to March 2024.

Target species were wetland and waterbirds, including qualifying interest species of nearby SPAs which may use the habitats within the survey area.

Full details of the wintering bird survey methodology and weather conditions are provided within the Wintering Bird Survey Report within Appendix D.

Breeding Bird Surveys

Breeding bird surveys were undertaken by Ryan Hanley between April and June 2024. The survey area (shown in Appendix E) was determined in accordance with the habitat's potential importance to breeding bird species of the area, and included Lough Funshinagh, as well as other smaller adjacent loughs and wetlands have been included in the survey area, this includes Lough Cup. Lough Funshinagh, Lough Cup and the adjacent smaller turloughs and wetlands formed the focus for the survey, together with associated habitats of the flood plain, wetlands in particular. Breeding bird species inhabiting the hedgerows and treelines at the margins of Lough Funshinagh and other wetlands were also noted. Preliminary survey transect lines were estimated at desktop stage but were officially assigned on-site. Some transect lines were along public roads, as Lough Funshinagh water levels were high during the survey. The majority of transect lines involved gaining permission to walk through private lands along the boundary of Lough Funshinagh and the adjacent smaller loughs and wetlands. Lough Cup was observed from the road boundary given the high-water level this lough was fully visible.

The methodology involved six dates for which the survey began before dawn (4:15AM – 6:30AM) and one dusk survey date which began at approximately 20:30PM. As standard it is recommended that six bird survey visits be undertaken as part of a survey for breeding birds. This was done to maximise the likelihood that all observations made were of birds breeding in the area and not birds which had migrated to the survey area from other breeding sites in the surrounding area. Once at the start of each transect route, each survey team began observing and counting waterfowl species on the lough, shore zones and adjacent wetland habitats using professional binoculars and spotting scope. The perimeter of the lough, where accessible, was covered multiple times between both survey teams. Irish Transverse Mercator (ITM) coordinates were estimated and assigned to each recorded observation of a species individual, group or flock marked down on the field map. Target species were wetland and waterbirds, including qualifying interest species of nearby SPAs which may use the habitats within the survey area.

Full details of the methodology and weather conditions are provided within the Breeding Bird Survey Report within Appendix D.

Aquatic and Riparian surveys

Aquatic and riparian surveys were undertaken by Ross Macklin at seven sites along the Cross River, as detailed below Table 1. A summary of the methods employed is provided below, however full details are provided within the Baseline Aquatic Survey Report[23] in Appendix F.

Table 1 Aquatic survey site locations.

Site no.	EPA code	Location	X (ITM)	Y (ITM)
S1*	26C10	250m upstream of proposed outfall	591827	748120
S2	26C10	Proposed outfall	592078	748072

[22] Bibby, C.J., Burgess, N.D., Hill, D.A. & Mustoe, S.H. (2000) Bird census techniques. Academic Press, London.
[23] Triturus Environmental Ltd. (2024). Aquatic baseline report for the Lough Funshinagh Interim Flood Relief Scheme.

Site no.	EPA code	Location	X (ITM)	Y (ITM)
S3	26C10	Curraghboy	592825	747561
S4	26C10	Derryglad	594403	745763
S5*	26C10	Millnagh Mill	596180	744369
S6	26C10	Crannagh	601017	740204
S7*	26C10	Kilnamanagh	603656	739232

In addition to the specific surveys outlined below, a broad aquatic and riparian habitat assessment was conducted, to define the watercourses' naturalness. Each site was assessed in terms of the following:

- Physical watercourse/waterbody characteristics (i.e. width, depth, channel form) including associated evidence of historical drainage
- Substrate type and relative condition, listing substrate fractions in order of dominance (i.e. bedrock, boulder, cobble, gravel, sand, silt etc.)
- Flow type by proportion of riffle, glide and pool in the sampling area
- An appraisal of the macrophyte and aquatic bryophyte community at each site; and
- Riparian vegetation composition and bordering land use practices.

In addition, an assessment of the aquatic vegetation community of Lough Funshinagh was undertaken, to identify any rare macrophyte species listed under the Flora (Protection) Order, 2022 and or relevant Irish Red lists[24,25] (Wyse-Jackson et al., 2016; Lockhart et al., 2012), and to establish any macrophyte plant communities corresponding to Annex I habitats. The survey was also undertaken to help ascertain the presence of Annex I habitats for Lough Funshinagh SAC.

Fisheries

Electrofishing was conducted at six riverine survey sites for a ten-minute Catch Per Unit Effort (CPUE)[26]. Electrofishing could not be carried out at Site 7, due to the water being too deep. Spot-point electrofishing was used to help establish the fisheries composition of the watercourses relative to the proposed scheme. Where ten-minute CPUE was not considered feasible, a five-minute CPUE was applied, with results standardised for all sites to allow data comparison. A single-anode Smith-Root LR24 backpack (12V DC input; 300V, 100W DC output) was used to electro-fish riverine sites during August 2024 under a Department of the Environment, Climate and Communications (DECC) licence. Electro-fishing settings were tailored for each different species group targeted. Electro-fishing techniques followed accepted European standards[27] and adhered to best practice[28].

Fisheries habitat appraisal was undertaken to establish the importance of the supporting habitats as nursery, spawning and or holding habitats for salmonids and lamprey species but also considered European eel and other fish species. Full details of the methodology are provided in Appendix F.

Assessment of the fish community at Lough Funshinagh was undertaken through bye-catch during sweep sampling or visual observations.

[24] Wyse Jackson, M., Fitzpatrick, Ú., Cole, E., Jebb, M., McFerran, D., Sheehy Skeffington, M. & Wright, M. (2016) Ireland Red List No. 10: Vascular Plants. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs, Dublin, Ireland.

[25] Lockhart, N., Hodgetts, N. & Holyoak, D. (2012) Ireland Red List No.8: Bryophytes. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

[26] Matson, R., Delanty, K., Shephard, S., Coghlan, B. and Kelly, F. (2018). Moving from multiple pass depletion to single pass timed electrofishing for fish community assessment in wadeable streams. *Fisheries research*, 198, 99-108.*8*

[27] CEN (2003). Water Quality - Sampling of Fish with Electricity. Document CEN EN 14011:2000.

[28] CFB (2008). Methods for the Water Framework Directive. Electric Fishing in Wadeable Reaches. Central Fisheries Board. Unpublished report

Macrophyte and aquatic bryophyte survey

Macrophyte and aquatic bryophyte surveys was conducted by instream wading at each of the survey sites on the Cross River, with specimens collected (by hand or via grapnel) for on-site identification. An assessment of the aquatic vegetation community helped to identify any rare macrophyte species listed under the Flora (Protection) Order, 2022 and or Irish Red list for vascular plants[29] or habitats corresponding to the Annex I habitats, e.g., 'Water courses of plain to montane levels, with submerged or floating vegetation of the *Ranunculion fluitantis* and *Callitricho-Batrachion* (low water level during summer) or aquatic mosses [3260]' (more commonly referred to as 'floating river vegetation').

White-clawed crayfish

A white-clawed crayfish (*Austropotamobius pallipes)* survey, including appraisal of habitat, was undertaken across the survey sites (under NPWS licence) on the 10th August 2024. Sweep netting was employed at each site to detect both adult and juvenile crayfish and assess habitat quality. Sweep netting involved sampling of both in-channel macrophytes, as well as checking typical boulder and cobble refugia. This involved the lifting of littoral boulders while the net is swept underneath to trap any crayfish positioned underneath. As per IFI recommendations (and as with other surveys conducted), crayfish surveys were undertaken in a downstream direction on each watercourse to minimise the risk of upstream mobilisation of crayfish plague *Aphanomyces astaci* or invasive species.

An appraisal of white-clawed crayfish habitat was undertaken based on physical habitat attributes[30,31], water chemistry and incidental records in mustelid spraint.

Macroinvertebrates

Sweep sampling of Lough Funshinagh was conducted during June 2024. Invertebrates sampled were identified to species level and native or non-native status recorded.

Otter

The presence of otter was determined through the recording of otter signs within 150m radius of each survey site on the Cross River. Notes on the age and location of signs (ITM coordinates) were made, in addition to the quantity and visible constituents of spraint (i.e. remains of fish, crustaceans, molluscs etc.).

Summary

A summary of ecological surveys undertaken for the scheme is provided below in Table 2.

Table 2 Summary of ecological surveys.

Survey Type	Dates of Survey	Survey Locations
Multi-disciplinary Walkover Survey; Habitat survey Otter survey Badger survey	28th March 2024, 5th, 25th June 2024 4th, 11th, 18th, 25th July 2024	Lough Funshinagh
Riparian and terrestrial habitat survey	2nd, 5th to 9th August 2024	Cross River
Hedgerow and PRF survey	28th March 2024 25th June 2024 9th August 2024	South end of Lough Funshinagh following fields to the Cross River outfall
Trail Cameras in operation	March to August 2024	Lough Funshinagh and Cross River
Wintering bird surveys	November 2023 – March 2024	Lough Funshinagh and adjacent smaller lakes

[29] Wyse Jackson, M., FitzPatrick, Ú., Cole, E., Jebb, M., McFerran, D., Sheehy Skeffington, M. & Wright, M. (2016) Ireland Red List No. 10: Vascular Plants. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs, Dublin, Ireland.

[30] Gammell, M., McFarlane, A., Brady, D., O'Brien, J., Mirimin, L., Graham, C., Lally, H., Minto, C. & O'Connor, I. (2021). White-clawed Crayfish Austropotamobius pallipes survey in designated SACs in 2017. Irish Wildlife Manuals, No. 131. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.

[31] Peay, S. (2003). Monitoring the white-clawed crayfish Austropotamobius pallipes. Conserving Natura 2000 Rivers Monitoring Series No. 1, English Nature, Peterborough.

Survey Type	Dates of Survey	Survey Locations
Breeding bird surveys	April – June 2024	Lough Funshinagh and adjacent smaller lakes
Aquatic and riparian surveys of Cross River	10th August 2024	As detailed in Table 1 above
Aquatic surveys of Lough Funshinagh	June 2024	Lough Funshinagh

4.5.2 Water Quality

Biological water quality

Biological water quality of the riverine survey sites was conducted through Q-sampling of macroinvertebrates. All samples were collected with a standard kick sampling hand net (250 mm width, 500 µm mesh size) from areas of riffle/glide utilising a 2-minute kick sample, as per EPA methodology[32]. Large cobble was washed at each site for one minute where present to collect attached macro-invertebrates. Samples were elutriated and fixed in 70% ethanol for laboratory identification. Samples were converted to Q-ratings[33] and assigned to WFD status classes. Further details on biological water quality methodology and sampling can be found in the WFD assessment[39].

Physicochemical water quality

The 7 no. riverine survey sites were assessed for physicochemical water quality on the 10th August 2024. Samples were cooled and delivered to the laboratory for analysis on the day of collection. In order to collate a broad water quality baseline for the study area, a range of EPA approved physicochemical parameters for each site were laboratory-tested, namely;

- Conductivity @25°C (µs/cm)[34]
- pH[34]
- Total Alkalinity (mg CaCO3/l)[34]
- Total oxidised nitrogen (mg N/l)[34]
- Nitrate (mg N/l)[34]
- Nitrite (mg N/l)
- Unionised ammonia (mg N/l)
- MRP (mg P/l)
- BOD (mg O2/l)[34]
- COD (mg O2/l)[34]
- Suspended solids (mg/l)[34]
- Chloride (mg Cl/l)[34]; and
- Dissolved oxygen (mg O2/l)[34].

Three composite physiochemical water quality samples were collected from Lough Funshinagh (north, central, and southern areas) on the 12th August 2024. The results informed the preliminary classification of lake trophy. The water samples were tested for the following parameters:

- Total Alkalinity (mg CaCO3/l)
- Conductivity @25°C (µs/cm)
- pH
- Total ammonia (mg N/l)
- Unionised ammonia (mg N/l)
- Nitrate (mg N/l)
- Nitrite (mg N/l)
- MRP (mg P/l)
- Total P (mg P/l)
- Chlorophyll a (µg/l)
- Suspended solids (mg/l); and
- Chloride.

[32] Feeley et al. (2020) A national macroinvertebrate dataset collected for the biomonitoring of Ireland's river network, 2007–2018. Sci Data 7, 280 (2020). https://doi.org/10.1038/s41597-020-00618-8

[33] Toner, P., Bowman, K., Clabby, K., Lucey, J., McGarrigle, M, Concannon, C., Clenaghan, C., Cunningham, P., Delaney, J., O'Boyle, S., MaCarthaigh, M., Craig, M., and Quinn, R. 2005. Water Quality in Ireland 20012003. Environmental Protection Agency, Wexford.

[34] EPA approved parameter

4.5.3 Limitations

The findings outlined in this report reflect those at the specific time of survey and writing, and accessible data. Ecological surveys are generally limited by factors that affect the presence and/or activity of the species, such as weather conditions, migration patterns and behaviour. In this case, weather was not considered a limitation as the survey was undertaken during optimal conditions.

Seasonal factors that affect distribution patterns and habits of species were taken into account when conducting these surveys and the potential of the site to support certain populations (in particular those of conservation importance that may not have been recorded during the field survey due to their seasonal absence or cryptic nature) was assessed.

Electrofishing could not be carried out at Site 7 of the aquatic surveys, due to the water being too deep. However, it is considered that the results from the remaining survey sites and desk study data provide sufficient information to inform the fisheries baseline.

Limitations encountered during breeding bird surveys included the following:

a. At times of high-water levels in watercourses/drainage channels, it was not possible to cross some channels or access some shoreline locations.

b. Owing to the necessitated timing of a breeding bird survey during spring/summer months (April-June), which must begin before dawn, visibility was reduced at the beginning of each survey with a gradual increase in clarity and luminosity typically observed as each survey progressed. Identification was also done by analysing bird call captured on wildlife audio recording equipment.

c. Given the limitations to access, some few sections of shoreline may have received less complete coverage owing to physical characteristics, visual obstruction and/or restricted access to survey transect routes. The limitations were overcome by viewing and counting from opposing sides of the lake/flooded areas. The islands of Lough Funshinagh were largely under water at the start of the survey due to high water levels. Any islands with nesting potential were observed from the shoreline.

Limitations encountered within the wintering bird surveys included the following:

a. At times of high water in rivers and watercourses/drain channels, it was not possible to cross some channels or access some shoreline locations.

b. In the mid-winter period (November to December) short day length and early night-fall curtailed survey coverage. This issue was addressed by splitting the field survey coverage between two ecologists, one assigned to cover the east side and the other to cover the west side, of L. Funshinagh and outlier lakes.

c. Given the limitations to access, some few sections of shoreline may have received less complete coverage owing to physical characteristics, visual obstruction and unavailability of access routes. The limitations were partially overcome by viewing and counting from opposing sides of the lake.

Targeted bird surveys were not conducted along at the intake compound, pipeline route and at the outfall location. However, it is considered that the desk study data and habitat appraisals are sufficient to inform the baseline for these areas, and impact assessment.

4.6 Ecological Evaluation and Impact Assessment

The information gathered from consultation, desk study and ecological surveys was used to produce an EcIA for the proposed scheme. The EcIA has been undertaken in accordance with guidelines produced by the CIEEM (CIEEM 2018); and experience of 'best practice' in ecological assessment.

The ecological value of a feature was determined using a geographic frame of reference (Table 3). Professional judgement was used to define the geographic framework based on available guidance, existing criteria, historical trends and information on the distribution, abundance and status of the ecological feature.

Table 3 Maximum Level of Impact Significance for KERs.

Key Ecological Receptor 'Value' Rating	Highest Possible Significance Level
International Importance	Significant Positive/ Negative Impact at International Level
National Importance	Significant Positive/ Negative Impact at National Level
County Importance	Significant Positive/ Negative Impact at National Level
Local Importance (Higher Value)	Significant Positive/ Negative Impact at National Level

For this assessment, the following geographic frame of reference is used:

- International - Including Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Ramsar sites
- National - For example, sites designated at national level, including Natural Heritage Areas (NHAs)
- Regional - Habitats or populations of species of value at a regional level (i.e., central Ireland)
- County - Designated sites, such as Wildlife Sites or habitats/species populations of value at a county (i.e., co Roscommon)
- Local - Habitats or species populations of value in a local context (i.e., within circa 5 km)
- Less than Local - Habitats or species populations which are of value only within the potential ZoI of the proposed scheme; and
- Negligible e.g., areas of hardstanding.

The assessment takes into account the source-pathway-receptor model. The source is defined as the individual elements of the proposed scheme that have the potential to affect identified ecological features. The pathway is defined as the means or route by which a source can affect the ecological feature. The receptor is defined as the ecological feature (species, habitat or ecosystem) of natural heritage importance. Each element can exist independently however an effect is created where there is a linkage between the source, pathway and receptor.

For the purposes of this assessment an impact is defined as an action that results in changes to an ecological feature. An effect is defined as the outcome to an ecological feature from an impact. The likely significance of effects is the combined function of the value of the ecological feature; the type, magnitude and duration of the impact and/or effect; the extent to which the impact and/or effect occurs; the timing and frequency of the impact and the reversibility of impacts and/or effects[35].

The geographic level at which the ecological feature is considered important needs to be considered when assessing the likely significance of effects. The CIEEM[1] defines a significant effect as "*...an effect that is sufficiently important to require assessment and reporting so that the decision maker is adequately informed of the environmental consequences of permitting a project. A significant effect is a positive or negative ecological effect that should be given weight in judging whether to authorise a project: it can influence whether permission is given or refused and, if given, whether the effect is important enough to warrant conditions, restrictions or further requirements such as monitoring*".

[35] CIEEM. (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland. Available at: https://cieem.net/wp-content/uploads/2018/08/ECIA-Guidelines-2018-Terrestrial-Freshwater-Coastal-and-Marine-V1.2-April-22-Compressed.pdf Accessed July 2024.

4.7 Other Reports

The following reports have been produced in relation to the proposed scheme:

- Screening for AA and NIS report[47]
- Environmental Impact Assessment (EIA) Screening report[36]
- CEMP [37]
- Archaeological Impact Assessment Report[38]
- WFD Assessment report[39]
- Operations-Phase Monitoring Plan[40]
- Breeding Birds Survey of Lough Funshinagh[41]
- Wintering Bird Survey Report[42]
- Baseline Survey Report[43]; and
- Aquatic Survey Report[23]

5. Baseline Ecological Conditions

5.1 Designated Sites

5.1.1 International Designated Sites

The following international designated sites within Table 4 were identified by the Screening for Appropriate Assessment (AA) and Natura Impact Statement Report to have potential pathways for effect.

[36] Arup, (2024). Lough Funshinagh Interim Flood Relief Scheme. Environmental Impact Assessment Screening Report.
[37] Arup, (2024). Lough Funshinagh Interim Flood Relief Scheme. Construction Environmental Management Plan.
[38] Arup, (2024). Lough Funshinagh Interim Flood Relief Scheme. Archaeological Assessment.
[39] Arup, (2024). Lough Funshinagh Interim Flood Relief Scheme. Water Framework Directive Assessment.
[40] Arup. (2024). Lough Funshinagh Interim Flood Relief Scheme. Operations Phase Monitoring Plan.
[41] Ryan Hanley. (2024). Lough Funshinagh Baseline Surveys. Breeding Birds Survey of Lough Funshinagh.
[42] Ryan Hanley. (2024). Lough Funshinagh Baseline Surveys. Wintering Birds Survey of Lough Funshinagh.
[43] Ryan Hanley. (2024). Lough Funshinagh Baseline Surveys. Baseline Survey of Lough Funshinagh to Cross River.

Table 4 International designated sites within a potential pathway to the proposed scheme.

Designated site	Description[44]	Distance from site
Lough Funshinagh SAC	This SAC comprises a turlough, as it fluctuates to a significant extent every year and occasionally dries out entirely (approximately two to three times every ten years). The turlough is filled with vegetation and provides excellent breeding habitat for wildfowl, with the site designated as a wildfowl sanctuary. The sites is a SAC for the following habitats/species listed under Annex I/II of the EU Habitats Directive (priority habitats are indicated with *): • Turloughs*; and • Chenopodion rubric p.p. and Bidention p.p. vegetation	Within site
Middle Shannon Callows SPA	The Middle Shannon Callows SPA extends for approximately 50 km from the town of Athlone to the town of Portumna. The site averages about 0.75km in width but reaches up to 1.5km in places. The site has extensive areas of seasonally flooded, semi-natural, lowland wet grassland along both sides of the river. The site is a SPA for the following species: whooper swan *Cygnus cygnus*, wigeon *Anas Penelope*, corncrake *Crex crex*, golden plover *Pluvialis apricaria*, lapwing *Vanellus vanellus*, black-tailed godwit *Limosa limosa*, and black-headed gull *Chroicocephalus ridibundus*. It is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds.	Overlaps with RLB
Ballynamona Bog and Corkip Lough SAC	The SAC comprises a small area of what was once a large bog complex. The SAC comprises areas of high bog and cutover bog, as well as the turlough, Corkip Lough. The site is selected as a SAC for the following habitats listed on Annex I / II of the EU Habitats Directive (priority habitats indicated by *) • Turloughs* • Raised bog (Active)* • Degraded raised bog • Rhynchosporion vegetation; and • Bog woodland*. The site includes species such as heather *Calluna vulgaris*, bog Asphodel, common and hare's-tail Cottongrasses *Eriophorum angustifolium* and E. vaginatum, carnation sedge Carex panicea and cranberry *Vaccinium oxycoccos*. the bog mosses *Sphagnum cuspidatum, S. magellanicum and S. papillosum* also occur.	1.5km west
Lough Ree SAC	Lough Ree is the third largest lake in Ireland. The site is selected as a SAC for the following habitats and/or species listed on Annex I / II of the EU Habitats Directive (priority habitats indicated by *): • Natural eutrophic lakes • Orchid-rich calcareous grassland* • Active raised bog* • Degraded raised bog	2.9km west

[44] National Parks & Wildlife Service. (2024). Protected Sites in Ireland. Available at: https://www.npws.ie/protected-sites Accessed July 2024.

Designated site	Description[44]	Distance from site
	• Alkaline fens • Limestone pavement* • Bog woodland* • Alluvial forests*; and • Otter. Species present include intermediate bladderwort *Utricularia intermedia*, pondweeds *Potamogeton spp*., quillwort *Isoetes lacustris*, greater duckweed *Spirodela polyrhiza*, stoneworts *Chara spp*., including *C. pedunculata* and arrowhead *Sagittaria sagittifolia*.	
Lough Croan Turlough SPA	The Lough Croan Turlough is a linear wetland, north-west/south-east, lying in a flattish area of glacial till. The east functions as a turlough whilst the west is a fen. The site qualifies under the EU Birds Directive for the following species: • Greenland white-fronted goose *Anser albifrons* • Shoveler *Spatula clypeata*; and • Golden plover. The site is also important for breeding birds, pochard *Aythya farina* and shoveler, which are both rare breeding species in Ireland. Mute swans *Cygnus olor* also breed within the site and black-headed gull has bred in the past. Whooper swan, a species listed under Annex I of the EU Birds Directive, is also present. Part of the site is a wildfowl sanctuary.	3.7km west
Lough Ree SPA	The Lough Ree is located on the River Shannon between Lanesborough and Athlone. It is the third largest lake in Ireland. The main inflowing rivers are the Shannon, Inny and Hind, and the main outflowing river is the Shannon. The site is a SPA under the EU Birds Directive for the following species: • Whooper swan • Wigeon • Teal *Anas crecca* • Mallard *Anas platyrhynchos* • Shoveler • Tufted duck *Aythya fuligula* • Common scoter *Melanitta nigra* • Goldeneye *Bucephala clangula* • Little grebe *Tachybaptus ruficollis* • Coot *Fulica atra* • Golden plover • Lapwing • Common tern *Sterna hirundo*.	4.7km east

Designated site	Description[44]	Distance from site
Mongan Bog SPA	This site comprises a midland, medium size raised bog. The bog has a well-developed microtopography of hummocks, pools and lawns. Species common within the bog include ling heather, cross-leaved heath *Erica tetralix* cottongrasses *Eriophorum angustifolium*, *E. vaginatum*, carnation sedge and white beak-sedge *Rhynchospora alba*. A variety of bog mosses *Sphagnum spp*. and other bryophytes are found. Greenland white-fronted goose is a special conservation interest for the SPA. The bog was traditionally used as a feeding/roosting site by small numbers of the River Suck population of Greenland white-fronted goose, which utilize the callows near the mouth of the Suck to Shannonbridge. Geese have not been recorded using the site in recent years. The cutaway areas of bog provides habitat for bird species including birds of prey, thrush, warblers and finches.	7.8km south
River Suck Callows SPA	The River Callows SPA comprises a section of the River Suck from Castlecoote to its confluence with the River Shannon close to Shannonbridge, approximately 70km along the river. The site is of special conservation interest for the following species: • Whooper swan • Greenland white-fronted goose • Wigeon • Golden plover; and • Lapwing. The site and its associated waterbirds are of special conservation interest for wetlands and waterbirds. The SPA is an important site for wintering waterfowl, in particular Greenland white-fronted goose, which congregates in the middle reaches of the river. Four other species occur in populations of national importance - whooper swan, wigeon, golden plover, and lapwing. Other species include mute swan, teal, mallard, black-tailed godwit, curlew, and black-headed gull.	7.8km west
Four Roads Turlough SPA	Four Roads Turlough SPA is of special conservation interest for the following species: Greenland white-fronted goose and golden plover. The site is also of special conservation interest for its waterbirds.	7.8km west
River Shannon Callows SAC	The site is comprised of seasonally flooded, semi-natural, lowland wet grassland, along and beside the river between Athlone and Portumna. It is approximately 50km long and averages 0.75m wide. The site is listed as a SAC for the following habitats/species (priority habitats are indicated by *): • Molinia meadows • Lowland hay meadows • Alkaline fens • Limestone pavement* • Alluvial forests*; and • Otter.	12.4km south-east

Designated site	Description[44]	Distance from site
Lower River Shannon SAC	The site is designated for the following qualifying interest habitats/species: • Sandbanks which are slightly covered by sea water all the time; • Estuaries • Mudflats and sandflats not covered by seawater at low tide • Coastal lagoons • Large shallow inlets and bays • Reefs • Perennial vegetation of stony banks • Vegetated sea cliffs of the Atlantic and Baltic coasts • Salicornia and other annuals colonising mud and sand • Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) • Mediterranean salt meadows (*Juncetalia maritimi*) • Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation • Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) • Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) • *Margaritifera margaritifera* (Freshwater Pearl Mussel) • *Petromyzon marinus* (Sea Lamprey) • *Lampetra planeri* (Brook Lamprey) • *Lampetra fluviatilis* (River Lamprey) • *Salmo salar* (Salmon) • *Tursiops truncatus* (Common Bottlenose Dolphin) • *Lutra lutra* (Otter).	

5.1.2 National designated sites

One Natural Heritage Area (NHA) is located within 2km of the site – Carrickynaghtan Bog NHA. The NHA is located 200m south of the Cross River. The site is comprised of a raised bog that includes areas of high bog and cutover bog. It is one of the few remaining raised bogs that developed on the former floodplain of the River Shannon. The high bog vegetation is typical of that in Ireland, with species including ling heather *Calluna vulgaris*, cross-leaved heath *Erica tetralix* and bog mosses *Sphagnum* spp.[45].

5.1.3 Non-Designated sites

All pNHAs were published on a non-statutory basis in 1995. They have not since been statutorily proposed or designated. These sites are of significance for wildlife and habitats. However, a process is underway to resurvey and formally designate some pNHAs as NHAs.

5.2 Habitats

5.2.1 Annex I Habitats

Outside of the Annex I habitat of Turlough, which lies within the Lough Funshinagh SAC, there are no further Annex I habitats within the red line (consent) boundary of the scheme, or within 500m of the boundary.

5.2.2 Other Habitats

The following habitats (classified to Fossitt Level 2) were returned as being within the study area (Lough Funshinagh, the pipeline route with a 100m buffer and the Cross River with a 100m buffer) by the National Land Cover Map:

Table 5 Habitats present within the study area, classified to Fossitt Level 2, from the EPA National Land Cover Map.

Habitat (Fossitt Level 2)	Total Hectares per Habitat
Bracken	0.20
Buildings	2.63
Artificial Waterbodies	5.40
Amenity Grassland	7.50
Cutover Bog	10.01
Scrub	11.34
Bare Soil and Disturbed Ground	12.15
Other Artificial Surfaces	13.44
Raised Bog	14.30
Treelines	18.19
Transitional Forest	18.96
Swamp	25.59
Ways	26.96
Broadleaved Forest and Woodland	27.35
Rivers and Streams	43.57
Cultivated Land	52.83
Hedgerows	63.28
Wet Grassland	251.69

[45] NPWS. (2002). Site Synopsis. Carrickynaghtan Bog NHA. Available at: https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY001623.pdf. Accessed August 2024.

Habitat (Fossitt Level 2)	Total Hectares per Habitat
Lakes and Ponds	358.10
Improved Grassland	1092.05

5.2.3 Field Study

A habitat map detailing the habitat survey is provided in Appendix H. There were 19 habitats recorded within the site. These are described in Table 6 and photographs of habitats are provided within the Baseline Survey Report within Appendix D.

Table 6 Fossitt Habitats on Site as identified by the Baseline Survey.

Name	Code	Description	Species List	Ecological Importance
Arable crops	BC1	Agricultural land that is cultivated and managed for the production of arable crops, including cereals (wheat, barley, oats, maize), and root, leaf, energy or fibre crops such as sugar beet, turnips, rape and flax). This habitat was not found along the shoreline of Lough Funshinagh.	Arable crops and weeds recorded in proximity to the Cross River included white mustard *Sinapis alba*, common flax (*Linum usitatissimum)*, and rapeseed (*Brassica napus*).	Local Importance (Lower Value) – due to being subject to high levels of disturbance and likely low species diversity.
Stone walls and other stonework	BL1	This category incorporates stone walls and most other built stone structures in rural and urban situations. In proximity to the proposed scheme this habitat included old stone walls found within and bordering field boundaries, stone bridges, stone ruins and old stone monuments which were all found in proximity to the Cross River. Stone walls and other stonework are a dominant field boundary feature in the landscape around Lough Funshinagh. This habitat was completely submerged in numerous locations around Lough Funshinagh.	Species recorded on stone walls and other stonework included lichens, bryophyta, ivy (*Hedera helix)*, spleenwort (*Asplenium* spp). and herb-robert (*Geranium robertianum*).	Local Importance (Higher Value) – due to providing potential habitat corridors for species such as pine martin.
Earth banks	BL2	Earth banks are a common type of field boundary in many parts of Ireland. Constructed from local materials such as peat, earth, gravel or stone, these narrow linear ridges are often bordered by drainage ditches. This habitat was found in the areas around Lough Funshinagh.	Species list not recorded	Local Importance (Lower Value) – no notable vegetation recorded and lack of cover for fauna noted during survey
Buildings and artificial surfaces	BL3	This broad category incorporates areas of built land that do not fit elsewhere in the classification. It includes all buildings (domestic, agricultural, industrial and community). This habitat was commonly found surrounding the Cross River, in the form of roads, private dwellings and farms. This habitat was found along Lough Funshinagh (residential dwellings, farm buildings, walls and roads). Some of this habitat was submerged by high water levels during the start of the survey season with some areas such as roads, walls and farm building submerged throughout the survey.	Potential for buildings, in particular old stone buildings, to provide roosting opportunities for birds and bats. No specific surveys were carried out to confirm if any bat roosts or birds' nests were present.	Local Importance (Lower Value) – of limited ecological value.
Recolonising bare ground	ED3	This category is used for any areas where bare or disturbed ground, derelict sites or artificial surfaces of tarmac, concrete or hard core have been invaded by herbaceous plants. This habitat was recorded in some areas surrounding Lough Funshinagh that had previously been disturbed.	Flora recorded in this habitat included colt's Foot (*Tussilago farfara)*, nettle (*Urtica dioica)*, dandelion (*Taraxacum* spp.), pineappleweed (*Matricaria discoidea)*, silverweed (*Argentina anserina)*, red clover (*Trifolium pratense)*, white clover (*Trifolium repens)*, ribwort plantain (*Plantago lanceolata)*, chickweed (*Stellaria media)*, cudweed (*Gnaphalium* spp)., red shank (*Persicaria maculosa)*,	Local Importance (Lower Value) – unlikely to support notable fauna and no protected flora recorded.

Name	Code	Description	Species List	Ecological Importance
			sow-thistle (*Sonchus* spp)., common fumitory (*Fumaria officinalis)*, knotgrass (*Polygonum aviculare)* and speedwell (*Veronica* spp).	
Turloughs	FL6	Turloughs are ephemeral lakes that occupy basins or depressions in limestone areas, and where water levels fluctuate markedly during the year. Their greatest concentration is in counties Clare, Galway and Roscommon. Their general pattern is to flood in winter and dry out in summer, but there may be other sporadic rises in response to high rainfall. Turloughs are defined by flooding vegetation and can have a variety of vegetation communities present, depending on depth and duration of annual flooding, and management practices. Lough Funshinagh is classified as a Turlough, although it hasn't fully drained since 2016. This corresponds to the Annex I habitat "Turloughs (3180)". The shoreline around Lough Funshinagh is predominately grasslands (GA1) and (GS1) with no transitional zone or marginal aquatic flora. Some previously inundated fields were showing signs of regrowth of recolonising flora such as Dock (*Rumex* spp.) There was a thick layer of decomposing vegetation mixed with Bryophyta and exposed soil on the shoreline as the water level dropped. The aquatic surveys of Lough Funshinagh found the lough to support local representations of the Annex I habitat 'Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation [3150]'.	The Turlough habitat at Lough Funshinagh was fully submerged during surveys in 2024 with only aquatic flora observed. Fine-leaved water-dropwort (*Oenanthe aquatica)*, reed canary-grass (*Phalaris arundinacea)* and common club-rush (*Schoenoplectus lacustris)*, were observed growing at different locations along the shoreline however they were fully submerged early in the growth season with some plants breaking during strong winds later in the season due to a drop in water levels and the length of the plants. Pondweed (*Potamogeton natans)* was observed in deeper areas of the lough and Amphibious Bistort (*Persicaria amphibia)* in shallow areas. Duckweed (*Lemna* spp.) was prevalent along the shoreline and dominant in areas with less disturbance. The rich pondweed lake habitat [3150] macrophyte assemblage at Lough Funshinagh included the following species: *Potamogeton lucens, Potamogeton natans, Potamogeton crispus, Potamogeton perfoliatus, Potamogeton berchtoldii, Stuckenia pectinata* with non-Potamogeton community associates, notably *Myriophyllum spicatum* and *Lemna trisulca*. *Potamogeton-Myriophyllum* and *Lemna* species were often associated with more widespread *Oenanthe aquatica* and *Persicaria amphibia*	International Importance – Annex I habitat
Depositing/lowland rivers	FW2	This category includes watercourses, or sections of these, where fine sediments are deposited on the riverbed. Depositing conditions are typical of lowland areas where gradients are low, and water flow is slow and sluggish. The Cross River is an Order 2 river which ultimately drains into the River Shannon. The Cross River from 1km upstream of the outfall commenced as a narrow and shallow river, dominated by reed canary grass and yellow iris (*Iris pseudacorus)* growing wider and deeper as it progresses towards the River Shannon. The water was noted as clear throughout and the riverbed as gravelly.	The Cross River has a variety of vegetation within it including yellow iris and reed canary grass. Other vegetation recorded surrounding the river includes meadowsweet (*Filipendula ulmaria)*, water mint (*Mentha aquatica)*, angelica (*angelica archangelica*), purple loosestrife (*Lythrum salicaria)*, valerian (*Valeriana* spp.,) silverweed, horsetail (*Equisetum arvense)*, blue water speedwell (*Veronica anagallis-aquatica)*, common rush (*Juncus effusus)*, articulated rush (*Juncus articulates)*, cow vetch (*Vicia cracca)*, water forget me-not (*Myosotis scorpioides)*, great willow herb (*Epilobium hirsutum*,) tormentil (*Potentilla erecta)* and field scabius (*Knautia arvensis)*.	Local Value (Higher Value) – the Cross River provides suitable habitat for a range of fauna including fish and birds.,

Name	Code	Description	Species List	Ecological Importance
		There were a number of locations along the Cross River where cows and/or sheep has access to the river, with small algal blooms noted in these areas due to eutrophication. Generally, the water flow was recorded as slow and during the terrestrial walkover of the river there were some fish (likely brown trout (*Salmo trutta)*) were observed within, although this was not the main focus of the survey.		
Drainage ditches	FW4	This category includes linear water bodies or wet channels that are entirely artificial in origin, and some sections of natural watercourses that have been excavated or modified to enhance drainage and control the flow of water. ditches were recorded and mapped leading into the Cross River at nearly every field boundary. Some of the ditches were narrow and stagnant, while others were as wide as the Cross River with a good flow. At the time of survey, all drainage ditches going into Lough Funshinagh were submerged by flood waters. Given the modified nature of the channels and the vegetation growth these would be classified as drainage ditches. Some drainage ditches located further away from the Lough showed signs of hypoxic conditions given the dark colour of the water and biofilm.	The flora along drainage ditch banks that were not submerged included lesser celandine (*Ficaria verna*,) wild angelica (*Angelica sylvestris)*, willowherb *Epilobium* spp., Butterbur (*Petasites hybridus)*, climbing nightshade (*Solanum dulcamara)*, creeping yellow-cress (*Rorippa sylvestris)* and common valerian (*Valerianai officinalis)*. Flora found growing in the drainage ditches included bulrush (*Typha latifolia)*, duckweed, hemlock water dropwort (*Oenanthe crocata)*, lesser water-parsnip (*Berula erecta)*, sweet grass (*Glyceria* sp.,) water mint, fool's-water-cress (*Apium nodiflorum)*, water-cress (*Rorippa nasturtium-aquaticum)*, water forget-me-not, and brooklime (*Veronica beccabunga*.)	Local Importance (Higher Value) – form part of the surface water network and provide habitat for wetland flora and fauna.
Improved agricultural grassland	GA1	This category is used for intensively managed or highly modified agricultural grassland that has been reseeded and/or regularly fertilised and is now heavily grazed and/or used for silage making. Due to the high-water levels of Lough Funshinagh this habitat was partly submerged with no transitional marginal zone along the shoreline.	Improved agricultural grassland was found either side of the Cross River with species including perennial rye grass (*Lolium perenne)*, Yorkshire fog (*Holcus lanatus)*, bent (*Agrostis* spp.)., false oat grass *Arrhenatherum elatius*, cock's foot *Dactylis glomerata*, common knapweed *Centaurea nigra*, self-heal *Prunella vulgaris*, creeping thistle *Cirsium arvense*, silverweed, red clover, white clover, meadow buttercup *Ranunculus acris* and lady's mantle *Alchemilla mollis*. Other improved agricultural grasslands were mosaiced with wet grassland species including common rush, meadowsweet and docks Improved agricultural grassland surrounding Lough Funshinagh included species such as perennial rye grass with other grass species such as bent, couch-grass *Elytrigia repens*, Yorkshire fog, cock's foot and crested dogs tail (*Cynosurus cristatus)*. Other flora found here include creeping buttercup (*Ranunculus repens)*, greater plantain (*Plantago major)*, creeping thistle, spear thistle (*Cirsium vulgare)*, nettle, docks, common rush, red clover and white clover.	Local Importance (Lower Value) – of low botanical importance and diversity.

Name	Code	Description	Species List	Ecological Importance
Amenity grassland (improved)	GA2	This type of grassland is improved, or species-poor, and is managed for purposes other than grass production. It includes amenity, recreational or landscaped grasslands, but excludes farmland. Most areas of amenity grassland have been reseeded and are regularly mown to maintain very short swards. This habitat was recorded within the surrounding habitats of both the Cross River. It located within the gardens of residential houses around Lough Funshinagh.	N/A - Species list unavailable.	Local Importance (Lower Value) – of low botanical importance and diversity.
Marsh	GM1	Marsh is found on level ground near riverbanks, lakeshores, and in other places where mineral or shallow peaty soils are waterlogged, and where the water table is close to ground level for most of the year. This habitat was recorded on the edge of Lough Funshinagh and within fields west of the lough.	This habitat was found surrounding Lough Funshinagh with species comprising of common rush, articulated rush, jointed rush (*Juncus articulatus)*, floating sweet-grass (*Glyceria fluitans)*, water smartweed (*Persicaria amphibia)*, water dock (*Rumex hydrolapathum)*, sedges (*Carex* spp)., creeping thistle, marsh thistle (*Cirsium palustre)*, marsh bedstraw (*Galium boreale)*, nettle, crested dog's-tail, common bent (*Agrostis capillaris)*, creeping buttercup, Yorkshire fog, yellow iris, meadowsweet, horsetail, marsh orchid (*Dactylorhiza* spp.,) marsh woundwort (*Stachys palustris)*, marsh marigold (*Caltha palustris)*, water pepper (*Persicaria hydropiper)*, water figwort (*Scrophularia auriculata)*, lesser marshwort (*Helosciadium inundatum)*, water mint and clustered dock (*Rumex conglomeratus)*.	Local Importance (Higher Value) – high levels of faunal activity noted in these areas.
Dry calcareous and neutral grassland	GS1	This category is used for unimproved or semi-improved dry grassland that may be either calcareous or neutral, but not acid. It is associated with low intensity agriculture and typically occurs on free-draining mineral soils of various depths. Areas of this habitat were recorded in the vicinity of the Cross River and Lough Funshinagh. The majority of fields with this habitat were grazed by livestock. Only a small area of orchids associated with this habitat were observed in a secluded field approximately 40m from the southern shoreline of Lough Funshinagh, outside of the footprint of the proposed scheme. This field was less intensively grazed by livestock hence the increased flora diversity. Due to the high-water levels of Lough Funshinagh some GS1 habitat was partly submerged with no transitional marginal zone along the shoreline.	Species recorded within areas surrounding the Cross River include bent, perennial rye grass, Yorkshire fog, cock's foot, crested dogs tail, meadow buttercup, creeping buttercup, ribwort plantain, hawkweed (*Hieracium hibernicum)*, creeping thistle, spear thistle, nettle, docks, common rush, self-heal yarrow (*Achillea millefolium*,) pignut (*Conopodium majus)*, red clover and white clover. Dry calcareous and neutral grassland surrounding Lough Funshinagh included cock's-foot meadow-grasses *Poa* spp., perennial ryegrass, Yorkshire-fog, common bent, timothy (*Phleum pratense)*, crested dog's-tail, sweet vernal-grass (*Anthoxanthum odoratum)*, red clover, white clover, yarrow *Achillea millefolium*, sticky mouse-ear chickweed (*Cerastium glomeratum)*, common knapweed, selfheal, ribwort plantain, field scabious, hawkweed, meadow buttercup, creeping buttercup, silverweed, common daisy (*Bellis perennis)*,	Local Value (Higher Value) - comprise a wide range of grasses and broadleaved herbs

Name	Code	Description	Species List	Ecological Importance
			creeping thistle, broad-leaved dock (*Rumex obtusifolius*), dandelion., nettle, common rush, ragwort (*Senecio jacobaea*), teasel (*Dipsacus* spp.,) chamomile (*Chamaemelum nobile*), common bird's-foot-trefoil (*Lotus corniculatus*) and lady's bedstraw (*Galium verum*).	
Dry meadows and grassy verges	GS2	Dry meadows that are rarely fertilised or grazed and are mown only once or twice a year for hay are now rare in Ireland. Most have been improved for agriculture and this type of grassland is now best represented on grassy roadside verges, on the margins of tilled fields, on railway embankments, in churchyards and cemeteries, and in some neglected fields or gardens. These areas are occasionally mown (or treated with herbicides in the case of some railway embankments), and there is little or no grazing or fertiliser application. This habitat was found in small pockets adjacent to the Cross River and Lough Funshinagh.	Species recorded in this habitat near the Cross River included bent.., perennial rye grass, Yorkshire fog, cocks foot meadow foxtail (*Alopecurus pratensis*), false Oat-grass (*Arrhenatherum elatius*), reed canary grass (*Phalaris arundinacea*), yellow iris, marsh woundwort (*Stachys palustris*), nettle, ragwort (*Senecio jacobaea*), meadowsweet, docks, creeping thistle, spear thistle, great willow herb false oat grass , cleavers (*Galium aparine*), false hedge bindweed (*Calystegia sepium*and) Bramble (*Rubus fruticosus*) Dry meadows and grassy verges surrounding Lough Funshinagh included perennial rye grass, Yorkshire fog, bent, cock's foot meadow foxtail *Alopecurus pratensis*, common nettle, Burdock (*Arctium* spp.,) thistle (*Cirsium* spp.,) cleavers common daisy and Vetch (*Vicia* spp..) This was not a common habitat around Lough Funshinagh but mostly located along road verges.	Local Value (Higher Value) – comprise a wide range of grasses and broadleaved herbs.
Wet grassland	GS4	This type of grassland can be found on flat or sloping ground in upland and lowland areas. It occurs on wet or waterlogged mineral or organic soils that are poorly-drained or, in some cases, subjected to seasonal or periodic flooding. Wet grassland was recorded in the vicinity of the Cross River and Lough Funshinagh.	Species recorded include Yorkshire fog, perennial rye grass, cock's foot, bent, sedges common rush, articulated rush, knapweed, yellow iris, Purple vetch (*Vicia benghalensis*,) silverweed, white clover, horse tail (*Equisetum arvense*), meadowsweet, marsh thistle common nettle, creeping buttercup, speedwell and great willow herb. Wet grassland surrounding Lough Funshinagh included Yorkshire fog, perennial rye grass, bent,, sedges common rush, articulated rush, knapweed, yellow iris, silverweed, horsetail, , meadowsweet, marsh thistle, dock , sweet grass, creeping cinquefoil (*Potentilla reptans*). This habitat was found around Lough Funshinagh however it was not a dominant habitat at Lough Funshinagh.	Local Value (Higher Value) – comprises a diversity of grasses and broadleaved herbs.
(Mixed) broadleaved woodland	WD1	This habitat category includes woodland areas with 75-100% cover of broadleaved trees, and 0-25% cover of conifers.	Species recorded include ash (*Fraxinus excelsior*,) blackthorn (*Prunus spinosa*), hawthorn (*Crataegus monogyna*), alder (*Alnus glutinosa*), sycamore (*Acer pseudoplatanus*), and elder (*Sambucus nigra*).	Local Value (Higher Value) – provides habitat for birds and mammals.

Name	Code	Description	Species List	Ecological Importance
		This habitat was recorded in small areas surrounding the Cross River and Lough Funshinagh. Mixed broadleaved woodland along the shoreline is showing signs of stress, with species that are water tolerant such as alder showing signs of prolonged submersion therefore the root zone is not receiving any oxygen.		
Conifer plantation	WD4	This category is used for areas that support dense stands of planted conifers where the broadleaved component is less than 25% and the overriding interest is commercial timber production. Conifer plantations are characterised by even-aged stands of trees that are usually planted in regular rows, frequently within angular blocks. Species diversity is low and single species stands are common. The edges of the woodlands were submerged with dead trees and more recent flooding starting to stress the plants due to prolonged submergence.	Spruce (*Picea* spp). and fir (*Abies* spp.) plantations were observed at different locations around Lough Funshinagh.	Local Value (Lower Value) – lacking an understorey and of low ecological importance, with low diversity of species.
Hedgerows	WL1	Linear strips of shrubs, often with occasional trees, that typically form field or property boundaries. Most hedgerows originate from planting, and many occur on raised banks of earth that are derived from the excavation of associated drainage ditches. The hedgerows along the shoreline of Lough Funshinagh are dead or dying due to prolonged submersion under water or submersion of the root zone. Hawthorn and Willow are less susceptible to stress from submersion however Gorse Ulex europaeus,, bramble and ivy were showing signs of stress due to submersion of the root zone.	Hedgerows were found bordering field boundaries surrounding the Cross River, species found included gorse, bramble (*Rubus* spp.,) nettle, false hedge bindweed, hawthorn, blackthorn, willow (*Salix* spp.,), lords and ladies (*Arum maculatum*,) common lilac (*Syringa vulgaris*), Snowberry (*Symphoricarpos albus)* and blueberry (*Vaccinium* spp..) Hedgerows are along the field boundaries that surround Lough Funshinagh. The tree species comprising of hawthorn, blackthorn , willow ., elder, ,holly , elm (*Ulmus* sp.,) hazel (*Corylus avellana*,) sycamore ash and cypress (*Cupressus* spp.,) with sog-rose (*Rosa canina* agg.), gorse, snowberry , privet (*Ligustrum* sp.,) honeysuckle (*Lonicera periclymenum)*, bramble , common nettle, ivy, foxglove (*Digitalis purpurea*,) bindweed, herb-Robert, common hogweed *Heracleum sphondylium*, lords-and-ladies, primrose (*Primula vulgaris)*, bracken, buckler-fern (*Dryopteris spp*.,) Hart's Tongue Fern (*Asplenium scolopendrum*), wild raspberry (*Rubus idaeus)*, cleavers, cow parsley (*Anthriscus sylvestris)* and lesser stitchwort (*Stellaria graminea).*	Local Value (Higher Value) – largely comprised of native species and provide suitable features for fauna including bats and invertebrates. Act as a habitat corridor.
Treelines	WL2	A treeline is a narrow row or single line of trees that is greater than 5m in height and typically occurs along field or property boundaries.	Species found included ash, hawthorn, beech (*Fagus sylvatica,)* ivy, horse chestnut (*Aesculus hippocastanum*,) rowan (*Sorbus aucuparia*,) sycamore , willow , elder , alder , poplar (*Populus* spp.,) birch (*Betula* spp.,) blackthorn , cherry laurel (*Prunus laurocerasus)* and	Local Value (Higher Value) – potential to provide habitat for nesting birds and roosting habitat

Name	Code	Description	Species List	Ecological Importance
		This category includes tree-lined roads or avenues, narrow shelter belts with no more than a single line of trees, and overgrown hedgerows that are dominated by trees. This habitat was commonly found along the Cross River, along field boundaries and lining the river itself. There are a large number of dead treelines along the shoreline of Lough Funshinagh due to prolonged submersion under water.	Sitka spruce (*Picea sitchensis*.) Other species including Lime (*Tilia* spp.,) Norway maple (*Acer platanoides)* and Japanese cherry (*Cerasus serrulate*) were recorded planted within GA2. Treelines were also found around Lough Funshinagh with species including ash, oak (*Quercus* spp.), Scots pine (*Pinus sylvestris)*, Sitka spruce, alder, larch *(Larix decidua)*, sycamore, beech, crab apple (*Malus sylvestris)*, cypress monkey puzzle (*Araucaria Araucana)*, rowan, hawthorn. and horse chestnut.	for bats, as well as acting as a habitat corridor.
Scrub	WS1	This broad category includes areas that are dominated by at least 50% cover of shrubs, stunted trees or brambles. The canopy height is generally less than 5m, or 4m in the case of wetland areas. Small pockets of scrub were recorded surrounding the Cross River. Scrub was also recorded along the shoreline of Lough Funshinagh. Scrub along the shoreline of Lough Funshinagh are dead or dying due to prolonged submersion under water or submersion of the root zone.	Species recorded surrounding the Cross River included willow bramble, and false hedge bindweed (*Calystegia sepium*.) Flora along the shoreline of Lough Funshinagh was dominated by gorse), blackthorn, and with vetch, nettle, rosebay willowherb (*Chamerion angustifolium)* and bracken.	Local Value (Higher Value) – potential to provide habitat for nesting birds and refuge for other fauna

5.3 Water Quality

5.3.1 Desk Study

The EPA does not routinely monitor Lake Funshinagh as it is not a designated WFD lake waterbody. However, summary data for the Upper Shannon catchment, within which Lough Funshinagh is located indicates that Lough Funshinagh has 'Good Water Quality Status' and is currently 'Not At Risk' per the WFD assessment criteria.

EPA maps were reviewed for the most recent Q values at the five monitoring stations along the Cross River, downstream of Lough Funshinagh. The most recent values are provided below:

Table 7 Latest Q value for monitoring stations downstream of Lough Funshinagh on the Cross River.

Monitoring Station	Location (relative to Lough Funshinagh)	Latest Q Value[46]
RS26C100100	Approx 5km downstream 8.0676488°W 53.4570739°N	Good
RS26C100200	Burnbrook Mill Approx 10km downstream 8.0207258°W 53.4292678°N	Moderate
RS26C100230	Millbrook Bridge Approx 11km downstream 8.0091807°W 53.4284179°N	No reading available
RS26C100300	Bridge South of Doyle's Bridge Approx 12km downstream 7.9841414°W 53.4119461°N	Moderate
RS26C100400	Bridge u/s Shannon River Approx 15km downstream 7.9449481°W 53.4029958°N	Poor

5.3.2 Field Survey

Results from water quality analysis of samples taken from Lough Funshinagh and the Cross River were received from the Environmental Research Institute on the 14th August and 19th August 2024, respectively. The water quality sample results for Lough Funshinagh and the Cross River outlined below show little difference in parameters deducing that both waterbodies are relatively similar in physicochemical and biological make-up.

Table 8 Water quality analysis results for the Cross River.

EPA Approved?	Sample	C1	C2	C3	C4	C5	C6	C7
Yes	Total Alkalinity (mg CaCO3/l)	377	374	370	350	237	257	258
Yes	Conductivity @25°C (µS/cm)	718	716	706	691	479	579	576
Yes	pH	7.71	7.64	7.85	7.50	7.62	7.92	8.04
Yes	Total Oxidised Nitrogen (mg N/l)	1.108	1.113	1.021	1.561	0.636	1.36	1.228

[46] Latest Q values taken from Latest River Q Values dataset accessed at EPA Maps Accessed August 2024.

EPA Approved?	Sample	C1	C2	C3	C4	C5	C6	C7
Yes	Nitrate (mg N/l)	1.103	1.107	1.015	1.556	0.627	1.352	1.223
N/A	Nitrite (mg N/l)	0.005	0.006	0.006	0.005	0.009	0.008	0.005
Yes	Total Ammonia (mg N/l)	0.030	0.031	0.028	0.019	0.039	0.014	0.027
N/A	Unionised Ammonia (mg N/l)	0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.001
N/A	MRP (mg P/l)	0.009	0.008	0.011	0.011	0.008	0.011	0.010
Yes	BOD (mg O2/l)	1.1	0.6	0.8	0.9	0.9	0.8	0.8
Yes	COD(mg O2/l)	14.4	14.9	14.9	17.9	18.7	19.6	21.3
Yes	Suspended Solids (mg/l)	1.3	1.3	1.0	7.2	1.0	2.0	2.0
Yes	Chloride (mg Cl/l)	13.3	13.4	13.2	15.8	12.9	29.2	28.0

Table 9 Water quality analysis results for Lough Funshinagh.

EPA Approved?	Sample	F1	F2	F3
Yes	Total Alkalinity (mg CaCO3)	159	160	157
Yes	Conductivity@25°C (µS/cm)	333	334	330
Yes	pH	8.16	8.20	8.24
Yes	Total Oxidised Nitrogen (mg N/l)	0.014	0.040	0.037
Yes	Total Ammonia (mg N/l)	0.021	0.014	0.007
Yes	Unionised Ammonia (mg N/l)	0.001	0.001	<0.001
Yes	Nitrate (mg N/l)	0.011	0.036	0.033
N/A	Nitrite (mg N/l)	0.003	0.004	0.004
N/A	Molybdate Reactive Phosphorus (mg P/l)	<0.001	<0.001	<0.001
Yes	Total P (mg P/l)	0.043	0.050	0.051
N/A	Chlorophyll a (µg/l)	39.4	47.2	49.7
Yes	Suspended Solids (mg/l)	4.5	5.8	6.0
Yes	Chloride (mg/l)	11.51	11.42	11.42

5.4 Protected and Notable Species

The desk study results for the below species refer to records from within Lough Funshinagh, which refers to NBDC records from the SAC, and those from the Cross River, which refer to the remainder of the study area shown in Appendix H (the pipeline route and Cross River from the outfall location with a 100m buffer). Where species records from field surveys are referred to, the locations are shown on Figure 4.5 of the Lough Funshinagh to Cross River Baseline Survey Report[43].

5.4.1 Amphibians

Desk Study

The NBDC and NPWS data searches returned no records of amphibians within the study area within the last ten years.

Field Survey

Suitability for smooth newt (*Lissotriton vulgaris)* was recorded within the study area, however, none were recorded during site surveys. Common frog (*Rana temporaria)* was recorded during the walkover survey of Lough Funshinagh and the Cross River and is likely present in most areas of standing waters, wet grassland, and other damp areas in the vicinity of the Cross River. Significant numbers of common frog were recorded in the northern section of Lough Funshinagh.

Amphibians are considered to be of **local importance (higher value)**, due to significant numbers of common frog being recorded within Lough Funshinagh, and the species being protected under the Wildlife Acts 1976 to 2023 and the Habitats Directive (92/43/EEC), Annex V.

5.4.2 Bats

Desk Study

The NBDC data search returned one record of pipistrelle (*Pipistrellus pipistrellus sensu lato)* and one record of soprano pipistrelle (*Pipistrellus pygmaeus)* within Lough Funshinagh SAC, both records from 2019. Three species of bat were recorded within the remainder of the study area – Daubenton's bat (*Myotis daubentonii*,) Leisler's bat (*Nyctalus leisleri)*, and soprano pipistrelle. No records of bats were returned by the NPWS data search within the last ten years.

Field Survey

The suitability of the Cross River site for bats was considered and while the site is likely to be used by foraging and commuting bats, no trees with potential roost features were identified from the ground. Stone ruins and abandoned buildings along the Cross River have been assigned Moderate suitability for roosting bats. Bat boxes have been recorded in a mature beech treeline between Lough Funshinagh and the Cross River.

Bat roost potential of Lough Funshinagh was assessed throughout the baseline surveys. Areas with high bat roost potential are indicated in Figure 4.5 of Appendix G. These areas had mature trees with potential crevices, thick ivy growth and were located away from potential light pollution. Old derelict buildings have the potential for bat roosts, but this can only be confirmed upon a bat emergence/re-entry survey. Bats were observed during the Breeding Bird Survey dawn surveys at some locations around Lough Funshinagh. It is highly likely there are bat roosts around Lough Funshinagh given the availability of mature trees, old stone buildings, dead trees and abundance of insects.

Bats are classed as of **local importance (higher value),** due to the potential for bats to roost around Lough Funshinagh and to use hedgerows, treelines, and watercourses within the study area for foraging and commuting. All bats are protected under the Wildlife Acts 1976 to 2023 and Annex IV of the Habitats Directive (92/43/EEC).

5.4.3 Birds

Desk Study

A summary of notable bird species identified from the NBDC for Lough Funshinagh SAC, from the previous ten years, is provided below:

Table 10 Protected Species records within the last ten years at Lough Funshinagh obtained from NBDC

Species name	Record count	Date of last record
Black-headed Gull Larus ridibundus	14	27/07/2017
Lesser Black-backed Gull Larus fuscus	7	27/07/2017
Little Egret Egretta garzetta	1	27/07/2017
Sand Martin Riparia riparia	10	27/07/2017

One species of bird was recorded within the remainder of the study area – whooper swan.

No records of protected/notable birds were returned by the NPWS data search within the last ten years.

Lough Funshinagh is an important site for wintering and breeding waterfowl and is surrounded by various Special Protection Areas (SPAs) - Lough Ree SPA (4.2km east), Lough Croan turlough SPA (4km west), Four Roads turlough SPA (9km west) and the River Suck Callows SPA (9.5km west).

Lough Funshinagh (code: 0E303) is part of the South Roscommon Lakes (Site Code 0E020), a national survey site comprising various lakes. It is monitored for winter bird species through the Irish Wetland Bird Survey (I-WeBS) by Bird Watch Ireland. I-WeBS counters, including volunteers, NPWS Rangers, and BirdWatch Ireland staff, record waterbirds at wetland sites across Ireland from September to March. Since 1994/95, I-WeBS has aimed to monitor nonbreeding waterbirds to support the conservation of their populations and habitats. Its main objectives are to:

- Assess waterbird population sizes
- Identify important sites for waterbirds; and
- Track trends in their numbers and distribution (BirdWatch Ireland, 2021).

Surveys for Lough Funshinagh have been conducted annually from 1994/95 to 2022/23, with some data gaps in 1997/98, 1998/99, 2001/02, 2003/04, 2004/05, and 2020/21.

A summary of the I-WeBS data returned by Birdwatch Ireland is provided below in Table 11.

Table 11 Summary of WeBS data.

Species	Scientific name	Peak annual count (2018-2024) – Lough Funshinagh
Brideswell		
Black-headed gull	*Chroicocephalus ridibundus*	75
Lesser black-backed gull	*Larus fuscus*	10
Whooper swan	*Cygnus cygnus*	115
Bullock Island Commonage		
Black-headed gull	*Chroicocephalus ridibundus*	40
Dunlin	*Calidris alpina*	4
Greenshank	*Tringa nebularia*	4
Grey heron	*Ardea cinerea*	2
Herring gull	*Larus argentatus*	1
Lapwing	*Vanellus vanellus*	128

Species	Scientific name	Peak annual count (2018-2024) – Lough Funshinagh
Mallard	*Anas platyrhynchos*	7
Mute swan	*Cygnus olor*	4
Snipe	*Gallinago gallinago*	3
Unidentified duck	*Anatinae* sp	10
Unidentified wader	*Charadrii* sp	3
Wigeon	*Mareca penelope*	177
Doovoge/Bigmeadow		
Black-headed gull	*Chroicocephalus ridibundus*	75
Coot	*Fulica atra*	24
Curlew	*Numenius arquata*	180
Grey heron	*Ardea cinerea*	3
Lapwing	*Vanellus vanellus*	235
Lesser black-backed gull	*Larus fuscus*	1
Little egret	*Egretta garzetta*	5
Mallard	*Anas platyrhynchos*	2
Mute swan	*Cygnus olor*	20
Pintail	*Anas acuta*	30
Shoveler	*Spatula clypeata*	12
Tufted duck	*Aythya fuligula*	100
Whooper swan	*Cygnus cygnus*	91
Wigeon	*Mareca penelope*	370
Inchinalee		
Coot	*Fulica atra*	5
Mute swan	*Cygnus olor*	1
Shoveler	*Spatula clypeata*	100
Whooper swan	*Cygnus cygnus*	5
Lough Funshinagh		
Black-headed gull	*Chroicocephalus ridibundus*	52
Black-tailed godwit	*Limosa limosa*	13
Coot	*Fulica atra*	8
Cormorant	*Phalacrocorax carbo*	50
Curlew	*Numenius arquata*	70
Gadwall	*Mareca strepera*	3
Golden plover	*Pluvialis apricaria*	185
Great crested grebe	*Podiceps cristatus*	23
Great white egret	*Ardea alba*	2
Greenshank	*Tringa nebularia*	1
Grey heron	*Ardea cinerea*	11
Greylag goose	*Anser anser*	106
Greylag goose (domestic)	*Anser anser*	2
Herring gull	*Larus argentatus*	14

Species	Scientific name	Peak annual count (2018-2024) – Lough Funshinagh
Kingfisher	*Alcedo atthis*	3
Lapwing	*Vanellus vanellus*	1570
Lesser black-backed gull	*Larus fuscus*	3
Little egret	*Egretta garzetta*	28
Little grebe	*Tachybaptus ruficollis*	33
Mallard	*Anas platyrhynchos*	54
Moorhen	*Gallinula chloropus*	2
Mute swan	*Cygnus olor*	68
Pintail	*Anas acuta*	2
Pochard	*Aythya ferina*	2
Redshank	*Tringa totanus*	3
Shoveler	*Spatula clypeata*	44
Snipe	*Gallinago gallinago*	1
Teal	*Anas crecca*	156
Tufted duck	*Aythya fuligula*	81
Whooper swan	*Cygnus cygnus*	27
Wigeon	*Mareca penelope*	206
Lusmagh Callows		
Coot	*Fulica atra*	1
Curlew	*Numenius arquata*	10
Golden plover	*Pluvialis apricaria*	296
Herring gull	*Larus argentatus*	3
Kingfisher	*Alcedo atthis*	1
Lapwing	*Vanellus vanellus*	1200
Mallard	*Anas platyrhynchos*	8
Moorhen	*Gallinula chloropus*	1
Mute swan	*Cygnus olor*	3
Redshank	*Tringa totanus*	1
Snipe	*Gallinago gallinago*	37
Water rail	*Rallus aquaticus*	1
Wigeon	*Mareca penelope*	177
South of Golden Island		
Black-headed gull	*Chroicocephalus ridibundus*	610
Black-tailed godwit	*Limosa limosa*	123
Common tern	*Sterna hirundo*	1
Coot	*Fulica atra*	67
Cormorant	*Phalacrocorax carbo*	20
Curlew	*Numenius arquata*	2
Glossy ibis	*Plegadis falcinellus*	1
Golden plover	*Pluvialis apricaria*	2500
Goosander	*Mergus merganser*	1

Species	Scientific name	Peak annual count (2018-2024) – Lough Funshinagh
Great crested grebe	*Podiceps cristatus*	6
Grey heron	*Ardea cinerea*	9
Lapwing	*Vanellus vanellus*	1611
Lesser black-backed gull	*Larus fuscus*	13
Little egret	*Egretta garzetta*	8
Little grebe	*Tachybaptus ruficollis*	7
Mallard	*Anas platyrhynchos*	83
Moorhen	*Gallinula chloropus*	5
Mute swan	*Cygnus olor*	192
Oystercatcher	*Haematopus ostralegus*	2
Pochard	*Aythya ferina*	7
Redshank	*Tringa totanus*	266
Shoveler	*Spatula clypeata*	14
Snipe	*Gallinago gallinago*	1
Teal	*Anas crecca*	223
Tufted duck	*Aythya fuligula*	2
Whooper swan	*Cygnus cygnus*	249
Wigeon	*Mareca penelope*	393

Field Survey

Wintering bird surveys

A suite of dedicated wintering bird surveys commissioned by RCC were carried out between November 2023 and March 2024 around the entire shoreline of Lough Funshinagh. Table 12 below contains the results of the dedicated survey effort. Figures 3 to 7 of the Wintering Bird Survey report illustrate the location of wintering bird counts (within Appendix D). The surveys found that golden plover and lapwing were the most abundant species, occupying the turlough, island edges, and agricultural fields. Wigeon, teal, and black-headed gulls were also abundant. The outer fringes of the turlough and island edges were found to be preferred for roosting and foraging by most of the waterbirds, however cormorant, shoveler, grebes and gull species were found to make use of the entire site. A kingfisher was recorded using the treeline surrounding the turlough, and buzzard (*Buteo buteo)* were recorded using agricultural fields surrounding the turlough. Wigeon and teal were recorded during the January and March 2024 surveys using the south-west of the turlough, close to the pump intake location.

Table 12 Bird species identified on site during dedicated wintering bird survey 2023-2024 (Ryan Hanley 2024 surveys)

Species	Seasonality R= Resident W= Winter M= Migrant	Conservation Status BOCCI	Peak No. Recorded
Greylag goose *Anser anser*	W/M	Amber	105
Mute swan *Cygnus olor*	R	Amber	33
Whooper swan *Cygnus cygnus*	W/M	Amber	26
Shoveler *Anas clypeata*	R/W	Red	212
Wigeon *Anas penelope*	W/M	Amber	670
Teal *Anas crecca*	R/W	Amber	739
Mallard *Anas platyrhynchos*	R/W	Amber	157

Species	Seasonality R= Resident W= Winter M= Migrant	Conservation Status BOCCI	Peak No. Recorded
Coot *Fulica atra*	R/W	Amber	5
Tufted duck *Aythya fuligula*	R/W	Amber	14
Moorhen *Gallinula chloropus*	R	Green	14
Coot *Fulica atra*	R/W	Amber	5
Little grebe *Tachybaptus ruficollis*	R	Green	8
Great crested grebe *Podiceps cristatus*	R	Amber	41
Lapwing *Vanellus vanellus*	R	Red	1485
Golden plover *Pluvialis apricaria*	W/M	Red	1000
Curlew *Numenius arquata*	W	Red	28
Snipe *Gallinago gallinago*	R/W	Red	14
Redshank *Tringa totanus*	R/W	Red	2
Black headed gull *Chroicocephauls ridibundus*	R/W	Amber	566
Great Black backed gull *Larus marinus*	R/W	Green	4
Lesser black backed gull *Larus fuscus*	R/W	Amber	8
Cormorant *Phalacrocorax carbo*	R	Amber	46
Grey heron *Ardea cinerea*	R	Green	12
Little *egret Egretta garzetta*	R	Green	8
Buzzard *Buteo buteo*	R	Green	3
Kingfisher *Alcedo atthis*	R	Amber	1
Raven *Corvus corax*	R	Green	1

Breeding bird surveys

Dedicated breeding bird surveys were carried out between April and June 2024 by Ryan Hanley. Table 13 displays a summary of results of these surveys. A total of 19 wetland species were recorded during the breeding bird survey across all habitats. The combination of the turlough and wetland habitat types with mixed farmland within the survey area and its location between various SPAs, are factors which underlie the broad range of taxonomic groups of bird families recorded in this survey; these include (1) Anatidea, (2) Scolopacidae, (3) Podicipedidae, (4) Phalacrocoracidae, (5) Charadriidae, (6) Laridae, (7) Rallidae, (8) Ardeidae. The survey found that Black-headed Gull, Cormorant, Mallard, Greylag Goose and Great-Crested Grebe were, overall, the most abundant species observed.

The Breeding Bird Survey Report (Ryan Hanley, 2024) for Lough Funshinagh was prepared in August 2024 and contains further details on the survey findings.

Table 13. Bird surveys identified on site during breeding bird surveys.

Species	Conservation Status BOCCI	Peak No. Recorded
Black headed gull *Chroicocephauls ridibundus*	Amber	61
Coot *Fulica atra*	Amber	10
Cormorant *Phalacrocorax carbo*	Amber	34
Great crested grebe *Podiceps cristatus*	Amber	25
Grey heron *Ardea cinerea*	Green	15
Greylag Goose *Anser anser*	Amber	22

Species	Conservation Status BOCCI	Peak No. Recorded
Lapwing *Vanellus vanellus*	Red	14
Little egret *Egretta garzetta*	Green	10
Little grebe *Tachybaptus ruficollis*	Green	8
Mallard *Anas platyrhynchos*	Amber	27
Moorhen *Gallinula chloropus*	Green	10
Mute swan *Cygnus olor*	Amber	18
Snipe *Gallinago gallinago*	Red	12
Teal *Anas crecca*	Amber	3
Whimbrel *Numenius phaeopu*	Green	60
Wigeon *Anas penelope*	Amber	4

Bird species along the Cross River are considered to be of **local importance (higher value)**. Waterbird species recorded within and in proximity to Lough Funshinagh, which are qualifying interests of nearby European designated sites, are considered to be of **international importance**.

5.4.4 Badger

Desk Study

No records of badger were returned from within the Lough Funshinagh SAC. 21 records of badger were returned from within the remainder of the study area, all from 2015. No records of badger were returned by the NPWS data search from the last ten years.

Field Survey

One large sett was recorded within a scrub habitat area (WS1) at the southern end of Lough Funshinagh, approximately 135m east of the proposed scheme. A trail camera was left at the location which confirmed badger activity in the area.

Another large sett was found and confirmed by the trail camera records, at the northwestern end of the lough approximately 3.2km northwest of the proposed scheme. The sett was recorded located along a hedgerow between two agricultural fields.

A badger sett was recorded approximately 4m west of the proposed scheme, c.2km southwest of Lough Funshinagh, located within a hedgerow line 100m before reaching the Cross River. Badger signs in the form of dead snails and other invertebrates confirmed recent badger activity in the area. Trail camera footage confirmed it is an active sett.

A trail camera located within a treeline 1.2km southeast of the proposed scheme, 2.5km south of Lough Funshinagh and running along the Cross River confirmed the presence of badger in the habitat. Further badger signs were also found at this location.

Badger are considered to be of **local importance (higher value)**, as a badger population of local value are known to be active throughout the study area. Badger are protected under the Wildlife Acts 1976 to 2023.

5.4.5 Flora

Desk Study

The data search returned no records of flora protected under the Birds and Natural Habitats Regulations or the Wildlife Acts within either Lough Funshinagh SAC or the remainder of the study area.

The Flora (Protection) Order 2022 Map Viewer displayed two records of orange foxtail *Alopecurus aequalis*, from 2004 and 2013, on the south-western banks of Lough Funshinagh.

The NPWS data search returned records of the following plants: green-winged orchid *Anacamptis morio* (three records), short-leaved water-starwort (*Callitriche truncate)* (two records), narrow-leaved helleborine (*Cephalanthera longifolia)* (16 records), autumn lady's-tresses (*Spiranthes spiralis)* (one record), autumn gentian (*Gentianella amarella)* (one record).

Field Survey

No protected plants were recorded during the field surveys.

Flora are considered to be of **local importance (lower value)**, given flora recorded were largely common and not of conservation interest.

5.4.6 Fish

Desk Study

The NBDC data search returned no records of fish within either Lough Funshinagh SAC or the Cross River and 100m buffer within the last ten years.

The National Research Survey Programme Rivers 2016 reported four fish species, and one hybrid, within the Cross River in 2016: brown trout (*Salmo trutta)*, perch (*Perca fluviatilis)*, pike (*Esox Lucius)*, roach (*Rutilus rutilus)*, and roach x bream hybrid (*Abramis brama x Rutilus rutilus)*. Roach was the most abundant species, followed by perch. Seven age classes of roach were encountered, 1+ to 7+ inclusive.

Field Survey

The following fish species were recorded within the Cross River during aquatic surveys:

- Brown trout *Salmo trutta*
- Lamprey (*Lampetra* sp,) (considered likely to be brook lamprey *Lampetra planeri*)
- Gudgeon (*Gobio gobio*)
- Three-spined stickleback (*Gasterosteus aculeatus*); and
- Non-native roach (*Rutilus rutilus*).

eDNA sampling of the Cross River confirmed the presence of brook / river lamprey. Whilst lamprey ammocoetes were only recorded via electrofishing at site S2 (at the location of the proposed scheme), strong eDNA signatures were recorded throughout the Cross River, suggesting they are widely distributed across the watercourse.

Despite physical suitability, including spawning and nursery habitat, the upper reaches of the Cross River (sites S1, S2, S3 and S4) did not support salmonids. Brown trout were present from site S5 downstream of the outfall. Sites S5 and S6 were noted to provide good quality holding and foraging habitat for brown trout.

Lough Funshinagh is known to support fish species including eel (*Anguilla anguilla*), pike (*Essox lucius*), perch (*Perca fluviatilis*), roach (*Rutilus rutilus*), minnow (*Phoxinus phoxinus*), three-spined stickleback (*Gasterosteus aculeatus*) and ten-spined stickleback (*Pungitius pungitius*).

Brook lamprey are considered to be of **international importance**, due to being a qualifying feature of nearby international designated sites. The other species of fish identified are considered to be of local importance (lower value).

5.4.7 Pine Martin

Desk Study

No records of pine martin were returned by the NBDC or NPWS desk study within the last ten years.

Field Survey

Pine martin was recorded in the form of trail camera evidence withing the surrounding habitats of Lough Funshinagh and the Cross River.

Pine martin are considered to be of **local importance (higher value)**, as the habitats in proximity to the lough support a regularly occurring pine martin population, and pine martin is protected under the Wildlife Acts 1976 to 2023 and the Habitats Directive (92/43/EEC), Annex V.

5.4.8 Invertebrates

Desk Study

The NBDC data search returned no records of invertebrates protected under the Birds and Natural Habitats Regulations or the Wildlife Acts from Lough Funshinagh SAC within the last ten years. The data search returned records of one invertebrate within the proposed route and Cross River, of white-clawed crayfish (26 records). No records of invertebrates were returned by the NPWS data search within the last ten years.

Field Survey

No white-clawed crayfish were recorded during surveys at the aquatic survey sites along the Cross River and are considered likely absent within 250m upstream and downstream of the proposed scheme. An eDNA sample at aquatic sampling site 7 returned a positive result for white-clawed crayfish, in the lower reaches of the watercourse downstream of the outfall. In this area, crayfish burrows were visibly abundant in clay banks.

No rare or protected macroinvertebrate species were recorded in sweep samples collected from Lough Funshinagh. The sweep samples recorded a high diversity of aquatic invertebrate species (71 taxa). The species communities were typical of shallow, weedy alklaline lakes and turloughs. Species recorded included *Athripsodes aterrimus*, *Mystacides longicornis*, *Oecetis furva*, *Triaenodes bicolor*, *Limnephilus marmoratus*, and *Agrypnia obsolete*. Common molluscs of lentic enriched habitats were recorded, including *Ampullacaena balthica*, *Bithynia tentaculata*, *Planorbis planorbis*, and *Physa fontanlis*. In addition, a high diversity of aquatic beetles were recorded, characteristic of shallow lakes and lentic waterbodies. The near threatened lipped diver (*Agabus labiatus*) which has previously been recorded in the lough was not recorded during surveys, likely due to the presence of large shoals of coarse fish.

The habitats surrounding Lough Funshinagh, comprising grasslands, scrubs, meadows and farmlands, including the temporary waterbodies which provide suitable breeding habitat, would likely support a diversity of invertebrates in the area however no evidence of protected invertebrates was identified.

White-clawed crayfish are considered to be of **local importance (higher value),** as a locally important population are present within the Cross River downstream of the proposed scheme, and the species is protected under the Wildlife Acts 1976 to 2023 and the Habitats Directive (92/43/EEC), Annex II and V. All other invertebrates are of **local importance (lower value)**.

5.4.9 Otter

Desk Study

The data search returned no records of otter within either Lough Funshinagh SAC or within the proposed scheme and Cross River and 100m buffer within the last ten years. No records of otter were returned by the NPWS data search within the last ten years.

Field Survey

The bank and riparian habitat of the Cross River 250m upstream and downstream was considered unsuitable to support otter holts, with the riverbanks highly consolidated and compacted. Spraints were recorded at S5 and S7, approximately 6.3km and 18km, respectively, downstream from the proposed scheme location. As such, it is considered likely that otter are found infrequently within 250m of the proposed scheme. The presence of otter was recorded at Lough Funshinagh by a trail camera located at the south end of the lough in shallow waters with prominent rocks (a semi submerged stone wall), 400m east of the intake location. The area was surrounded by scrub (WS1), dry calcareous and neutral grassland (GS1) and treelines (WL2).

Otter are considered to be of **international importance**, due to being a qualifying feature of nearby international designated sites.

5.4.10 Reptiles

Desk Study

The data search returned no records of reptiles within either Lough Funshinagh SAC or within the proposed pipeline route and Cross River and 100m buffer within the last ten years. Similarly, no records of reptiles were returned by the NPWS data search within the last ten years.

Field Survey

No reptiles were recorded during the walkover surveys, however the grassland habitats and hedgerows surrounding the lough and Cross River may present suitable habitat for reptiles including common lizard.

Reptiles are considered to be of **local importance (lower value),** due to the study area likely supporting a local population of common reptiles.

5.4.11 Invasive non-native species

Desk Study

No records of terrestrial or aquatic invasive non-native species (INNS) were returned by the data search.

Field Survey

Mink (*Neovison vison)* was recorded within the survey area in proximity to Lough Funshinagh largely within agricultural fields. Mink was recorded on trail cameras actively hunting and breeding within these areas.

No invasive macrophyte plant species were recorded during aquatic surveys of Lough Funshinagh other than Canadian pondweed. *(Elodea canadensis*), which was frequent throughout the lake basin.

INNS are not valued as per CIEEM guidelines.

5.4.12 Other notable species

Desk Study

One record of west European hedgehog (*Erinaceus europaeus)* was returned by the data search, within the proposed pipeline route and Cross River and 100m buffer. No records of other notable species were returned by the NPWS data search within the last ten years.

Field Survey

Hare (*Lepus europaeus)* were recorded in proximity to Lough Funshinagh, largely within agricultural fields.

Fallow deer was recorded on the camera trap on the 30th of April to the west of the lough adjacent to a conifer plantation (WD4). There were no signs of deer recorded during the walkover surveys around Lough Funshinagh or along the Cross River.

Hare and fallow deer are considered to be of **local importance (lower value)**, due to the common nature of the species and being of low conservation concern.

5.5 Summary of Key Ecological Receptors

The following ecological features are considered to be KERs in relation to the proposed scheme and its potential construction and/or operational impacts:

- All sites scoped into the AA Stage 1 screening are considered to be KERs. These include Lough Funshinagh SAC, Lough Ree SAC, River Shannon Callows SAC, Lower River Shannon SAC, Ballynamona Bog and Corkip Lough SAC, Lough Ree SPA, River Suck Callows SPA, Four Roads Turlough SPA, Lough Croan Turlough SPA, Middle Shannon Callows SPA, and Mongan Bog SPA
- The following habitats are considered to be KERs: stone walls and other stonework (BL1), dry calcareous and neutral grassland (GS1), dry meadows and grassy verges (GS2), wet grassland (GS4), scrub (WS1), marsh (GM1), hedgerows (WL1), treelines (WL2), (mixed) broadleaved woodland (WD1), turloughs (FL6), depositing/lowland rivers (FW2), and drainage ditches (FW4). This is due to these habitats presenting floral interest and/or providing refuge/foraging resource for faunal species
- The assemblage of breeding birds and wintering birds are considered to be KERs on a precautionary basis due to the presence of suitable breeding and wintering habitat within the proposed scheme lands and species protection under the Wildlife Acts, as well as certain species being qualifying features of nearby international designated sites
- Amphibians are considered to be KERs due to the known presence of common frog within Lough Funshinagh, with significant numbers recorded within the north of the lough
- Bats are considered to be KERs due to the potential for bats to use buildings and trees in proximity to the proposed scheme for roosting, and the suitability of habitats within and in proximity to the proposed scheme boundary for commuting and foraging bats
- Badgers are considered to be KERs due the suitability of foraging, resting, breeding habitat and their protection under the Wildlife Acts, and confirmed presence within the landscape, including a confirmed active sett 50m from the pipeline location
- Otter are considered to be KERs due to the suitability of foraging, resting, breeding habitat and their protection under the Wildlife Acts, and confirmed presence within the landscape, with otter activity recorded within 191m of the proposed scheme at Lough Funshinagh. In addition, otter are a qualifying feature of international designated sites in proximity
- West European hedgehog and brown hare are considered to be KERs due to their protection under the Wildlife Acts, and given they are known to utilise habitats surrounding the proposed scheme
- Pine martin is considered to be a KER on the basis that the habitats within the area are utilised by a regularly occurring pine martin population, with pine martin recorded by a trail camera within 191m of the proposed scheme

- White clawed crayfish is considered to be a KER on the basis that they are known to be present within the Cross River, approximately 18km downstream of the outfall
- Fish are considered to be a KER due to known populations of species within the Cross River; and
- Brook Lamprey, which is a qualifying interest feature of the Lower River Shannon SAC, is considered to be a KER due to a known population within the Cross River.

6. Identification of Likely Significant Impacts

6.1 Overview

Direct and indirect likely significant impacts on KERs that may occur as a result of the proposed scheme are identified in this section.

The proposed scheme is described in Section 2 of this report and will comprise a pump intake and associated compound at Lough Funshinagh, an overland pipeline from the lough to the River Cross and an outfall into the River Cross. Water will be discharged into the river at a rate of up to 300 litres/second.

6.2 Characteristics of the proposed scheme

6.2.1 Construction

At the time of writing, it is understood that the construction phase will have a duration of up to one month, with approximately 3 – 4 weeks of civil works and one week of installation and equipment set-up. In terms of environmental importance, activities will include vegetation clearance, construction of an intake compound adjacent to the intake location at Lough Funshinagh (see location in Figure 1), installation of the pump intake system within the south-west extent of Lough Funshinagh, and installation of the pipeline between Lough Funshinagh and the Cross River outfall location (see route in Appendix H), including three road crossings, whereby the pipes will run underground.

The pump intake system will include two hydraulic power units (HPU's), positioned within the bund. These will be fitted with a silencer to reduce the sound to approximately 76dBA at 7m. Water from the lough will enter the pump pontoon via a 10mm aperture fish screen with a net area of 2 m^2, such that the approach velocity of the water entering the fish screen will be a maximum of 150 mm/s at a flow rate of 300l/s.

Limited amounts of hedgerow clearance will be required for the laying of overland pipes and installation of the pipes under the roads. The construction phase is anticipated to be carried out in Autumn 2024, and as such is expected to avoid the breeding bird season. The hedgerow to be cleared on field boundaries will be limited to a 5m width, to allow a tractor/excavator to move through and the pipeline to be laid. At the three locations where road crossings are required, existing hedgerow on each side of the road will be removed over a width of c.5m.

A stockproof fence will be constructed on each side of the pipeline, to provide a total corridor width of 5m – 7 m. Pipes to allow badger to cross the fence will be installed in line with ramps to be placed over the pipeline, to allow movement of badger and other mammals through the pipeline route.

At the outfall location, a geotextile layer will cover the riverbed and extend up the side of the riverbanks on both sides to protect the integrity of the riverbed from potential erosion from the outflow. To further protect the riverbed from erosion, natural flag stone will be installed slightly below the existing bed level at the outfall location. The geotextile and natural flag stones will extent over a length of 10m, centred on the outflow location (5m upstream and 5m downstream of outflow). The geotextile will be held in place by rock armour which consists of 200kg rocks approximately 0.5 m in diameter, up to the proposed high-water mark. The central part of the riverbed will remain at its existing level so as not to impede fish passage.

The water from the outfall pipe will run onto the rock armour on the north (left) bank and this will dissipate the energy of the flow and allow it to enter the river in a controlled manner without causing erosion. It is currently assumed that the geotextiles, natural flag stone , and rock armour will remain in place between seasonal pumping and after cessation of works. The outfall location and arrangement will be regularly reviewed to ensure the riverbed and riverbanks are not being adversely affected.

All machinery and construction materials will be stored in a bunded construction compound on the edge of the lough, with the location of the construction compound shown in Figure 2-5.

All work will be carried out in line with industry best practice, including the following:

- CIRIA (2001) Control of water pollution from construction sites. Guidance for consultants and contractors (C532)
- CIRIA (2005) "Environmental good practice on site" 145
- CIRIA (2006) Control of water pollution from linear construction projects. Technical guidance (C648)
- CIRIA (2015), The SuDS Manual (C753)
- Enterprise Ireland, Best Practice Guide BPGCS005 Oil Storage Guidelines
- Environment Protection Agency (EPA), http://www.epa.ie/pubs/advice/; and
- Inland Fisheries Ireland (2016) Guidance on Protection of Fisheries during Construction in and adjacent to Water.

The CEMP will include pollution prevention control measures to control surface water runoff.

Significant negative impacts on air quality during the construction phase are not anticipated due to the limited construction works proposed and short duration, as well as the minimal increase in construction traffic. Noise emissions will be controlled by implementation of best construction practice, and with the implementation of mitigation measures and given the limited duration of the works, it is not predicted that there will be any significant adverse noise or vibration impacts associated with the construction phase.

6.2.2 Operation

The operational phase of the proposed scheme is described in Section 2.3. During the operational phase, water will be pumped from Lough Funshinagh, through the two pipelines, into an outfall into the Cross River. The pumps and generators will operate for a duration of up to 2 years. It is anticipated that the generators will be operating 24 hours a day initially. It is anticipated that flow rate within the Cross River at and downstream of the outfall will be increased from a baseline of 50l/s to 300l/s.

The pump intake system will be inspected daily to ensure proper operation and to check for blockages or damage to the fish screen. Any blockages will be cleared by an operative from the access walkways. Refuelling of the hydraulic pumps will be required every fourth day of pumping, involving a fuel tanker delivering fuel into the tanks within the bunds. Refuelling will take place with the truck parked over a portable PVC containment bund mat. Rainwater will be emptied from the HPU bund daily using a light duty puddle pump and will be discharged at a location at least 15m to the lough edge. Servicing of the pumps will be undertaken every 500 running hours, and will involve a change of filters and oil, with a spill kit available to contain any spillage. Local drainage around the compound area and the silt fence on the downslope side of the compound will be checked once per week.

The pipeline will be inspected every day to identify any signs of damage or distress to the pipeline or the fencing. Similarly, the outfall location will be inspected daily to ensure the diffuser is working correctly and the rock armour and geotextile is stable. Should there be any concern regarding the integrity of the outfall, the pumps will be shut down immediately.

Remote monitoring of the flow in the pumps and in the Cross River will be carried out daily.

During operation, whilst there will be air emissions from the diesel pumps operating at the intake compound and the haulage trucks delivering fuel to the site, these are not expected to be significant.

6.2.3 Decommissioning

The decommissioning stage is anticipated to have the same effects as the construction stage of the proposed scheme, and shall consist of up to one month of in-situ works

Decommissioning of the pumps will involve removal of the pump pontoon from the lough, using a 60 Tonne crane, to an articulated truck within the intake compound. A small boat will be in the water to assist. The floating access pontoons will be dismantled and lifted from the edge of the lough to a truck parked in the compound, using the crane. The same crane will lift the HPUs and fuel tanks onto the truck.

Decommissioning of the pipeline will involve the pipe being cut into transportable lengths using a consaw and then being lifted onto a flatbed trailer using an excavator. The layflat hose will be collected using a proprietary hose reel system. The stockproof fence will be removed and the pipeline corridor reinstated back to the existing land use. A stockproof fence will be erected at all field boundary fences/hedgerows that were taken down and a native hedgerow planted on one side of the fence.

6.3 Likely Significant Impacts

6.3.1 Construction

The potential impact of construction activities on important ecological features include:

- Aquatic and terrestrial habitat loss to facilitate the temporary compound, overland pipe laying and access to the Cross River (including of SAC qualifying interest features)
- Introduction and/or spread of Invasive Non-Native Species (INNS)
- Mortality/injury of species
- Disturbance/displacement of species, including disturbance to foraging, commuting and breeding; and
- Habitat degradation due to movement of vehicles, accidental pollution events, changes to water quality.

6.3.2 Operation

Whilst the operational phase is only anticipated to last up to two years, certain potential impacts (for example introduction of INNS and habitat degradation) may persist after cessation of the works. Based on hydrological modelling, in Section 4.5.2, the Cross River is expected to have capacity to absorb the additional quantity of water from the abstraction from the lough. As such, potential impacts of overtopping within the Cross River are not considered.

The potential effects of operational activities on important ecological features include:

- Disturbance of species, including disturbance to foraging, commuting and breeding
- Introduction/spread of INNS
- Aquatic and terrestrial habitat degradation due to water quality impacts, accidental pollution events; and
- Habitat fragmentation.

6.3.3 Decommissioning

All effects during the decommissioning phase are anticipated to be temporary.

The potential effects of decommissioning activities on important ecological features include:

- Introduction and/or spread of INNS
- Disturbance/displacement of species, including disturbance to foraging, commuting and breeding
- Habitat degradation due to movement of vehicles, accidental pollution events, changes to water quality; and
- Mortality/injury of species.

7. Ecological Impact Assessment

As per the relevant guidelines, likely significant effects have only been assessed for identified KERs, as listed in Section 5.5. An impact is considered to be ecologically significant if it is predicted to affect the integrity or conservation status of a KER at a specified geographical scale. All impacts are first described in the absence of mitigation, and mitigation is then proposed, with potential residual impacts, where they exist, outlined. Under the do-nothing scenario, it is likely that the site would continue to offer suitable nesting habitat for breeding birds, foraging and resting habitat for otter, foraging and sett creation habitat for badger.

The importance of ecological receptors identified within the study area, assigned according to the methodology outlined in Section 4.6, potential impacts as a result of the proposed scheme in the absence of mitigation, proposed mitigation, and residual impacts, are outlined below in Table 14.

7.1 Embedded mitigation

The following mitigation measures will be implemented during construction, operation and decommissioning to prevent impacts on ecological receptors:

- Implementation of all guidance outlined in Section 6.2.1, as outlined within the CEMP
- Strict biosecurity measures will be required to be put in place. Measures will be required to specify no transfer of plant materials without appropriate safeguards to avoid the introduction and/or spread of invasive non-native species to the site
- Any areas of exposed sediment deemed at risk of erosion during heavy rainfall shall be protected using measures such as coir matting until vegetation is able to establish on these surfaces. The ECoW will identify locations likely to be at risk of erosion
- The flow in the Cross River will be monitored at three locations by OPW hydrometric gauges at 15-minute intervals for the duration of the interim scheme. Two new hydrometric gauges will be installed on the left bank of the Cross River. The pumping control system will be remotely monitored and if required the pumping flow rates will be adjusted or shut off
- Weekly water quality testing will be undertaken at seven locations on the Cross River and three locations in Lough Funshinagh
- Standard measures to prevent soil and water pollution through CEMP in construction stage
- Appointment of Ecological Clerk of Works (ECoW) to implement mitigation measures during construction and decommissioning
- Appointment of Project Ecologist to implement mitigation measures during operations
- Silt fences during construction, with specification to be reviewed by a qualified surface water specialist on behalf of RCC, and installation to be reviewed by ECoW
- Machines will be kept no less than 50m from all watercourses except where necessary for installation and fuelled at a safe location with all machines provided with spill kits. Machines are present on-site during construction and decommissioning with only refuelling machines present during operation
- No excavation works during/following heavy rainfall
- Construction adhere to industry best practice guidelines, as outlined in Section 6.2.1
- Application of standard mitigation measures for construction related contaminants (refuelling, maintenance, storage, pouring of concrete etc.); and
- Acoustic barrier (4m high) surrounding the HPUs.

7.2 Impact Assessment and Mitigation

Table 14 Ecological impact assessment.

KER	Importance	Impact	Mitigation	Residual impacts
Designated sites				
European designated sites (screened into the AA screening): • Lough Funshinagh SAC • Lough Ree SAC • River Shannon Callows SAC • Lower River Shannon SAC • Ballynamona Bog and Corkip Lough SAC • Lough Ree SPA • River Suck Callows SPA • Four Roads Turlough SPA • Lough Croan Turlough SPA • Middle Shannon Callows SPA, and • Mongan Bog SPA.	International – designated at the European level	Potential for significant effects on the following sites were identified: • Lough Funshinagh SAC • Lough Ree SAC • River Shannon Callows SAC • Middle Shannon Callows SPA • Potential impacts include: • Habitat loss • Habitat fragmentation • Accidental pollution event • Habitat and species disturbance/displacement • Introduction and/or spread of INNS • Changes to water quality/water quality degradation.	Mitigation for impacts on each of the designated sites identified is provided within the Screening for Appropriate Assessment (AA) and Appropriate Assessment Report[47] and summarised below in Section 7.1.	No significant residual impacts identified.
National designated sites - Carrickynaghtan Bog NHA.	National – statutorily designated at the national level	Carrickynaghtan Bog NHA is located 200m south of the Cross River, and approximately 690m from the confluence between the Cross River and River Shannon. No construction works are proposed in proximity to Carrickynaghtan Bog NHA, so impacts are considered limited as a result of increased flow within the Cross River and River Shannon.	None required	No significant residual impacts identified

[47] Arup. (2024). Lough Funshinagh Interim Flood Relief Scheme. Screening for Appropriate Assessment & Natura Impact Statement Report.

KER	Importance	Impact	Mitigation	Residual impacts
		Hydrological modelling, as outlined in Section 2.5, has indicated the Cross River will not overtop due to the increased flow, and as such, it is not anticipated that the NHA would be impacted. The Bog sits within a separate groundwater body to Lough Funshinagh, and therefore impacts as a result of reducing the water level at Lough Funshinagh are not anticipated. As such, no impacts on the Carrickynaghtan Bog NHA as a result of the proposed scheme are considered likely.		
Habitats				
Annex I habitats – Turlough	International – qualifying interest feature of Lough Funshinagh SAC.	Habitat degradation – potential for degradation of the turlough habitat during the construction, operation, and decommissioning phases, through the following pathways: Accidental pollution events, e.g. diesel spill from the pipes supplying the pumps within the lough; Surface water runoff from the temporary compound and access road; Spread of INNS through movement of boats used during installation of floating infrastructure; Movement of machinery and vehicles, in particular during construction and decommissioning when installing/removing the floating container.	Best practice construction practices, including CIRIA Good Practice[48] will be implemented throughout the construction phase by the appointed contractor which will include pollution prevention control measures to control surface water runoff and measures to prevent the spread of INNS, as outlined within Section 7.1. The diesel tanks within the intake compound adjacent to the lough will be double skinned and bunded to at least 110% of the capacity of two tanks to prevent contamination of adjacent habitats, in the scenario of a leak. Specific mitigation measures will be implemented to minimise the risk of spillage/leakage during re-fuelling, as detailed in Section7.3. Servicing of the pumps will be undertaken every 500 running hours, and a spill kit will be available to contain any spillage. Local drainage around the compound area and the silt fence on the downslope side of the compound will be checked once per week.	No significant residual impacts identified

[48] Construction Industry Research and Information Association (CIRIA) in the UK, Environmental Good Practice on Site Guide, 4th Edition

KER	Importance	Impact	Mitigation	Residual impacts
			Further details of mitigation for the SAC habitat are provided within Section 6.4 and within the AA report[47]. It is considered that implementation of the mitigation measures outlined above will prevent any significant habitat degradation of the Annex I turlough habitat.	
Non-annex I terrestrial KER habitats (stone walls and other stonework (BL1), dry calcareous and neutral grassland (GS1), dry meadows and grassy verges (GS2), wet grassland (GS4), scrub (WS1), marsh (GM1), hedgerows (WL1), treelines (WL2), (mixed) broadleaved woodland (WD1), turloughs (FL6), depositing/lowland rivers (FW2), and drainage ditches (FW4))	Local – all other terrestrial habitats within the red line boundary	Habitat loss – Small pockets of hedgerow (5m width/5m width at road crossings) are proposed to be removed to enable laying of the pipelines. A small amount of vegetation clearance may also be required at the location of the outfall into the Cross River.	Placement of the pipelines will be sited to avoid removal of mature trees, and to allow suitable distance from any sensitive ecological receptors identified by survey. An Ecological Clerk of Works (ECoW) will oversee vegetation removal and advise on where is most suitable to locate the pipelines. The loss of hedgerow will be temporary – after cessation of the pumping works, native hedgerow will be planted where removed, and fenced with stock proof fencing to allow the gaps in the hedgerow to grow back. As such, no permanent significant impact is anticipated.	No significant residual impacts identified
		Habitat degradation – there is potential for terrestrial habitats (such as wet grassland and marsh, which are located in close proximity to the proposed compound) to be degraded by incidents including: Accidental pollution during construction and operation (including diesel spills from the generator, run off from the access road) Accidental damage to semi-natural habitats in close proximity to site works during site preparation.	Best practice construction practices, including CIRIA Good Practice[9] will be implemented throughout the construction phase by the appointed contractor which include pollution prevention control measures to control surface water runoff. Embedded mitigation measures which will avoid habitat degradation are outlined within Section 7.1. To prevent incidental damage by machinery or by the deposition of any spoil during site works, woodland, tree, hedgerow and scrub vegetation which are located in close proximity to working areas will be clearly marked and fenced (as outlined within the CEMP).	No significant residual impact identified

KER	Importance	Impact	Mitigation	Residual impacts
			The diesel tanks within the intake compound adjacent to the lough will be bunded to prevent contamination of adjacent habitats, in the scenario of a leak. Specific mitigation measures will be implemented to minimise the risk of spillage/leakage during re-fuelling, as detailed in Section 7.3. An ECoW should brief the contractor staff prior to the commencement of works via a 'toolbox talk'. This will include briefing on the importance of biosecurity measures to prevent the introduction/spread of INNS.	
		Habitat fragmentation – due to removal of sections of hedgerow.	Impacts as a result of hedgerow removal are considered to be likely minor and temporary, given a maximum of 5m will be removed at any section of hedgerow. Resultant gaps in the hedgerow will be filled in after cessation of the works, when native hedgerow will be planted.	No significant residual impact identified
Non-Annex I aquatic habitats – depositing/lowland rivers (FW2)	Local – the Cross River	Habitat degradation Accidental water pollution during construction. Introduction of INNS from Lough Funshinagh (namely Canadian pondweed). Erosion of the riverbed and riverbanks due to velocity of water entering the Cross River at the outfall location. Alteration in nutrient levels within the Cross River, through addition of water from Lough Funshinagh is not considered to be a risk, given the lough has better water quality than the river.	Standard measures to prevent water pollution during construction are outlined within the CEMP, including refuelling and chemical management mitigation measures, flood risk mitigation, and a management plan for foul waste generated during construction. Section 7.1 outlines embedded mitigation which will avoid degradation impacts on the river. The mesh screen on the intake pump system will have a maximum opening of 10mm, which is considered sufficiently small to prevent large fragments of Canadian pondweed entering the pipelines and being pumped into the Cross River. The screens will be checked daily to ensure no blockages. On a weekly basis, a Project Ecologist will check for Canadian pondweed at the intake point and outfall.	No significant residual impact identified

KER	Importance	Impact	Mitigation	Residual impacts
			Given there is already a hydrological connection between Lough Funshinagh and the Cross River, via the swallow hole at Lough Funshinagh and the spring at Atteragh Mill which discharges into the Cross River, the proposed pumping is not expected to result in increased distribution of the species. A geotextile layer will cover the riverbed and extend up both sides of the riverbanks over a length of c.10m, centred on the outfall location. Rock armour will hold the geotextile in position to prevent erosion and dissipate energy from the pipeline. The rock armour will extend up to the proposed high-water mark at the outfall location. In addition, natural flag stones will be installed slightly below the existing bed level to further protect the riverbed at the outfall location. A diffuser tee will be fitted to the end of the PE ribbed pipe to dissipate energy and distribute the flow over a larger area of the riverbank. Weekly water quality testing to be conducted at several locations, including: Pumping location at Lough Funshinagh, discharge point at entry to Cross River, confluence of Cross River and Brideswell, and the discharge point to the River Shannon. Water quality trend monitoring to be undertaken by a suitably qualified individual will inform whether the level of pumping should be reviewed at any point during operation.	
Species				
Amphibians	Local – evidence that common frog are present in significant numbers within Lough Funshinagh.	Disturbance - there is potential for amphibians using habitat within and adjacent to the red line boundary to be disturbed by increased vibration, noise, and lighting associated with the construction works and operation and maintenance of the pumps.	Impacts will be localised, and noise modelling suggests impacts will only occur within 50m of the pumps. As such, no mitigation is considered necessary, given there is an abundance of suitable habitat outside of this 50m area which displaced amphibians can use. Additionally, records from field surveys were largely to the north of the lough, which is not anticipated to be affected by the proposed scheme.	No significant residual impacts.

KER	Importance	Impact	Mitigation	Residual impacts
			During the construction and decommissioning phase, the appointed ECoW will fingertip search any vegetation suitable to support amphibians prior to removal (namely hedgerow). Lighting will be designed to minimise glare and light spill onto adjacent habitats.	
Bats	Local - in absence of activity surveys, assumed there is potential for locally significant bat roosts in proximity to the proposed scheme.	Disturbance – potential for bats using habitat within/adjacent to the red line boundary to be disturbed by vibration, noise, and light during construction, operation, and decommissioning.	Noise and vibration impacts will be localised, and noise modelling suggests impacts will only occur within 50m of the pumps. Any structures or trees within this area should be assessed for potential bat roosts. Should any bat roosts be present, a disturbance licence may be required and additional mitigation agreed with NPWS. At the time of writing, no trees are proposed to be felled during the construction phase. Should it be required that trees are removed as part of the overground pipe laying, the trees should be assessed for potential bat roosts. Construction and operational stage lighting details will be reviewed by a suitably qualified bat ecologist. The design should follow guidelines set out in Bats and Artificial Lighting GN08/23. Lighting will be designed to minimise glare and light spill onto adjacent habitats.	No significant residual impacts.
Birds	International/local – qualifying interest features of Lough Ree SPA, Suck River Callows SPA, Four Roads Turlough SPA, and Lough Croan SPA have been recorded using habitats surrounding Lough Funshinagh.	Disturbance –there is potential for localised and temporary disturbance from within 500m of the intake compound during all phases of the works. The project noise at the intake compound is estimated to be 76dBa at source, and this would dissipate to background levels over the surrounding landscape. No of birds were recorded surrounding the outfall location during surveys of the Cross River, though it should be noted that targeted bird surveys were not carried out at this location. It is assumed there is potential for common bird species to use the river and surrounding habitat.	Impacts will be highly localised and short-term within Lough Funshinagh, with construction works lasting approximately one month and the pumps in operation for up to two years. Should individuals be disturbed by the proposed scheme during any phase, there is an abundance of alternative suitable habitat, both within the unaffected areas of Lough Funshinagh, and within surrounding wetland habitats, such as Lough Ree. It is anticipated that species, if disturbed/displaced, will seek alternative land within Lough Funshinagh within a few hundred metres of the proposed scheme. As such, no additional mitigation is considered necessary.	No significant residual impact identified

KER	Importance	Impact	Mitigation	Residual impacts
	Species not listed as qualifying species of nearby designated sites are considered to be of local importance.	There is therefore potential for disturbance to birds using habitats close to the temporary compound and pumps within the lough, as well as habitats surrounding the outfall into the Cross River.	As described above in relation to bats, lighting will be designed to minimise glare and light spill onto adjacent habitats to avoid disturbance due to artificial lighting. Construction and operational stage lighting details will be reviewed by a suitably qualified ecologist. Installation works at the outfall will be highly localised and temporary (lasting up to one month). During operation, any increase in disturbance will be minimal, limited to non-intrusive inspections of the outfall. As such, no mitigation is considered necessary relating to disturbance at the outfall into the Cross River.	
		Habitat loss - The proposed works will result in temporary loss of areas of hedgerow (limited to a maximum 5m width), to enable the installation of the overland pipes. A small area of land on the fringe of Lough will be temporarily occupied by an intake compound during all project phases.	Due to the interim nature of the proposed scheme, habitat loss is expected to be entirely temporary. During the decommissioning phase, areas of removed hedgerow will be replanted with native hedgerow. Given the abundance of hedgerow habitat within the wider landscape, the minor and temporary loss of areas of hedgerow to enable the pipes to be laid is not considered to be a significant effect for birds. As such, no additional mitigation is considered necessary. The area of terrestrial habitat adjacent to the lough to be temporarily occupied by the intake compound represents a small area relative to the abundance of suitable habitat surrounding the lough. As such, it is considered that there is enough alternative suitable habitat for wintering and breeding birds within unaffected terrestrial habitat, that the loss of this area is not considered significant.	No significant residual impact identified

KER	Importance	Impact	Mitigation	Residual impacts
		Mortality/injury – There is potential for birds and their nests to be destroyed, in the absence of mitigation, during hedgerow clearance works, if undertaken during the nesting season (1st March to 31st August inclusive).	In order to avoid disturbance of breeding birds, their nests, eggs and/or their unfledged young, all works involving the removal of trees or hedgerows will be undertaken outside of the nesting season (1st March to 31st August inclusive). Or where this seasonal restriction cannot be observed then: A pre-construction check will be undertaken, prior to works commencing by an ECoW to confirm whether birds are nesting within suitable habitat affected by or immediately adjacent to the subject lands. If no breeding birds are found nesting in trees or hedgerows on the site, this vegetation must be removed within 48 hours or repeat surveys will be necessary. Should nesting birds be present during surveys, the removal of trees or hedgerows may be required to be delayed until after the nesting season (1st March to 31st August inclusive), or the route of the pipes amended to avoid the nesting identified, with a buffer of minimum 5m and to be agreed with the supervising ECoW.	No significant residual impact identified
Badger	Local – evidence that badger forage, commute and breed within and in proximity to the pipeline route, in locally significant numbers.	Disturbance - the proposed works, including construction and operation, will result in localised increase in vibration, noise, and lighting. There is therefore potential for disturbance to badgers using habitats close to the intake compound and pumps within the lough, as well as habitats surrounding the outfall into the Cross River. The identified active badger sett is located over 50m from the proposed scheme, at which distance impacts on the sett are not anticipated. No heavy engineering (e.g. piling and/or blasting) are planned as part of the proposed scheme, and as such, a 50m buffer from the sett is considered appropriate.	Construction works will be undertaken during the daytime, such that disturbance impacts are unlikely to be significant. Artificial lighting will be limited to the mornings and evenings in winter, when natural light levels are low. Lighting will be designed to avoid illuminating habitats suitable for badger. If works are not undertaken by August 2025 then a pre-construction survey should be undertaken to establish if any new setts have been established in the elapsed time. An update survey should be conducted a maximum of 12 months before the decommissioning phase to determine if any new setts have been established in the elapsed time.	No significant residual impacts

KER	Importance	Impact	Mitigation	Residual impacts
		Habitat loss – minor and temporary vegetation clearance will be required to facilitate installation of the overland pipes, creation of the access road, and installation of the outfall into the Cross River. No works that would necessitate destruction of setts are required, however there is potential for removal of foraging and commuting habitat.	Any removal of vegetation will be limited in extent, and temporary, with a maximum of 5m width of hedgerow removed within each field boundary/road crossing, and native hedgerow to be planted during the decommissioning phase to replace the removed hedgerow sections. Given the abundance of alternative suitable commuting and foraging habitat surrounding the proposed scheme, the minor loss of habitat is not considered to be a significant impact. As such, no additional mitigation is considered necessary.	No significant residual impact identified
		Habitat fragmentation – there is potential for the overland pipelines to prevent movement of badger through suitable habitat. The stock proof fence and pipeline could result in badger being forced to travel greater distances to forage, which may result in greater energy expenditure, reduced reproductive success, and/or direct mortality should this fragmentation result in a greater number of road crossings.	Ramps will be placed over the pipes, and pipes of 30cm diameter placed through the stock proof fence, at a maximum of 100m intervals where in close proximity to the identified badger setts. The pipes and ramp will be positioned wherever the pipeline crosses a field boundary across the entirety of the pipeline route, with a maximum of 500m between access routes. This will mean the maximum distance a badger will be displaced to travel through the pipeline barrier in any area of the pipeline would be 500m. to provide a means by which badgers can move over the pipes. This distance is not considered significant enough to cause a likely significant impact on the survival and reproductive success of badgers in the area. A repeat badger survey will be carried out after the first year of operation to confirm whether any new setts have been established, and to ascertain whether there are any signs of digging under the fence, such that the position of the badger pipes and ramps can be reviewed.	No significant residual impact identified

KER	Importance	Impact	Mitigation	Residual impacts
Fish	International / Local – brook lamprey are a qualifying feature of Lower River Shannon SAC, and it is precautionarily assumed that the fish within the Cross River may belong to or be connected to the SAC population. Other fish are considered to be of local value.	Disturbance/displacement – fish may be disturbed as a result of the following pathways: Construction/decommissioning disturbance during installation and removal of the floating container within the lough, and outfall (and geotextile layer, natural flag stones, and rock armour) into the Cross Riv This may include disturbance of adult spawning brook lamprey and disturbance to spawning beds where eggs are deposited, if within the spawning period (March to May); and, Increased noise and vibration during operation of the pumps, within the lough and Cross River.	Installation of the floating container within the lough will result in temporary disturbance, directly due to the placement of the container into the waterbody, and indirectly due to additional noise and vibrations associated with construction machinery, e.g. the mobile crane. Disturbance impacts are not considered likely significant, given the highly temporary nature of increased noise and vibrations, and abundance of alternative habitat within the lough within which fish can utilise during the construction phase. The proposed outfall area does not directly overlap with soft silt lamprey ammocoete habitat. In addition, in-stream work relating to the proposed scheme is scheduled outside the spawning and early larval development periods (March to June) of brook lamprey. As early developmental ammocoetes are vulnerable to sedimentation and habitat disruption, undertaking in-stream works out with spawning period will minimise the risk to ammocoetes. Disturbance impacts to fish within the Cross River during the construction phase will be mitigated by implementation of a fish translocation prior to installation of the geotextile mesh and rock armour. At the outfall location, brook lamprey will be translocated to a suitable site upstream to prevent adverse impact, including disturbance, mortality, and injury. Any in stream working will be supervised by an ECoW with a freshwater ecology and fisheries specialism and experience of overseeing construction activities in or around water. A derogation will be required for in stream working during the salmonid close season. The full fish translocation methodology will be detailed within a separate fish translocation method statement.	No significant residual impact identified

KER	Importance	Impact	Mitigation	Residual impacts
			During operation, noise modelling suggests impacts will only occur within 50m of the pumps. As a result, only a relatively small proportion of the lough is anticipated to be subject to disturbance from noise and vibration. Within the lough, there is considered to be abundant alternative habitat for fish to use. As such, it is not considered that disturbance will be a significant impact on fish within the lough. At the outfall location, there is not anticipated to be any significant increase in disturbance during operation. Inspection of the outfall will be non-intrusive, and the outfall has been designed to dissipate energy from water discharging from the outfall pipe such that input of water from the outfall is not considered a likely significant source of disturbance.	
		Mortality/injury – should juvenile fish get entrained on the fish screen on the container containing the pumps within the lough, there would be potential for mortality/injury. There is also potential for mortality/injury to fish (specifically juvenile brook lamprey, which burrow into soft sediment within the riverbed) within the Cross River during installation of the outfall, in particular the laying of the geotextile layer, natural flag stones, and rock armour.	The approach velocity will be a maximum of 150mm/s with a flow rate of 300litres/s. Juvenile fish should be able to swim against the current at this velocity, and not get entrained on the mesh. As described above, in advance of installation of the geotextile mesh and rock armour at the outfall location, brook lamprey at the site will be translocated to a suitable site upstream to prevent injury/mortality of individuals. Brook lamprey will be removed from the river using electric fishing techniques, carried out by a specialist contractor working under a licence from NPWS. The preferred location where fish from the river will be put into the river upstream will be agreed in consultation with IFI, however this is likely to be within a meander approximately 430m upstream of the outfall location, which was identified during aquatic surveys as offering suitability for juvenile brook lamprey.	No significant residual impacts identified.

KER	Importance	Impact	Mitigation	Residual impacts
			The proposed outfall area does not directly overlap with soft silt lamprey ammocoete habitat. In addition, in-stream work relating to the proposed scheme is scheduled outside the spawning and early larval development periods (March to June) of brook lamprey. As early developmental ammocoetes are vulnerable to sedimentation and habitat disruption, undertaking in-stream works out with spawning period will minimise the risk to ammocoetes.	
		Habitat loss – there is potential for minor habitat loss to occur where the pumps are installed within Lough Funshinagh. Within the Cross River, the proposed outfall location does not directly overlap with soft silt lamprey ammocoete habitat, and therefore there will not be direct habitat loss in this location.	No mitigation is considered necessary in relation to habitat loss, given the minor and temporary nature of the impact, as well as the abundance of alternative suitable habitats within Lough Funshinagh.	No significant residual impacts identified.
		Habitat degradation – there is potential for fish spawning, foraging, and commuting habitat to be degraded through the following pathways: • Altered nutrient levels within the Cross River, resulting in change in vegetation composition; • Pollution of Lough Funshinagh/Cross River through sedimentation and/or accidental pollution incidents; • Removal of marginal vegetation to facilitate the installation of the outfall into the Cross River; • Changes to the hydrology of the Cross River, including increased flow speed and depth.	In-stream construction works should be avoided during the salmonid close season (October to June inclusive) to protect downstream spawning salmonids from potential habitat degradation (e.g. sedimentation risks). If works are to be undertaken during the above avoidance periods, given the nature of the proposed scheme and the urgency in relation to current water levels in Lough Funshinagh, a derogation under the Local Authority Works Act, 1949 will be sought. Weekly water quality testing will be undertaken at several locations including: Pumping location at Lough Funshinagh, discharge point at entry to Cross River, confluence of Cross River and Brideswell, and the discharge point to the River Shannon. The pumping of water from the lough to the Cross River is not anticipated to result in water quality degradation, given water quality testing of both water bodies have shown them have similar parameters. Standard measures to prevent water pollution during construction are outlined within the CEMP. These will include silt mitigation measures, such as silt fencing, which will be installed to eliminate any silt load entering the Cross River.	No significant residual impacts identified.

KER	Importance	Impact	Mitigation	Residual impacts
			In addition, any areas of exposed sediment deemed at risk of erosion during heavy rainfall shall be protected using measures such as coir matting until vegetation is able to establish on these surfaces. These measures will be overseen by an on-site ECoW. Method statements will be produced for all works in close proximity to watercourses, and will be submitted to IFI prior to works commencing. Measures to avoid degradation of the Cross River are outlined within Section 7.1 Any removal of vegetation to allow the installation of the outfall within the Cross River will be minor in extent and temporary in nature. As such, no mitigation is considered necessary. During operation, the nearest soft sediment juvenile lamprey (ammocoete) nursery areas downstream of the geotextile installation and outfall will be monitored by the Project Ecologist and fisheries specialist to ensure integrity of soft sediment remains intact during the pumping operation. Should any significant visible changes be observed the pumping regime can be adjusted accordingly to reduce potential impacts such as 'scour out'.	
Otter	International – due to being a qualifying feature of nearby designated sites (Lough Ree SAC and River Shannon Callows SAC).	Disturbance/displacement - there is potential for otter using habitat within and adjacent to the red line boundary to be disturbed by increased vibration, noise, and lighting associated with the construction/decommissioning works and operation and maintenance of the pumps.	No holts or couches were identified within 250m of the outfall location, or within 250m of the intake at Lough Funshinagh. As such, any disturbance will be limited to commuting/foraging otter. Disturbance impacts during construction and decommissioning will be temporary, lasting approximately one month. An ECoW will be employed during construction and decommissioning stages. A walkover of the turlough edge in proximity to works will be carried out each day during these stages to identify if otter are present. The ECoW will inform site personnel when works can commence without causing disturbance to otter.	No significant residual impacts identified.

KER	Importance	Impact	Mitigation	Residual impacts
			The ECoW will carry out weekly checks of the pumping area and turlough edge in proximity to identify if any evidence of otter. If any evidence of otter is identified this will be reviewed and any necessary further measures to mitigate effects identified and implemented. Remotely accessed trail camera (s) shall be installed in proximity to the pump intake compound to monitor for any otters present during operation. These shall be checked 2-3 times a week for otter presence. If any evidence of otter is identified this will be reviewed and any necessary further measures to mitigate effects identified and implemented. If obvious sudden avoidance by otter of the pump intake compound is occurring then the Project Ecologist will review behaviour, consider whether this is significant and discuss as necessary with relevant NPWS staff as to whether revised pumping hours may be required. This could include reduced pumping at specific times however it is considered likely that otter would become habituated to the pump and maintaining operation is likely to be the best course of action.	
Pine martin	Local – evidence that pine martin use the habitats surrounding the lough and Cross River, assumed in locally significant numbers.	Habitat loss – potential for minor habitat loss where sections of hedgerows are removed.	Loss of hedgerow habitat is not considered a likely significant impact, given the minor nature of areas being removed (5m), and given the habitat loss is entirely temporary, with native hedgerow being replanted during the decommissioning phase. As such, no additional mitigation is required.	No significant residual impacts identified.
		Disturbance/displacement – potential for minor disturbance impacts during construction, operation and decommissioning.	Disturbance impacts during construction and decommissioning will be temporary, lasting approximately one month. Given the relatively small areas to be subject to construction/decommissioning works, and large amount of suitable habitat within the wider landscape, disturbance during operation is not considered to be a likely significantly detrimental effect.	No significant residual impacts identified.

KER	Importance	Impact	Mitigation	Residual impacts
			During operation, noise modelling suggests impacts will only occur within 50m of the pumps. Given the abundance of within the wider landscape, any disturbance from within this 50m area should not have a significant negative impact, given disturbed pine martin could use alternative habitat in close proximity. Disturbance impacts at the outfall are considered to be very limited, limited to non-intrusive inspection by personnel.	
White clawed crayfish	Local – evidence that white clawed crayfish are present downstream of the outfall into the Cross River, assumed in locally significant numbers.	Habitat degradation – there is potential for the downstream habitat of white clawed crayfish to be degraded, should the Cross River be subject to an accidental pollution event or increased siltation due to erosion of the riverbanks at the outfall. White clawed crayfish are thought to be sensitive to water quality[49], and therefore any reduction in water quality within their habitat downstream within the Cross River could result in reduced survival of the population.	Standard measures to prevent water pollution during construction are outlined within the CEMP, including refuelling and chemical management mitigation measures, flood risk mitigation, and a management plan for foul waste generated during construction. A summary of such measures is provided within Section 7.1. A geotextile layer will cover the riverbed and extend up both sides of the riverbanks over a length of c.10m, centred on the outfall location. Rock armour will hold the geotextile in position to prevent erosion and dissipate energy from the pipeline. In addition, a diffuser tee will be fitted to the end of the PE ribbed pipe to dissipate energy and distribute the flow over a larger area of the riverbank. Within implementation of these measures, erosion of the riverbanks, which otherwise could result in reduced water quality and increased siltation downstream, will be avoided. Weekly water quality testing to be conducted at several locations, including: Pumping location at Lough Funshinagh, discharge point at entry to Cross River, confluence of Cross River and Brideswell, discharge point to the River Shannon.	No significant residual impacts identified.

[49] Haddaway, NR., Mortimer, RJG, Christmas, M. & Dunn, AM. (2015). Water chemistry and endangered white-clawed Crayfish: a literature review and field study of water chemistry association in *Austropotamobius pallipes*. Knowledge and Management of Aquatic Ecosystems. (2015). 416, 01.

7.3 Mitigation for European Designated Sites

7.3.1 Lough Funshinagh SAC

The Screening for Appropriate Assessment (AA) and Appropriate Assessment report (AA report) identified potential impacts on the SAC via water quality and area of vegetation communities. Mitigation measures to be implemented during construction, operation and decommissioning are detailed within the AA report, including the following:

- Installation of silt fencing, and inspection throughout operation
- Monitoring of downstream water quality
- Fuelling of machinery in accordance with OPW protocols
- Implementation of a spillage procedure
- Regular inspection of vehicles and plant, and provision of wheel washing facilities
- Storage of fuels, oils, and other chemicals as outlined within the CEMP; and
- Concrete bunding of the diesel generators.

Area of vegetation communities

- Mitigation to prevent impacts to water quality as outlined above; and
- Biosecurity measures will be included to cover workers, plant and equipment working in/or near Lough Funshinagh and the Cross River. The biosecurity measures will adhere to the check-clean-dry protocol.

7.3.2 River Shannon Callows SAC

The AA report identified potential for the proposed scheme to impact the distribution of otter, a qualifying interest feature of the SAC. The following mitigation measures were proposed to avoid impacts:

- An ECoW will be employed during construction and decommissioning stages. A walkover of the turlough edge in proximity to works will be carried out each day during these stages to identify if otter are present. The ECoW will inform site personnel when works can commence without causing disturbance to otter
- The ECoW will carry out weekly checks of the pumping area and turlough edge in proximity to identify if there is any evidence of otter. If any evidence of otter is identified this will be reviewed and any necessary further measures to mitigate effects identified and implemented; and
- Remotely accessed trail camera (s) shall be installed in proximity to the pump intake compound to monitor for any otters present during operation by the Project Ecologist. These shall be checked 2-3 times a week for otter presence. If any evidence of otter is identified this will be reviewed and any necessary further measures to mitigate effects identified and implemented.

7.3.3 Lower River Shannon SAC

The AA report identified potential for the proposed scheme to impact on the brook lamprey population of the SAC due to local and temporary change in distribution of spawning habitat in the locality of the outfall. To mitigate impacts, where juvenile lamprey are considered at risk, or located within the immediate discharge location where the riverbed and banks will be subject to protection measures, they will be translocated to suitable habitat upstream of the discharge. A suitable site with silt bed was identified c. 430m upstream of the discharge location during baseline surveys.

7.3.4 Lough Ree SAC

The AA report identified potential for the proposed scheme to impact the distribution of otter. These potential impacts will be mitigated as for River Shannon Callows SAC:

- An ECoW will be employed during construction and decommissioning stages. A walkover of the turlough edge in proximity to works will be carried out each day during these stages to identify if otter are present. The ECoW will inform site personnel when works can commence without causing disturbance to otter
- The ECoW will carry out weekly checks of the pumping area and turlough edge in proximity to identify if there is any evidence of otter. If any evidence of otter is identified this will be reviewed and any necessary further measures to mitigate effects identified and implemented; and
- Remotely accessed trail camera (s) shall be installed in proximity to the pump intake compound to monitor for any otters present during operation by the Project Ecologist. These shall be checked 2-3 times a week for otter presence. If any evidence of otter is identified this will be reviewed and any necessary further measures to mitigate effects identified and implemented.

7.4 Cumulative Impacts & Effects

Several planning applications, as outlined below in Table 15 were identified in proximity to the proposed scheme. The applications identified are largely for small scale residential developments, however applications were also identified for larger infrastructure projects, including a windfarm, substation, and power plant. Potential effects of these applications, and potential for cumulative impacts, in combination with the proposed scheme, are discussed below.

Table 15 Projects considered for cumulative effects.

Planning Application No.	Project Details	Distance from the proposed scheme	Potential for Cumulative Effects
22351	Permission for development consisting of: Demolition of sections of the existing dwelling located to the east and south of the dwelling, demolition of existing porch, removal of existing roof and demolition of existing shed; (ii) Construction of an extension to the east and south elevations of the existing dwelling, new rooflights, construction of a new porch, and construction of a new garage; (iii) Decommissioning of existing septic tank and soak away and installation of a new treatment system and percolation area and all associated site works (Application made for Permission for development consisting of: Demolition of sections of the existing dwelling located to the east and south of the dwelling, demolition of existing porch, removal of existing roof and demolition of existing shed; (ii) Construction of an extension to the east and south elevations of the existing dwelling, new roof with raised eaves and ridge level and new rooflights, construction of a new porch, and construction of a new garage; (iii) Decommissioning of existing septic tank and soak away and installation of a new treatment system and percolation area and all associated site works) at Ballycreggan, Kiltoom, Co. Roscommon. Conditional Permission Granted.	5km south	If construction of the development is undertaken at the same time as the proposed scheme, there is potential for cumulative effects in relation to water pollution of the Cross River. Any surface water run off/accidental pollution entering the Cross River from the construction site in combination with input of eutrophic water from the proposed scheme could result in a cumulatively lowered water quality. Potential for minor in-combination effect. Due to the minor scale of the development and implementation of the new treatment system, there are no anticipated impacts arising from water quality effects to the Cross River. The only identified pathway for an in-combination effect is through surface water runoff from the development to in-water flows through the cross river. A condition of the planning consent requires the applicant to ensure that all efficient disposal from the development is in compliance with EPA Code of Practice. No cumulative effect anticipated
22445	Permission to construct 1 No. dwelling, garage, entrance onto road, new wastewater treatment system and percolating area and all associated site works at Ballycreggan Kiltoom Roscommon Conditional Permission Granted.	6km south	Should construction of the property and associated infrastructure be carried out at the same time as construction/operation of the proposed scheme, there is potential for cumulative effects on water quality due to accidental pollution from the construction works in combination with reduced water quality within the Cross River as a result of eutrophic input. Potential for minor in-combination effect.
20370	For the construction of 8 no two storey detached houses including connections to existing public services and sewers, landscaping and all associated infrastructure works and services at Waterville Housing Estate, Monksland, Bealnamulla, Athlone. Conditional Permission Granted.	10km south	No environmental documentation submitted with the application. The location seems to be adjacent to an infilled or vegetated drain which runs into the Cross River. Unlikely that any wastewater/water pollution would flow within as wasn't identified in any of the planner's reports. No cumulative effect is anticipated.
2360195	Permission for development consisting of the demolition of 2 bungalows and 1 two-storey house and a proposed construction of 86 two and three-storey houses and apartments. The dwelling mix is as follows: 4 1-bedroom apartments, 16 2-bed apartments , 4 2-bed semi-detached houses, 34 3-bed semi-detached and terraced houses, 28 5-bed semi-detached and terraced houses, 1 creche building (361sqm) for 60 children,	11km south	The AA Screening identifies potential water quality impacts to the Cross River, and associated effects on the Shannon Callows SAC & SPA.

Planning Application No.	Project Details	Distance from the proposed scheme	Potential for Cumulative Effects
	pumping station with a new singular residential access road with associated estate roads and footpath, public open space (4319sqm) together with all associated existing and proposed site development/car parking/landscaping/ boundary detail works at Monkland Athlone Planning application under consideration.		The NIS identifies mitigation for any potential adverse effects upon water quality into the Cross River which may affect the downstream European sites. The only ecological receptor identified as requiring detailed assessment was breeding birds, with potential impact being restricted to breeding passerine birds. Vegetation clearance was proposed to take place outside of the nesting bird season, and with implementation of this, no residual impact is considered likely. No potential for cumulative effects anticipated.
21405	Permission for a ground floor extension to existing access corridor with extended roof canopy to set back north façade, alterations to existing west and south façade windows at ground level for additional access and escape doors, external escape stairs and ladder to the south façade, alteration to existing high level windows on the south facade to be replaced with air intake louvres, and provision of exhaust flues and enclosure to the existing roof, and all associated site works at Jazz Pharmaceuticals Ireland Manufacturing & Development, Monksland, Co. Roscommon, N37 AZ84. Planning Application Granted with Conditions	11km south	No impacts identified within any of the planners reports. No environmental reports provided or needed. No potential for cumulative effects anticipated.
317588	110kV single-bay air insulated substation (Cuilleen), 110kV underground grid connection and all associated works Electricity Development Application Greener Ideas Ltd applicant Permission granted with conditions.	11km south	AA & NIS submitted as part of application It is stated in the NIS (section 2.6) that the power plant drainage design includes silt control, interceptors, attenuation storage and hydrobrake. Stormwater will be generated at greenfield rates with outfall to Cross River located to the south of the power plant. No surface water drainage is required for the underground cable or cable bay in Athlone substation. Potential Impacts: Interaction of the construction phase of the project (UCG, Athlone substation) with existing drainage infrastructure and the potential for the development to impact on water quality in the River Shannon and for adverse effects on habitats and species of conservation interest. • Accidental interaction with the buried pipe/ remaining open sections of the unnamed watercourse that runs through/ alongside the substation site and which outfalls to the River Shannon, with the potential for the development to impact on water quality in the river and for adverse effects on habitats and species of conservation interest

Planning Application No.	Project Details	Distance from the proposed scheme	Potential for Cumulative Effects
			• Discharge of contaminated water from the construction site to the adjoining watercourse, Cross River with impacts on downstream qualifying interest features of European sites • Unmanaged disposal of wastewater from welfare facilities used during the construction phase of the development. Mitigation measures: Otter & wetland and water birds [A999]: Standard measures to prevent soil and water pollution (CEMP); appointment of ECoW to implement mitigation measures during construction; blocking of road drainage gullies within 50m of open trench construction; silt fences along eastern boundary of Cuilleen substation site (between works and open channel); demarcation of culverted/piped section of unnamed channel; access by machinery to avoid open stretches of unnamed watercourse adjacent to substation site; stockpiling >50m from channel; no excavation works during/following heavy rainfall; dewatering of excavations to be avoided or directed to settlement pond >50m from channel; no discharge to Cross River/open water channels/ ditches; construction to industry best practice guidelines; application of standard mitigation measures for construction related contaminants (refuelling, maintenance, storage, pouring of concrete etc.). Operation. Development to discharge foul and surface water to drainage system of permitted Peaker Power Plan. Design mitigation measures include silt traps and petrol interceptors within surface water drainage design for permitted power plant site and Cuillean substation. NB Additional mitigation measures required in respect of construction phase (a) appropriate disposal of waste from welfare facilities. With the application of mitigation measures from this project, no potential for cumulative effects anticipated.
22177 18256	Permission for development consisting of revisions and alterations of the permitted development of a gas fired power plant under Planning Register Reference PD/18/256. The revisions and alterations relate to the design of the gas fired power plant and will include a change to the electrical output of the power plant to 102MW with associated balance of plant, equipment and buildings including an Engine Hall building with a height of 16.9m, (comprising 5 no. gas engines and ancillary infrastructure) an Electrical Annex Building with a height of 18.7m; and sixteen associated buildings and facilities with varied dimensions to support the development's operations.	11km south	Environmental Impact Statement (EIS) identifies environmental impacts including water quality impacts to Cross River located 20m away from site boundary. Mitigation measures are included within the EIS. AA Screening Report: concluded no potential for significant effects as a result of the project on EU sites. The reports found that there would be no water quality impacts to the Cross River. Additionally significant effects to otter of Shannon Callows SAC.

Planning Application No.	Project Details	Distance from the proposed scheme	Potential for Cumulative Effects
	The development optimises the same access permitted under PD/18/256 and includes 12 no. parking spaces, footpaths, landscaping; fencing and all other associated site development plant and equipment and other works including surface water and foul wastewater drainage all on site 1.8 hectares in size (A NIS has been prepared for this development and is submitted as part of the planning application).		An NIS was NOT prepared as part of the planning application. As such potential for cumulative effects cannot be ruled out.
313750	Windfarm development and all associated works. Energia Renewables RoI Ltd.	7km northwest	An EcIA was carried out as part of the Environmental Impact Assessment Report (EIAR) for the project. The report identified the following potential effects on KERs, and proposed the outlined mitigation, considered of relevance to the proposed scheme: • Permanent loss of hedgerow and scrub – new hedgerow proposed to be planted to provide alternative habitat (no residual effect) • Short term reversible impact on watercourses, as an indirect effect of water pollution – a drainage management plan is provided, outlining how water quality will be protected. Additional mitigation is provided within a CEMP (no residual effect) • Short term reversible negative effect on turloughs due to water quality - drainage management plan is provided, outlining how water quality will be protected. Additional mitigation is provided within a CEMP and the hydrology and hydrogeology chapter of the EIAR to protect groundwater and surface water quality (no residual effect) • Minimal loss of suitable badger foraging habitat, habitat fragmentation, mortality, and disturbance – exclusion zone fencing, and appropriate signage will be put in place along the section of the access road occurring within the area of the identified badger sett. All works will be supervised by an appropriately qualified ecologist in advance of construction (no residual effect) • Short-term reversible impact on otter due to water pollution during construction – mitigation to avoid water quality impacts is outlined within the water chapter of the EIAR, as well as details on mitigation during construction being outlined within the CEMP (no residual effect). An AA report and NIS were submitted as part of the application, providing mitigation measures to prevent significant impacts on European designated sites. With implementation of the mitigation measures outlined within the EIAR report to prevent water quality impacts, no cumulative impacts are considered likely with the proposed scheme.

8. Conclusions & Summary

Arup was commissioned to evaluate the ecological receptors likely to be present at the site and to assess the potential impacts associated with the construction, operational, and decommissioning phases of the proposed scheme. The Ecological Impact Assessment, as detailed in this report, considers effects on protected sites, habitats, and species.

Potential impacts identified on the ecological receptors include degradation and disturbance to protected sites (Lough Funshinagh SAC), in addition to habitats of value for protected/notable species. There is also the potential for disturbance to protected/notable species (otter, fish (including brook lamprey), badger, breeding and wintering birds, pine martin, white clawed crayfish), degradation and fragmentation of their habitats, and harm/injury to protected species.

General embedded mitigation and best practice methods are recommended during site preparation and construction to safeguard protected sites, notable habitats and protected/notable species. Additional more specific mitigation is required for protected species and habitats.

With the agreed construction mitigation measures incorporated into the development, and post construction habitat management and monitoring plan, effects during the construction and operational phase are reduced to an insignificant level or removed completely.

This report is the result of survey work undertaken between 2023 and 2024. This report refers, within the limitations stated, to the condition of the Site at the time of the surveys. No warranty is given as to the possibility of future changes in the condition of the site or to the species present.

This report is produced solely for the benefit of RCC and no liability is accepted for any reliance placed on it by any other party. This report is prepared for the proposed use stated in the report and should not be used in any other context.

Appendix A

Statements of Competency

A.1 Statement of Competencies

The statements of competencies for the contributing authors to this EcIA report are provided below:

Fraser Maxwell (BSc, MSc, MCIEEM, CEnv) approved this report as a competent expert. Fraser is an Associate Director consultant at Arup, leading the Ecology team for Arup's North and North-West Yorkshire Region (Belfast, Glasgow, Edinburgh, Leeds, Manchester, York and Newcastle offices) with over 24 years' experience conducting EcIAs and over 20 years of undertaking EcIAs. He is an experienced leader of technical projects including high profile projects and has provided expertise internationally. Fraser is a member of the Scottish CIEEM Committee.

Donncha Madden has a BSc in Applied Ecology and a PGEDip in Restoration Ecology and is a Chartered Ecologist and Full Member of CIEEM. Donncha has over 20 years' experience in the environment and ecology sector and has prepared numerous EcIA reports for a variety of plans and projects in both Ireland and the UK.

Thom Reid holds a Master of Research (MRes) in Ecology and Environmental Biology. With seven years of experience as an ecologist, Thom has worked extensively in both the public and private sectors. His expertise includes preparing biodiversity chapters for Environmental Impact Assessment Reports (EIARs) and conducting Habitats Regulations Appraisals (HRAs) across a diverse range of projects in Scotland, including those in the renewable energy, civil engineering, and local authority sectors.

Eleanor Harrison has a MSci in Zoology and is a Qualifying Member of CIEEM. Eleanor has two years of experience working as an ecologist in the private sector and has prepared Ecological Impact Assessment Reports and HRAs across a number of projects in England and Wales.

Appendix B

Data Search Area

B.1 Data Search Area

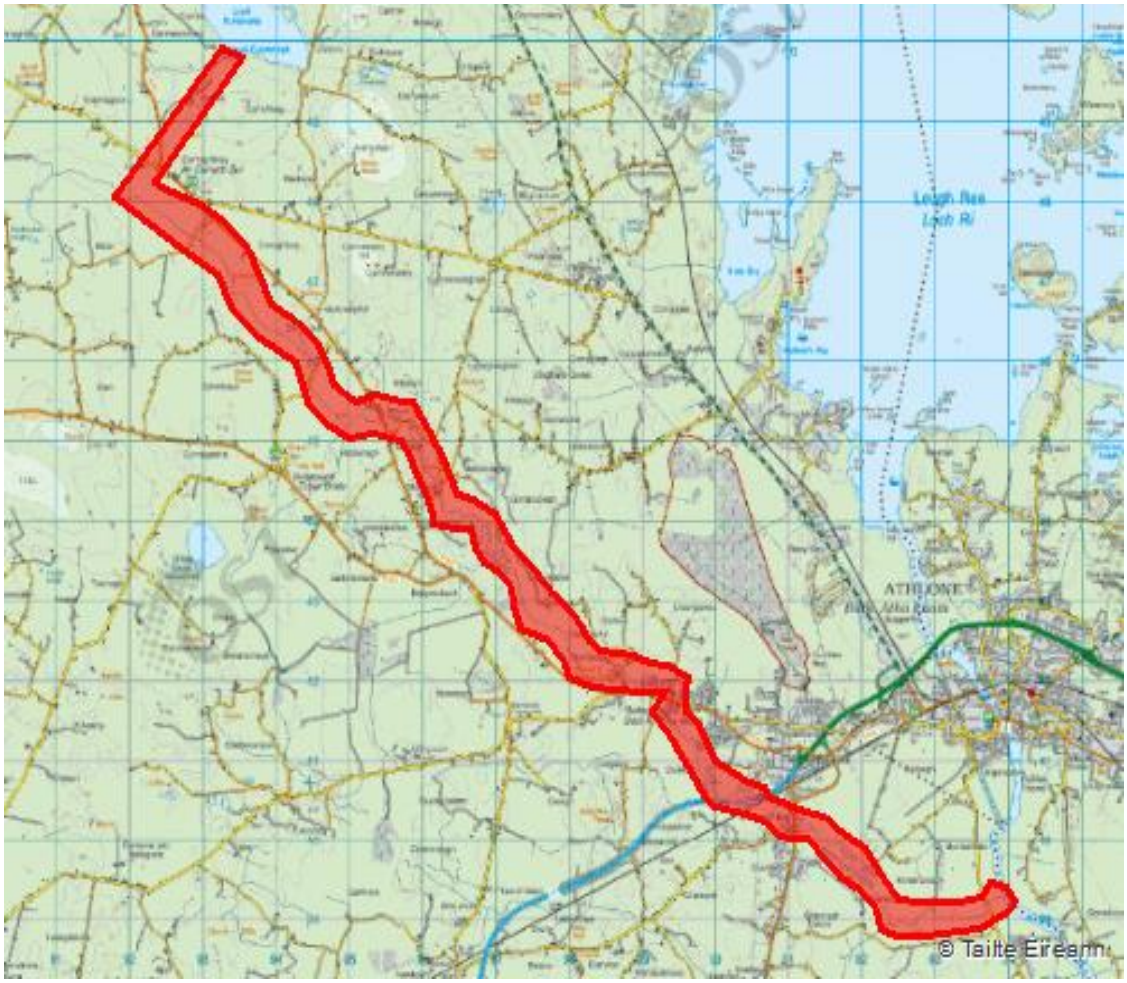


Figure 8-1 Polygon along the pipeline route, within which species records were returned | not to scale

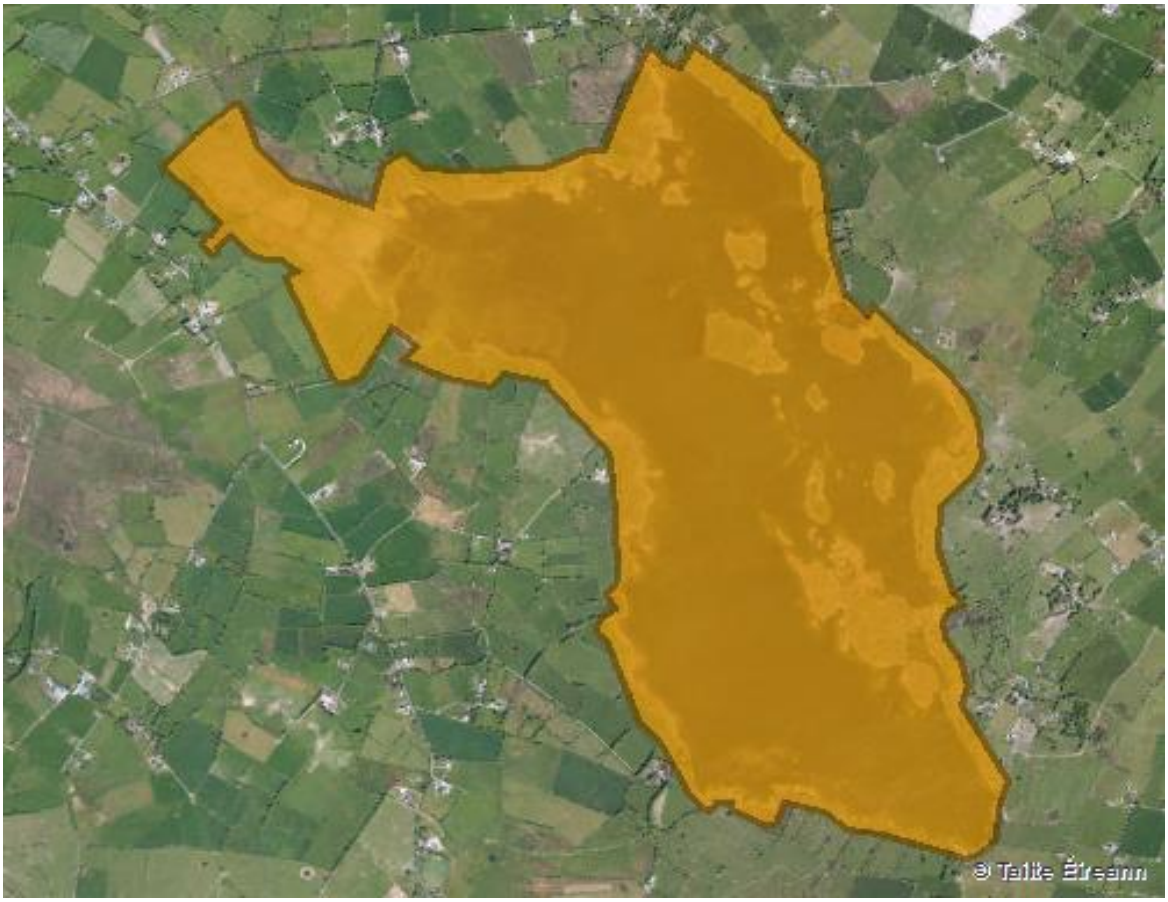


Figure 8-2 Polygon of Lough Funshinagh SAC, records from within which were returned | not to scale

Appendix C

Wintering Birds Survey of Lough Funshinagh

See Appendix D of this Report

Appendix D

Breeding Birds Survey of Lough Funshinagh

See Appendix E of this Report

Appendix E

Aquatic baseline report for the Lough Funshinagh Interim Flood Relief Scheme

See Appendix H of this Report

Appendix F

Addendum to aquatic baseline report for the Lough Funshinagh Interim Flood Relief Scheme

See Appendix K of this Report

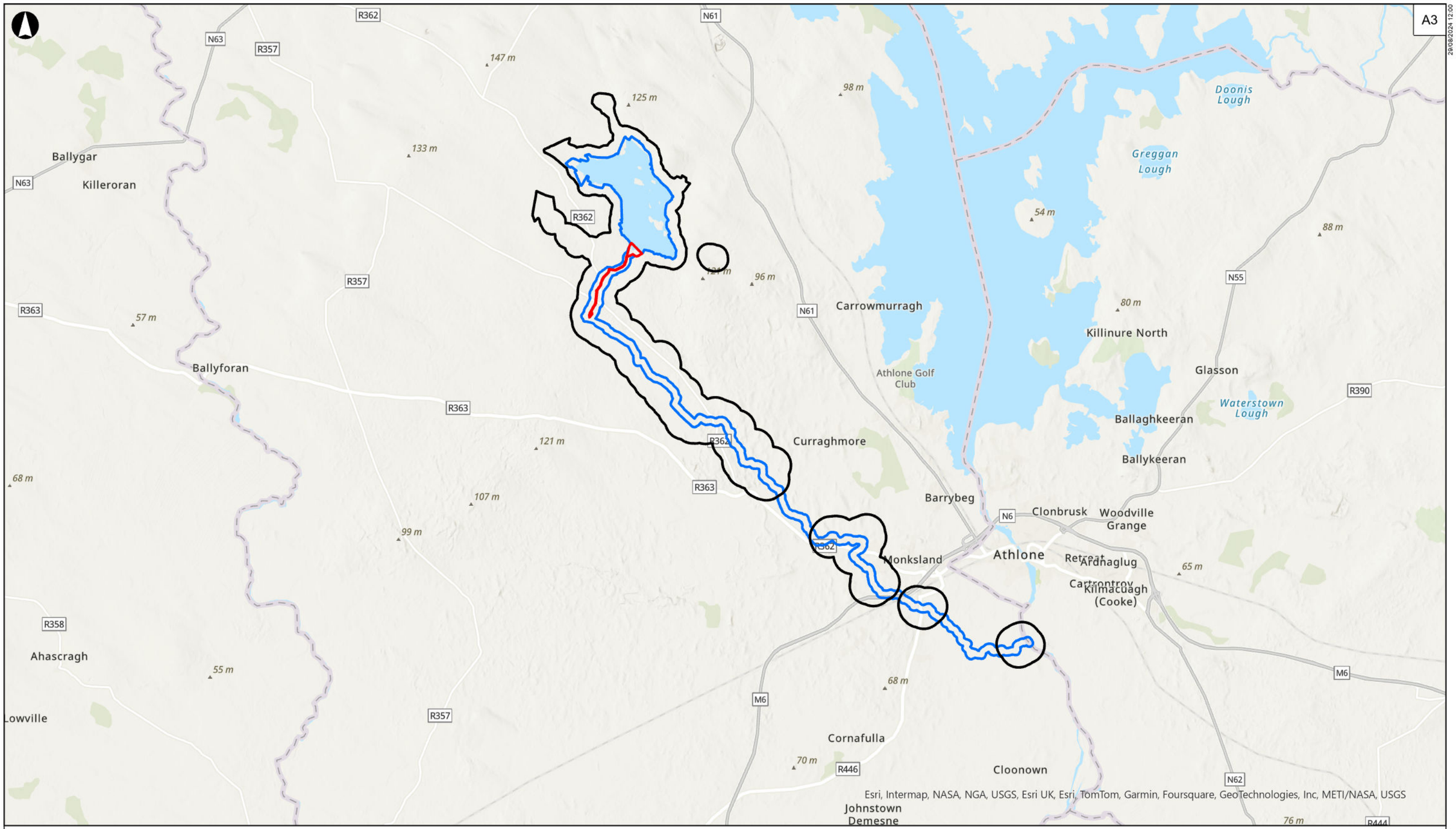
Appendix G

Lough Funshinagh to Cross River Baseline Survey

See Appendix F of this Report

Appendix H

Figures



Red Line Boundary
Study Area
Baseline Survey Area

0 1.5 3 6 Kilometers

Coordinate System:

Irish Tranverse Mercator

Rev	Date	By	Chkd	Appd	Authd
01	27/08/2024	EH	FM	COD	--

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Client

Roscommon County Council

Project Name

Lough Funshinagh Interim Flood Relief Scheme

Drawing Title

Red Line Boundary, Study Area, and Baseline Survey Area

Scale at A3
100,000

Role
Ecology

Suitability
Issue

Project Number
303666-00

Rev
01

Drawing Name
Figure 1

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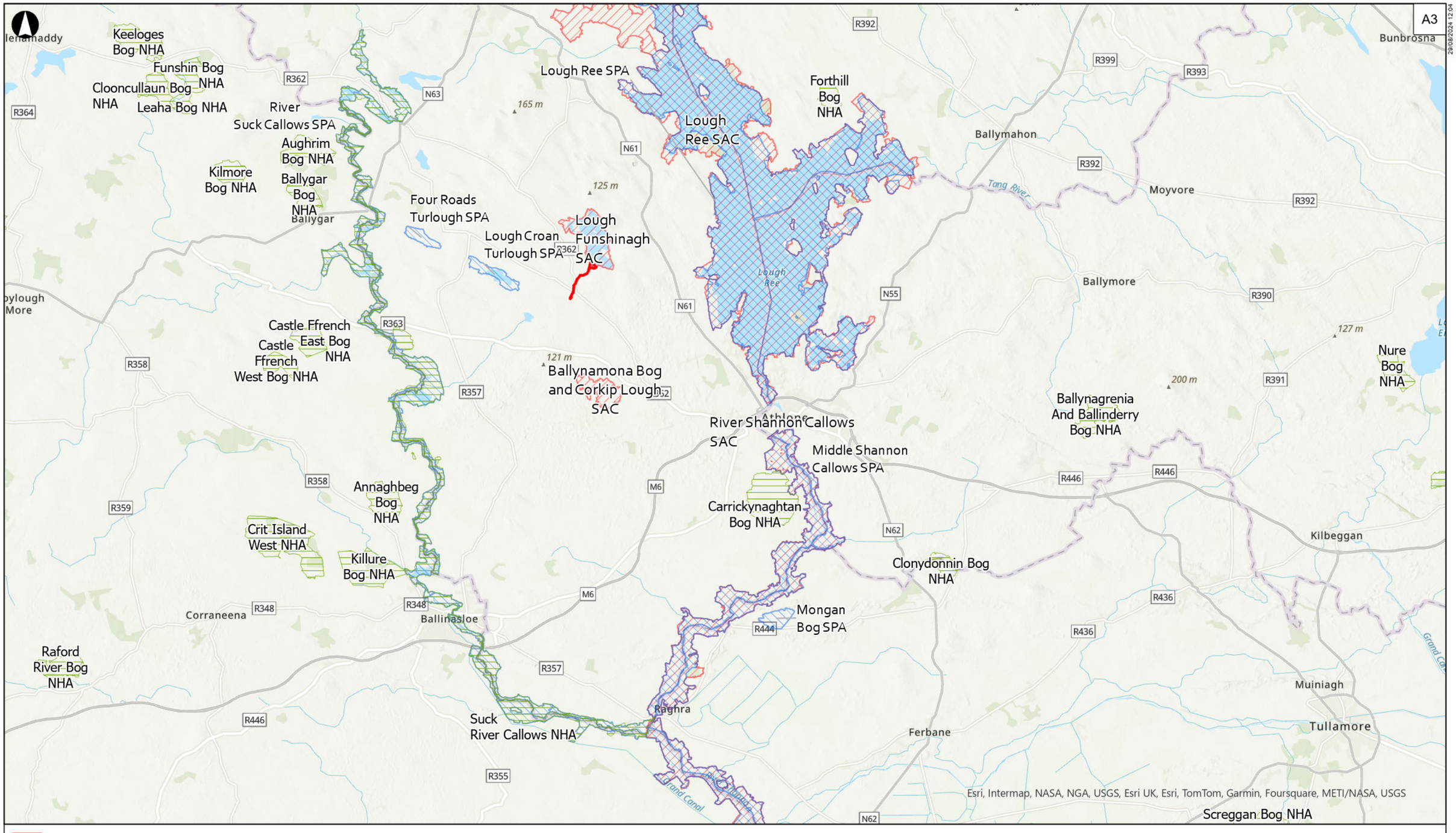

Red Line Boundary
Special Protection Areas (SPA)
Special Area of Conservation (SAC)
Natural Heritage Areas (NHA)

0 3 6 12 Kilometers

Coordinate System:
Irish Tranverse Mercator

Rev	Date	By	Chkd	Appd	Authd
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Project Name
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Drawing Title
European and National Designated Sites

Scale at A3
1:200,000
Role
Ecology
Suitability
Issue
Project Number
303666-00
Rev
01
Drawing Name
Figure 2

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A3

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N61

91 m

76 m

69 m

86 m

83 m

77 m

124 m

Lakes and Ponds

Lough Funshinagh

N61

R362

100 m

79 m

83 m

92 m

121 m

96 m

Esri UK, Esri, TomTom, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS, Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community

- Amenity Grassland
- Artificial Waterbodies
- Bare Soil and Disturbed Ground
- Bracken
- Broadleaved Forest and Woodland
- Buildings
- Cultivated Land
- Cutover Bog
- Hedgerows
- Improved Grassland
- Lakes and Ponds
- Other Artificial Surfaces
- Raised Bog
- Rivers and Streams
- Scrub
- Swamp
- Transitional Forest
- Treelines
- Ways
- Wet Grassland
- <all other values>
- Study Area

0 255 510 1,020 Meters

Coordinate System: IRENET95 Irish Transverse Mercator

Irish Tranverse Mercator

Rev	Date	By	Chkd	Appd	Authd
01	19/08/2024	EH	FM	COD	--

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Project Name

Lough Funshinagh Interim Flood Relief Scheme

Drawing Title

Land Cover Mapping within the Study Area - A

Scale at A3

1:21,000

Role

Ecology

Suitability

Issue

Project Number

303666-00

Rev

01

Drawing Name

Figure 3

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R362
R362
R363
N61
Curraghmore

- Amenity Grassland
- Artificial Waterbodies
- Bare Soil and Disturbed Ground
- Bracken
- Broadleaved Forest and Woodland
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- Transitional Forest
- Treelines
- Ways
- Wet Grassland
- <all other values>
- Study Area

0 255 510 1,020 Meters

Coordinate System: IRENET95 Irish Transverse Mercator

Irish Tranverse Mercator

Rev	Date	By	Chkd	Appd	Authd
01	19/08/2024	EH	FM	COD	--

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Project Name

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Drawing Title

Land Cover Mapping within the Study Area - B

Scale at A3

1:21,000

Role

Ecology

Suitability

Issue

Project Number

303666-00

Rev

01

Drawing Name

Figure 4

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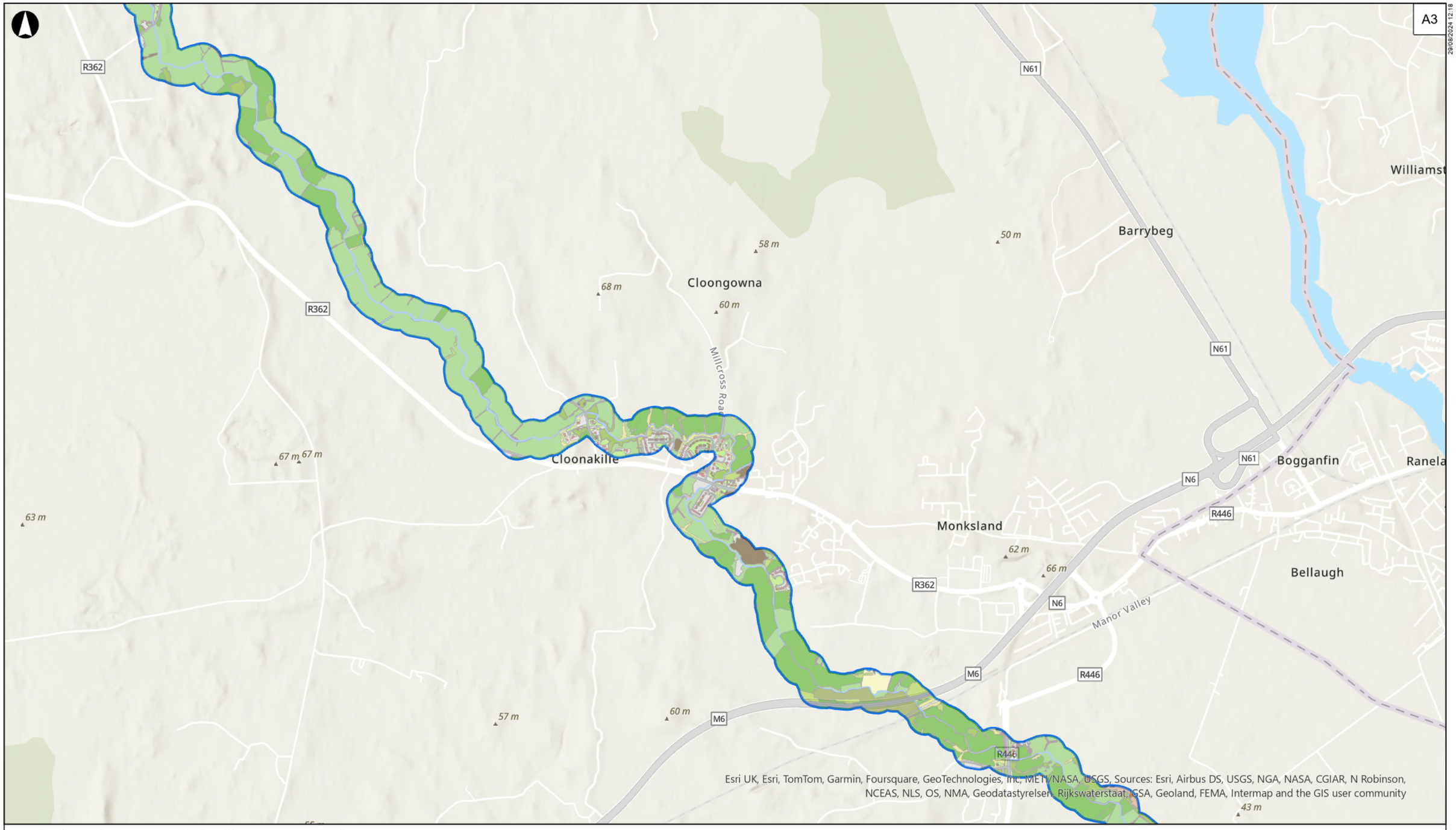

- Amenity Grassland
- Artificial Waterbodies
- Bare Soil and Disturbed Ground
- Bracken
- Broadleaved Forest and Woodland
- Buildings
- Cultivated Land
- Cutover Bog
- Hedgerows
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- Other Artificial Surfaces
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- Swamp
- Transitional Forest
- Treelines
- Ways
- Wet Grassland
- <all other values>
- Study Area

0 255 510 1,020 Meters

Coordinate System: IRENET95 Irish Transverse Mercator

Irish Tranverse Mercator

Rev	Date	By	Chkd	Appd	Authd
01	19/08/2024	EH	FM	COD	--

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Project Name

Lough Funshinagh Interim Flood Relief Scheme

Drawing Title

Land Cover Mapping within the Study Area - C

Scale at A3

1:21,000

Role

Ecology

Suitability

Issue

Project Number

303666-00

Rev

01

Drawing Name

Figure 5

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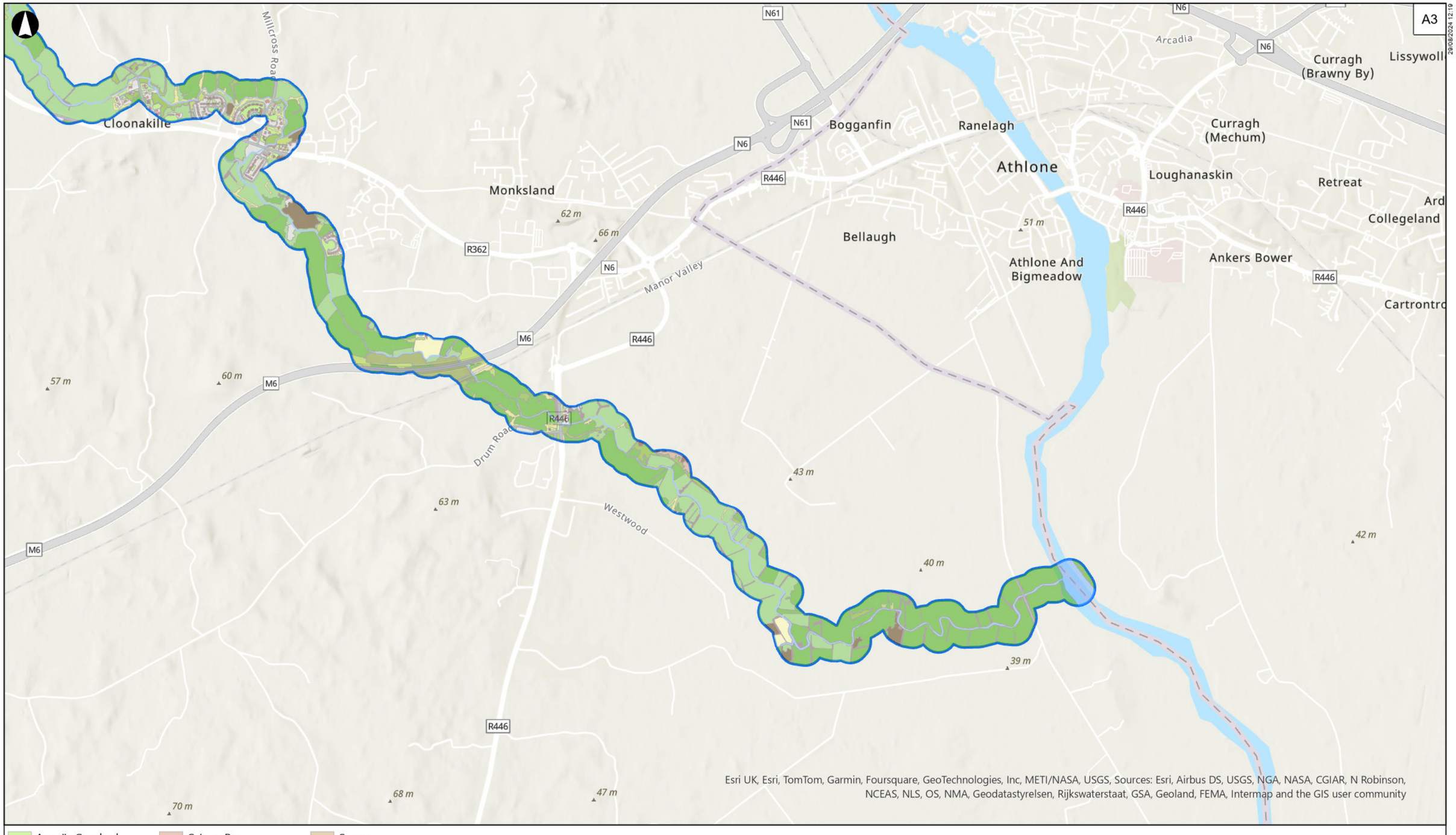

- Amenity Grassland
- Artificial Waterbodies
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- Scrub
- Swamp
- Transitional Forest
- Treelines
- Ways
- Wet Grassland
- <all other values>
- Study Area

0 255 510 1,020 Meters

Coordinate System: IRENET95 Irish Transverse Mercator

Irish Tranverse Mercator

Rev	Date	By	Chkd	Appd	Authd
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Client

Roscommon County Council

Project Name

Lough Funshinagh Interim Flood Relief Scheme

Drawing Title

Land Cover Mapping within the Study Area - D

Scale at A3

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Role

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Appendix H – Baseline Aquatic Survey Report

Aquatic baseline report for the Lough Funshinagh Interim Flood Relief Scheme

Triturus

Prepared by Triturus Environmental Ltd. for Ryan Hanley

August 2024

Please cite as:

Triturus (2024). Aquatic baseline report for the Lough Funshinagh Interim Flood Relief Scheme. Report prepared by Triturus Environmental Ltd. for Ryan Hanley. August 2024.

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1. Introduction

1.1 Background

Triturus Environmental Ltd. were commissioned by Ryan Hanley to conduct baseline aquatic surveys to inform EIAR/NIS preparation for the proposed Lough Funshinagh Interim Flood Relief Scheme.

The aim of the interim measures is to extract a sufficient volume of water from Lough Funshinagh so as to mitigate the predicted increase in level over the short to medium term and to limit the peak water level to a level that will allow the flood risk at the properties around the lough to be successfully managed. This interim scheme is proposed prior to the interim scheme of a permanent scheme to manage flood risk in the vicinity of the lough. To achieve this, the proposed interim scheme is to pump water from Lough Funshinagh to the Cross River (**Figure 2.1**).

In light of these proposals, this report provides a baseline assessment of the aquatic ecology including fisheries and water quality (biological and physiochemical), as well as other protected aquatic species and habitats in the footprint of the proposed interim scheme. Aquatic surveys were undertaken in August 2024.

2. Methodology

2.1 Aquatic site surveys

A total of 7 no. riverine sites on the Cross River (EPA code: 26C10) were selected for detailed aquatic assessment (**Table 2.1, Figure 2.1**). This included sites both upstream and downstream of the proposed pipeline outfall and served to provide a robust baseline of the river throughout its course.

Aquatic surveys of the Cross River were conducted on Saturday 10th August 2024. Survey effort focused on both instream and riparian habitats at each aquatic sampling location and included a fisheries assessment (electro-fishing and or fisheries habitat appraisal), white-clawed crayfish (*Austropotamobius pallipes*) survey, otter (*Lutra lutra*) survey, macrophyte/aquatic bryophyte survey, macro-invertebrates, biological water quality sampling (Q-sampling) and physiochemical water quality sampling (**Figure 2.1**). This holistic approach informed the overall aquatic ecological evaluation of each site in context of the proposed interim scheme and ensured that any habitats and species of high conservation value would be detected to best inform mitigation.

In addition to the ecological characteristics of the site, a broad aquatic and riparian habitat assessment was conducted utilising elements of the methodology given in the Environment Agency's 'River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003' (EA, 2003) and the Irish Heritage Council's 'A Guide to Habitats in Ireland' (Fossitt, 2000). This broad characterisation helped define the watercourses' conformity or departure from naturalness. All sites were assessed in terms of:

- Physical watercourse/waterbody characteristics (i.e. width, depth, channel form) including associated evidence of historical drainage
- Substrate type and relative condition, listing substrate fractions in order of dominance (i.e. bedrock, boulder, cobble, gravel, sand, silt etc.)
- Flow type by proportion of riffle, glide and pool in the sampling area
- An appraisal of the macrophyte and aquatic bryophyte community at each site
- Riparian vegetation composition and bordering land use practices

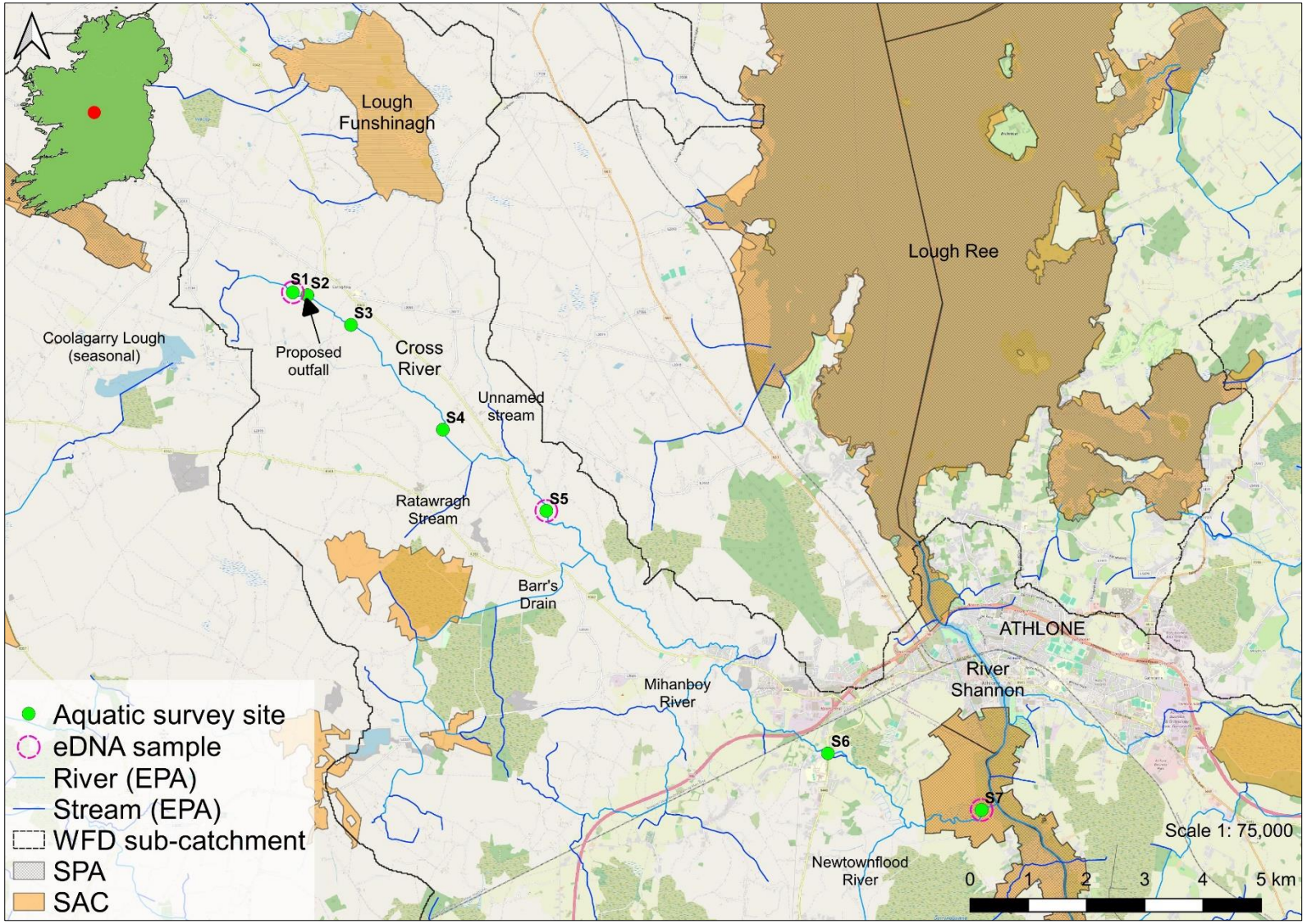

Figure 2.1 Overview of the aquatic survey sites on the Cross River, August 2024

Table 2.1 Location of *n*=7 aquatic survey sites on the Cross River, Co. Roscommon

Site no.	Watercourse	EPA code	Location	X (ITM)	Y (ITM)
S1	Cross River	26C10	250m upstream of proposed outfall	591827	748120
S2	Cross River	26C10	Proposed outfall	592078	748072
S3	Cross River	26C10	Curraghboy	592825	747561
S4	Cross River	26C10	Derryglad	594403	745763
S5	Cross River	26C10	Millnagh Mill	596180	744369
S6	Cross River	26C10	R446 road crossing	601017	740204
S7	Cross River	26C10	Kilnamanagh	603656	739232

2.2 Fisheries assessment (electro-fishing)

A single anode Smith-Root LR24 backpack (12V DC input; 300V, 100W DC output) was used to electro-fish sites on the Cross River in August 2024 following notification to Inland Fisheries Ireland and under the conditions of a Department of the Environment, Climate and Communications (DECC) section 14 authorisation. Electro-fishing was undertaken at all survey sites with the exception of S7 on the lower reaches where prohibitive depths prevented safe or effective electro-fishing backpack operation.

Both river and holding tank water temperature was monitored continually throughout the survey to ensure temperatures of 20°C were not exceeded, thus minimising stress to the captured fish due to low dissolved oxygen levels. A portable battery-powered aerator was also used to further reduce stress to any captured fish contained in the holding tank. Salmonids, European eel and other captured fish species were transferred to a holding container with oxygenated fresh river water following capture. To reduce fish stress levels, anaesthesia was not applied to captured fish. All fish were measured to the nearest millimetre and released in-situ following a suitable recovery period.

As different species groups were targeted during the survey (i.e., salmonids/eel, lamprey and coarse fish) the electro-fishing settings were tailored for each. By undertaking electro-fishing using the rapid electro-fishing technique (see methodology below), the broad characterisation of the fish community at each sampling reach could be determined as a longer representative length of channel was surveyed. Electro-fishing methodology followed accepted European standards (CEN, 2003) and adhered to best practice (e.g., CFB, 2008).

2.2.1 Salmonids and European eel

For salmonid species and European eel, as well as all other incidental species, electro-fishing was conducted in an upstream direction for a 10-minute CPUE, an increasingly common standard approach for wadable streams (Matson et al., 2018). A total of 50-75m channel length was surveyed at each site, where feasible, in order to gain a better representation of fish stock assemblages.

Relative conductivity of the water at each site was checked in-situ with a conductivity meter and the electro-fishing backpack was energised with the appropriate voltage and frequency to provide enough draw to attract salmonids and European eel to the anode without harm. For the high conductivity waters of the sites a voltage of 200-220v, frequency of 35Hz and pulse duration of 3.5-4ms was used

to draw fish to the anode without causing physical damage.

2.2.2 Lamprey

Electro-fishing for lamprey ammocoetes was conducted using targeted quadrat-based electro-fishing (as per Harvey & Cowx, 2003) in objectively suitable burial areas of soft sediment, where encountered. As lamprey take longer to emerge from sediment and require a more persistent approach, they were targeted at a lower frequency (30Hz) burst DC pulse setting which also allowed detection of European eel, if present. Settings for lamprey followed those recommended and used by Harvey & Cowx (2003), APEM (2004) and Niven & McAuley (2013). Using this approach, the anode was placed under the water's surface, approximately 10-15cm above the sediment, to prevent immobilising lamprey ammocoetes within the sediment. The anode was energised with 100V of pulsed DC for 15-20 seconds and then turned off for approximately five seconds to allow ammocoetes to emerge from their burrows. The anode was switched on and off in this way for approximately two minutes. Immobilised ammocoetes were collected by a second operator using a fine-mesh hand net as they emerged.

Lamprey species were identified to species level, where possible, with the assistance of a hand lens, through external pigmentation patterns and trunk myomere counts as described by Potter & Osborne (1975) and Gardiner (2003).

2.3 Fisheries habitat appraisal

A fisheries habitat appraisal of all survey sites was undertaken to establish the importance of the supporting habitats as nursery, spawning and or holding habitats for salmonids and lamprey species but also considered European eel and other fish species. The appraisals of salmonids and lamprey were cognisant of species-specific habitat requirements and preferences as outlined in O'Grady (2006), Hendry et al. (2003), Armstrong et al. (2003), Harvey & Cowx (2003), Maitland (2003) and Hendry & Cragg-Hine (1997). River habitat surveys and fisheries assessments were also carried out utilising elements of the approaches in the River Habitat Survey Methodology (Environment Agency, 2003) and Fishery Assessment Methodology (O'Grady, 2006) to broadly characterise the riverine sites (i.e., channel profiles, substrata etc.).

2.4 White-clawed crayfish survey

White-clawed crayfish (*Austropotamobius pallipes*) surveys were undertaken at the aquatic survey sites on the 10thAugust 2024 under a National Parks and Wildlife (NPWS) open national licence (no. C20/2024), as prescribed by Sections 9, 23 and 34 of the Wildlife Act (1976-2023), to capture and release crayfish to their site of capture. As per Inland Fisheries Ireland aquatic biosecurity recommendations, the crayfish sampling started at the uppermost site(s) of the catchment/sub-catchments in the survey area to minimise the risk of transfer invasive propagules (including crayfish plague) in an upstream direction.

Hand-searching of instream refugia and sweep netting was undertaken according to Reynolds et al. (2010). An appraisal of white-clawed crayfish habitat at each site was conducted based on physical habitat attributes (Gammell et al., 2021; Peay, 2003), water chemistry and incidental records in mustelid spraint. Additionally, a desktop review of crayfish records within the wider survey area was completed.

2.5 Environmental DNA analysis

To further validate site surveys and to detect potentially cryptically-low populations of protected and or rare aquatic species within the study area, composite water samples were collected from a total of 3 no. survey sites and analysed for white-clawed crayfish, lamprey (*Lampetra* spp.), freshwater pearl mussel (*Margaritifera margaritifera*) and Atlantic salmon (*Salmo salar*) environmental DNA (eDNA). Sampling was undertaken at sites S1, S4 and S7 (**Figure 2.1; Table 2.1**), with the sites strategically chosen to maximise longitudinal (instream) coverage within the catchment, thus facilitating a greater likelihood of species detection.

In accordance with laboratory guidance, a composite (500ml) water sample was collected from the sampling point, maximising the geographic spread at the site (20 x 25ml samples at each site), thus increasing the chance of detecting the target species' DNA. The composite sample was filtered and fixed on site using a sterile proprietary eDNA sampling kit. The sample was stored at room temperature and sent to the laboratory for analysis with 48 hours of collection. A total of *n*=12 qPCR replicates were analysed for the site. Given the high sensitivity of eDNA analysis, a single positive qPCR replicate is considered as proof of the species' presence (termed qPCR No Threshold, or qPCR NT). Whilst an eDNA approach is not currently quantitative, the detection of the target species' DNA indicates the presence of the species at and or upstream of the sampling point. Please refer to **Appendix A** for full eDNA laboratory analysis methodology.

2.6 Biological water quality (Q-sampling)

The 7 no. riverine survey sites were assessed for biological water quality through Q-sampling in August 2024 (**Table 2.1**). All samples were taken with a standard kick sampling hand net (250mm width, 500µm mesh size) from areas of riffle/glide utilising a 2-minute kick sample, as per Environmental Protection Authority (EPA) methodology (Feeley et al., 2020). Large cobble was also washed at each site for 1-minute (where present) to collect attached macro-invertebrates (as per Feeley et al., 2020). Samples were elutriated and fixed in 70% ethanol for subsequent laboratory identification to species level. Samples were converted to Q-ratings as per Toner et al. (2005) and assigned to WFD status classes (**Table 2.2**). Any rare invertebrate species were identified from the NPWS Red List publications for beetles (Foster et al., 2009), mayflies (Kelly-Quinn & Regan, 2012), stoneflies (Feeley et al., 2020) and other relevant taxa (i.e. Byrne et al., 2009; Nelson et al., 2011).

Table 2.2 Reference categories for EPA Q-ratings (Q1 to Q5) (Toner et al., 2005)

Q value	WFD status	Pollution status	Condition
Q5 or Q4-5	High status	Unpolluted	Satisfactory
Q4	Good status	Unpolluted	Satisfactory
Q3-4	Moderate status	Slightly polluted	Unsatisfactory
Q3 or Q2-3	Poor status	Moderately polluted	Unsatisfactory
Q2, Q1-2 or Q1	Bad status	Seriously polluted	Unsatisfactory

2.7 Physiochemical water quality

The 7 no. riverine survey sites were assessed for physiochemical water quality on the 10th August 2024. Samples were cooled and delivered to the laboratory for analysis on the day of collection. In order to collate a broad water quality baseline for the study area, a range of EPA approved[1] physiochemical parameters for each site were laboratory-tested, namely;

- Conductivity @25°C (µs/cm)[1]
- pH[1]
- Total Alkalinity (mg $CaCO_3$/l) [1]
- Total oxidised nitrogen (mg N/l) [1]
- Nitrate (mg N/l) [1]
- Nitrite (mg N/l)
- Unionised ammonia (mg N/l)
- MRP (mg P/l)
- BOD (mg O_2/l) [1]
- COD (mg O_2/l) [1]
- Suspended solids (mg/l) [1]
- Chloride (mg Cl/l) [1]
- Dissolved oxygen (mg O^2/l)[2]

2.8 Macrophytes and aquatic bryophytes

Surveys of the macrophyte and aquatic bryophyte community were conducted by instream wading at each of the survey sites, with specimens collected (by hand or via grapnel) for on-site identification. An assessment of the aquatic vegetation community helped to identify any rare macrophyte species listed under the Flora (Protection) Order, 2022 and or Irish Red list for vascular plants (Wyse-Jackson et al., 2016) or habitats corresponding to the Annex I habitats, e.g., 'Water courses of plain to montane levels, with submerged or floating vegetation of the *Ranunculion fluitantis* and *Callitricho-Batrachion* (low water level during summer) or aquatic mosses [3260]' (more commonly referred to as 'floating river vegetation').

2.9 Otter signs

The presence of otter (*Lutra lutra*) was determined through the recording of otter signs within 150m radius of each survey site. Notes on the age and location of signs (ITM coordinates) were made, in addition to the quantity and visible constituents of spraint (i.e. remains of fish, crustaceans, molluscs etc.).

2.10 Biosecurity

A strict biosecurity protocol following IFI (2010) and the Check-Clean-Dry approach was adhered to during surveys for all equipment and PPE used. Disinfection of all equipment and PPE before and after use with Virkon™ was conducted to prevent the transfer of pathogens or invasive propagules between

[1] EPA approved parameter
[2] Tested in the field using an OxyGuard Handy probe

survey sites. Surveys were undertaken at sites in a downstream order to minimise the risk of upstream propagule mobilisation. Furthermore, staff did not undertake any work in a known crayfish plague (*Aphanomyces astaci*) catchment for a period of <72hrs in advance of the survey. Any aquatic invasive species or pathogens recorded within or adjoining the survey areas were geo-referenced. All Triturus staff are certified in 'Good fieldwork practice: slowing the spread of invasive non-native species' by the University of Leeds.

3. Desktop review

3.1 Survey area description

The Cross River is a historically modified lowland limestone watercourse (FW2; Fossitt, 2000) that rises approximately 1km east of the seasonal Coolagarry Lough, Co. Roscommon. It flows in a south-westerly direction for approximately 21km until it joins the River Shannon, 2km south of Athlone. The river flows through a landscape dominated by agricultural pasture. The survey area is underlain by Visean limestone & calcareous shale (Geological Survey of Ireland data).

3.2 Fisheries

The Cross River is a renowned recreational brown trout (*Salmo trutta*) fishery although historical drainage works (as recent as 2001) have impacted the fisheries habitat (O'Reilly, 2009). In addition to brown trout, the river is known to support lamprey (*Lampetra* sp.), three-spined stickleback (*Gasterosteus aculeatus*), stone loach (*Barbatula barbatula*) and gudgeon (*Gobio gobio*) (Triturus 2021-2023 data) with perch (*Perca fluviatilis*), pike (*Esox lucius*), roach (*Rutilus rutilus*) and roach x bream hybrids (*R. rutilus* x *Abramis brama*) in its lower reaches near The River Shannon confluence (Kelly et al., 2017; 2010). Low numbers of juvenile Atlantic salmon (*Salmo salar*) were recorded by Triturus via electro-fishing at Millbrook Bridge (R363 road crossing) in September 2021.

3.3 Protected aquatic species

A comprehensive desktop review of available data from the National Parks and Wildlife Service (NPWS), National Biodiversity Data Centre (NBDC), Inland Fisheries Ireland (IFI), Botanical Society of Britain and Ireland (BSBI), National Crayfish Plague Surveillance Programme (NCPSP), Environmental Protection Agency (EPA) and Triturus databases for the 10km grid squares containing the project (i.e. M94, N03 & N04) identified records for a low number of rare and or protected aquatic species within the vicinity of the proposed project, although most did not overlap directly with the survey area.

Within the wider survey area, a low number of records for white-clawed crayfish (*Austropotamobius pallipes*) were available for Cross River and a tributary, the Mihanboy River (records spanned from 1984 to 2014; NPWS & EPA data). The species was also detected via eDNA sampling at Millbrook Bridge in August 2023 (Triturus survey data).

A low number of Annex II otter (*Lutra lutra*) records were available in the vicinity of the proposed interim scheme although most were historical only (i.e. 1980). Several more contemporary records for the Cross River were available in the 2005-2015 period (NPWS, NBDC & Triturus data).

4. Results of aquatic surveys

The following section summarises each of the 7 no. survey sites in terms of aquatic habitats, physical characteristics and overall value for fish, white-clawed crayfish, otter and macrophyte/aquatic bryophyte communities. Environmental DNA results are provided in **Table 4.1** and **Appendix A**. Biological water quality (Q-sample) results are summarised for each site with full results in **Appendix B**. Physiochemical results are provided in **Table 4.2.** A summary of the fish species recorded at each survey site is provided in **Table 4.3** and **4.4**. A summary of the aquatic species and habitats of high conservation concern recorded during the surveys is provided in **Table 4.4**. Habitat codes are according to Fossitt (2000). Scientific names are provided at first mention only. Sites were surveyed on the 10th August 2024.

4.1 Aquatic survey sites

4.1.1 Site S1 – Cross River, 250m upstream of proposed outfall

Site S1 was located on the upper reaches of the Cross River (EPA code: 26C10) approximately 250m upstream of the proposed pipeline outfall. The highly alkaline lowland river (FW2; Fossitt, 2000) had been extensively deepened and locally straightened, resulting in a trapezoidal channel with steep banks of 2-4m. Bank slumping as a result of livestock poaching was present along the south bank. The river was 2m wide and 0.05-0.15m deep with a profile dominated by riffle and shallow, slow-flowing glide with very occasional small pool. The substrata were dominated by mixed gravels and cobble. Boulder was rare. These were heavily bedded and calcified, with high rates of siltation. Boulder was rare. Soft sediment accumulations of sand and shallow silts were occasional along channel margins. Fool's watercress (*Helosciadium nodiflorum*) was frequent with occasional water mint (*Mentha aquatica*), water forget-me-not (*Myosotis scorpioides*) and common duckweed (*Lemna minor*). Aquatic bryophyte coverage was low with occasional *Leptodictyum riparium*[3] and rare *Rhynchostegium riparioides* mosses. Filamentous rhodophyta (*Batrachospermum* sp.) were rare on larger substrata. The steep banks were heavily scrubbed with locally abundant bramble (*Rubus fruticosus* agg.) and scattered elder (*Sambucus nigra*), hawthorn (*Crataegus monogyna*) and sycamore (*Acer psuedoplatanus*). Riparian shading was low overall (banks often open) with abundant herbaceous vegetation and rank grasses. The site was bordered by improved pasture (GA1) and calcareous/neutral grassland (GS1) with little to no riparian borders and hawthorn-dominated hedgerows along field boundaries.

Three-spined stickleback (*Gasterosteus aculeatus*) (*n*=3) was the only fish species recorded via electro-fishing at site S1 (**Figure 4.1**). Despite some physical suitability for salmonids, none were recorded and this likely reflected low summer flows in addition to siltation pressures and bed compaction/colmation. Abundant mixed gravels, although silted, provided some suitable spawning habitat for both salmonids and lamprey. The site was of moderate value as a nursery habitat only given poor summer flows and the low frequency of instream refugia. Small pool and bank scour areas offered some value as holding habitat for adult salmonids but overall the river was of low value in the upper reaches. The site was unsuitable as a lamprey nursery habitat with any soft sediment accumulations shallow/flocculent in nature. Despite some low suitability for white-clawed crayfish,

[3] Indicator of eutrophication (Weekes et al., 2021)

none were recorded via hand searching or environmental DNA sampling (**Table 4.1**). No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

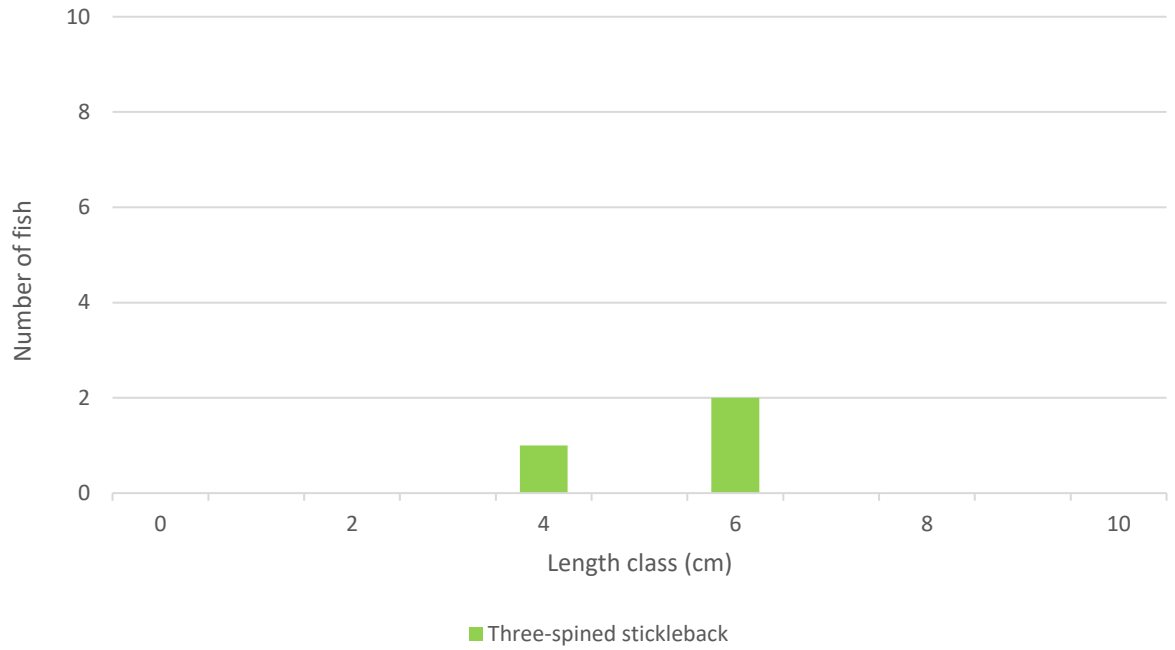

Figure 4.1 Length frequency distribution recorded via electro-fishing at site S1, August 2024

Plate 4.1 Representative image of site S1 on the Cross River upstream of the proposed outfall, August 2024

Plate 4.2 Representative image of site S1 on the Cross River upstream of the proposed outfall, August 2024

4.1.2 Site S2 – Cross River, proposed outfall

Site S2 was located on the upper reaches of the Cross River at the proposed pipeline outfall, approximately 250m downstream of site S1. As per upstream, the highly alkaline lowland river (FW2) had been extensively deepened and locally straightened resulting in a trapezoidal channel with steep banks of up to 4m. Although some instream recovery had occurred, hydromorphology was poor overall. The profile comprised shallow glide and occasional riffle with localised small pool only. The substrata were dominated by fine and medium gravels with frequent small cobble. Boulder was rare. Pool slacks, often associated with macrophyte beds and meanders, featured soft sediment accumulations of sand and shallow silts. Siltation was moderate to high locally. Fool's watercress was frequent with occasional water mint, water forget-me-not and common duckweed. Aquatic bryophyte coverage was low given the predominance of smaller substrata, with scattered *Leptodictyum riparium*, *Rhynchostegium riparioides* and rare *Chiloscyphus polyanthos*. *Pellia* sp. liverwort was present on muddy sections of steep banks. The narrow, steep sided channel encouraged encroachment of terrestrial herbaceous and scrub vegetation which provided shading to the otherwise open (historically cleared) banks. The site was bordered by improved pasture (GA1) with little to no riparian borders and hawthorn-dominated hedgerows along field boundaries.

Lamprey (*Lampetra* sp.) (*n*=20) and three-spined stickleback (*n*=3) were the only fish species recorded via electro-fishing at site S2 (**Figure 4.2**). Despite good physical suitability for salmonids, none were recorded and this likely reflected low summer flows in addition to siltation pressures. Abundant mixed gravels, although silted, provided good quality spawning habitat for both salmonids and lamprey. The site was of moderate value as a nursery habitat only given a paucity of oxygenated riffle areas, poor flows and low frequency of instream refugia. Small pool and bank scour areas offered some value as holding habitat for adult salmonids but overall the river was of low value in the upper reaches.

Lamprey nursery habitat was present but highly localised and supported low to medium densities of ammocoetes (up to 10 per m^2). Low summer flows reduced the value for lamprey. The nearest nursery areas were located on the meander immediately upstream of the pipe outfall (ITM 592064, 748086) and c.30m downstream (ITM 592107, 748057). Despite some suitability for white-clawed crayfish, none were recorded via hand searching or sweep netting. No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

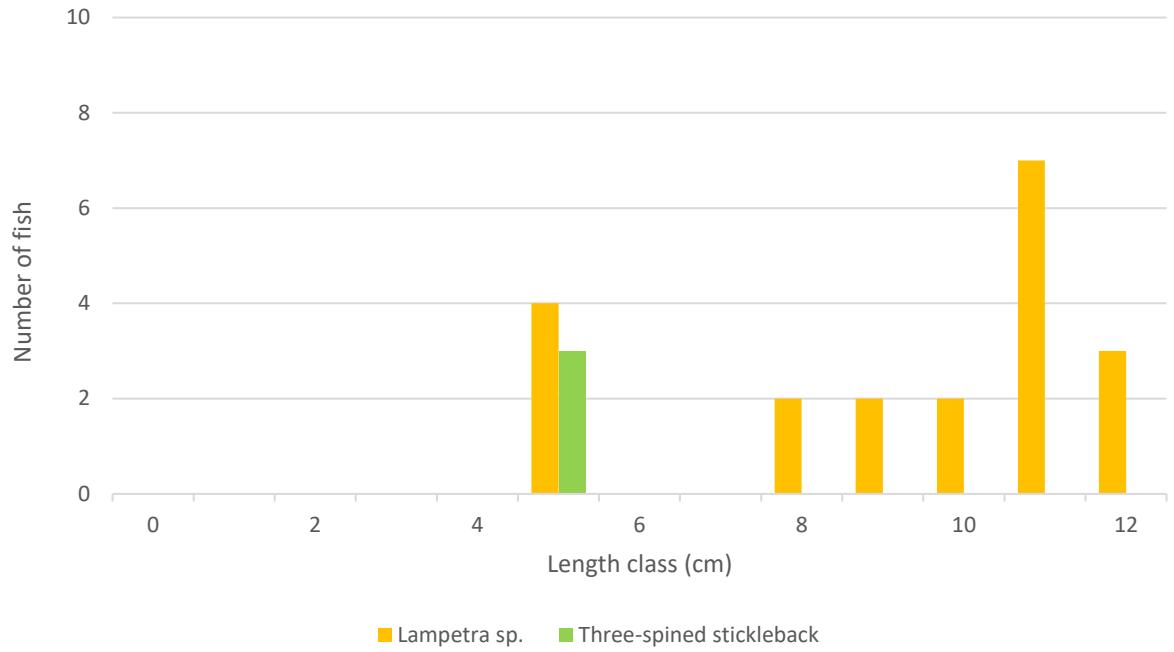

Figure 4.2 Length frequency distribution recorded via electro-fishing at site S2, August 2024

Plate 4.3 *Lampetra* sp. ammocoetes recorded at site S2, August 2024

Plate 4.4 Representative image of site S2 on the Cross River near the proposed pipeline outfall, August 2024

Plate 4.5 Image showing lamprey spawning habitat (gravels) adjoining sub-optimal soft sediment accumulations (nursery habitat) near the proposed pipeline outfall, August 2024

4.1.3 Site S3 – Cross River, Curraghboy

Site S3 was located on the upper reaches of the Cross River at a local road crossing, approximately 0.9km downstream of site S2. The highly alkaline river (FW1) had been historically deepened and locally straightened, with bank modifications and revetment in vicinity of the bridge (box culvert). The swift-flowing river was 2-2.5m wide and 0.1-0.3m deep with a good flow diversity despite modifications. The profile comprised a mix of riffle, glide and pool. The substrata were dominated by heavily calcified cobble and boulder with localised mixed gravels and sands. Siltation was moderate overall although soft sediment accumulations were rare and flocculent where present. Given bed compaction and riparian shading, macrophyte growth was sparse with occasional fool's watercress, common duckweed and water mint. Ivy-leaved duckweed (*Lemna trisulca*) was present but rare. The compacted bed supported locally abundant *Pellia endiviifolia* and localised *Leptodictyum riparium*. Filamentous rhodophyta (*Batrachospermum* sp.) were present on larger boulder. The riparian zones supported mature treelines of ash (*Fraxinus excelsior*), hawthorn and sycamore with bramble scrub which caused local tunnelling of the channel. The site was bordered by improved pasture (GA1) with narrow buffers.

Three-spined stickleback (*n*=3) was the only fish species recorded via electro-fishing at site S3 (**Figure 4.3**). As per upstream sites, despite good physical suitability for salmonids, none were recorded. Abundant mixed gravels, although silted, provided good quality spawning habitat for both salmonids and lamprey. The site was of good physical value as a salmonid nursery habitat with ample flow refugia and flow diversity and ample flow refugia. Small pool and bank scour areas offered some value as holding habitat for adult salmonids. The site was not of value as a lamprey nursery given the compacted bed and paucity of soft sediment. Despite some low suitability for white-clawed crayfish,

none were recorded via hand searching or sweep netting. No otter signs were recorded in vicinity of the site.

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

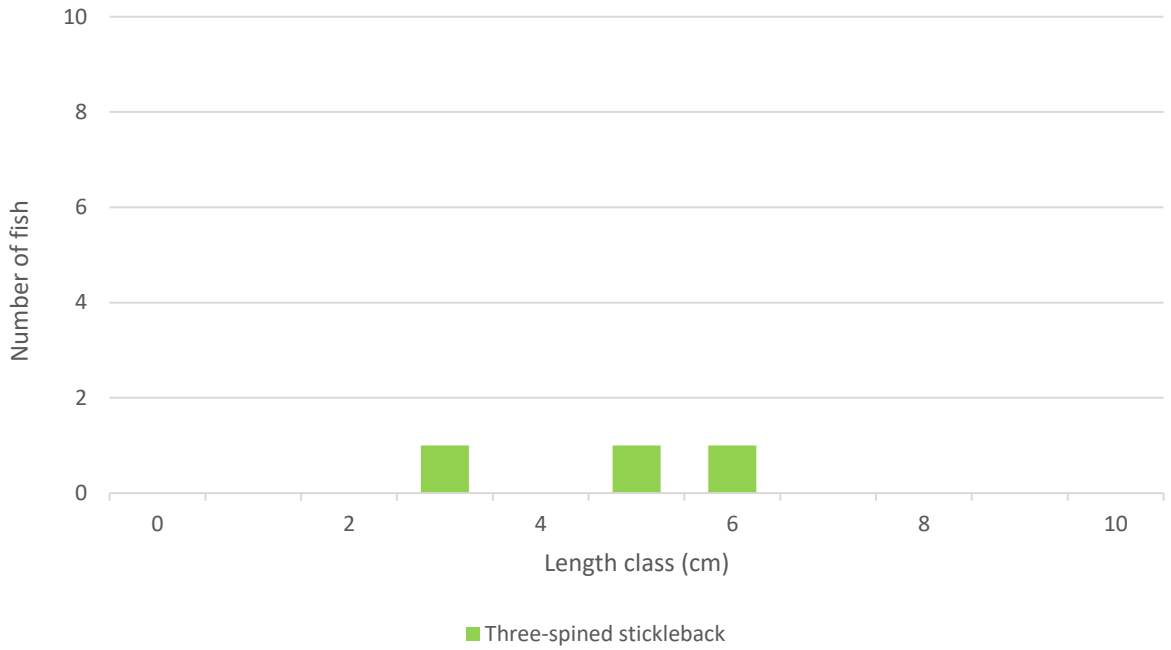

Figure 4.3 Length frequency distribution recorded via electro-fishing at site S3, August 2024

Plate 4.6 Representative image of site S3 on the Cross River, August 2024

Plate 4.7 Heavily calcified bed of the Cross River at site S3 with cover of *Pellia endiviifolia* liverwort

4.1.4 Site S4 – Cross River, Derryglad

Site S4 was located on the Cross River at a farm access track crossing adjacent to the L2023 local road. The highly alkaline lowland depositing river (FW2) had been extensively deepened historically and locally straightened along the road. This resulted in a homogenous trapezoidal channel with steep, historically cleared banks of up to 3m. The river was 2.5-3m wide and >0.5m deep with a profile comprising deep slow-flowing glide and pool (no riffle areas). The substrata were dominated by deep silt with a high clay fraction. Mixed superficial gravels were present locally (but heavily silted) with rare boulder. The slow-flowing site was heavily vegetated with abundant branched bur-reed (*Sparganium erectum*), common reed (*Phragmites australis*), ivy-leaved duckweed and fool's watercress. Water mint, common duckweed, water starwort (*Callitriche* sp.) and water forget-me-not were also present locally. Aquatic bryophyte s were limited to rare *Leptodictyum riparium* and *Pellia endiviifolia*. The steep banks offered low riparian shading and were dominated by rank grasses, common reed and hedge bindweed (*Calystegia riparium*) with scattered scrub only. The site was bordered by improved pasture (GA1) with little to no riparian buffers.

Three-spined stickleback (*n*=9) was the only fish species recorded via electro-fishing at site S4 (**Figure 4.4).** With the exception of low densities of this species, the site was of very poor fisheries value given significant siltation, eutrophication and hydromorphological pressures. There was an absence of spawning habitat for salmonids and lamprey. Despite the presence of abundant soft sediment accumulations, these were clay-dominated and largely unsuitable for ammocoete burial. Furthermore, poor flows also reduced the value for lamprey. Despite some good suitability for white-clawed crayfish (clay banks for burrowing, macrophyte refugia etc.), none were recorded via hand searching/sweep netting or eDNA sampling (**Table 4.1**). No otter signs were recorded in vicinity of the site (poor marking opportunities).

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)** (**Appendix B**). However, it should be noted that this was a tentative rating given poor flows and an absence of suitable riffle areas for sampling (Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

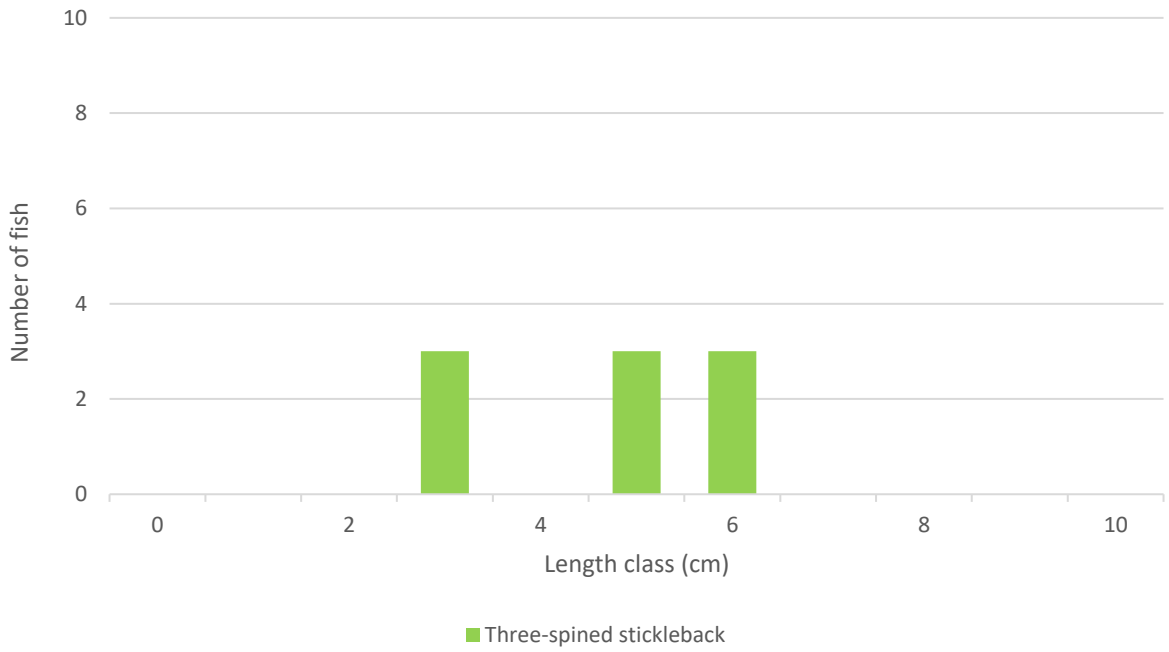

Figure 4.4 Length frequency distribution recorded via electro-fishing at site S4, August 2024

Plate 4.8 Adult three-spined stickleback recorded at site S4 on the Cross River, August 2024

Plate 4.9 Representative image of site S4 on the Cross River, August 2024

4.1.5 Site S5 – Cross River, Millnagh Mill

Site S5 was located on the Cross River at Millnagh Mill, approximately 2.8km downstream of site S4. The lowland alkaline river (FW2) featured significantly higher flows compared with upstream (given the confluence with other channels). The river had been deepened historically with some local straightening in vicinity of the former mill. However, good instream recovery had occurred with a good flow diversity and strong flows, and the river retained sinuosity upstream and downstream of the site. The river was 4-5m wide and 0.3-1.2m deep with a profile comprising deep, high energy glide and pool. Strong flows created frequent bank scours and scour pools. The substrata were dominated by heavily compacted/calcified cobble and abundant boulder. Mixed gravels were present interstitially with occasional sand/flocculent silt accumulations in pool slacks. Siltation was low overall given high flow rates. The site supported abundant beds of heterophyllus lesser water parsnip (*Berula erecta*) and fool's watercress with occasional branched bur-reed, water starwort (*Callitriche* sp.) and ivy-leaved duckweed. Water mint, common duckweed and water forget-me-not were also locally frequent. Cover of aquatic bryophytes was very high with abundant *Fontinalis antipyretica* in addition to frequent *Chiloscyphus polyanthos*, *Rhynchostegium riparioides*, *Leptodictyum riparium* and *Cinclidotus fontinaloides*. The historically cleared banks supported only scattered hawthorn and grey willow (*Salix cinerea*) with abundant herbaceous vegetation dominated by great willowherb (*Epilobium hirsutum*) and reed canary grass (*Phalaris arundinacea*). The site was bordered by improved pasture (GA1) with dry meadow borders (GS2).

Brown trout (*Salmo trutta*) (*n*=25) and three-spined stickleback (*n*=2) were the only fish species recorded via electro-fishing at site S5 (**Figure 4.5**). The site was of very high value for adult salmonids, with abundant deep glide and pool providing a diverse and high quality habitat. The very high energy glide was of relatively poor suitability as a salmonid nursery despite an abundance of instream, bryophyte-rich refugia. Such areas were also of high suitability for European eel although none were

recorded. The site was of poor value as a salmonid and lamprey spawning habitat given bed compaction/calcification and paucity of smaller substrata (due to high energies). High flows rates precluded the presence of lamprey nursery habitat (flocculent where present). Despite some good suitability for white-clawed crayfish, none were recorded. Two old otter spraint sites were recorded on the narrow bridge ledge (ITM 596177, 744372 & 596177, 744374) - neither contained crayfish remains.

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

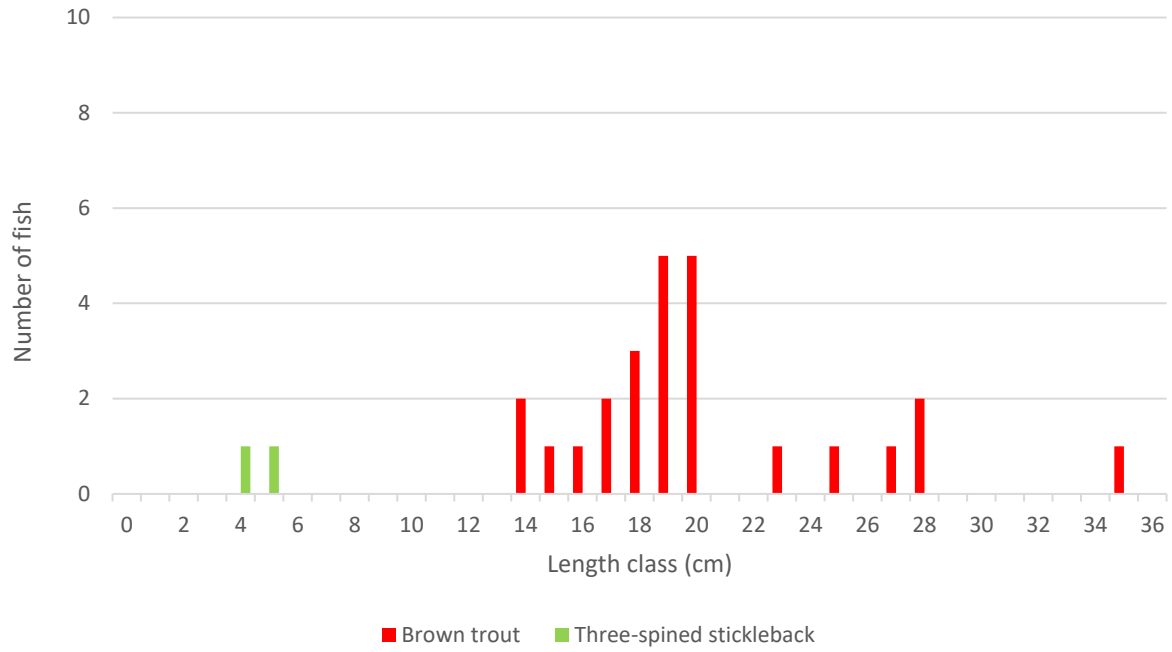

Figure 4.5 Length frequency distribution recorded via electro-fishing at site S5, August 2024

Plate 4.10 Adult brown trout recorded at site S5, August 2024

Plate 4.11 Representative image of site S5 on the Cross River, August 2024

Plate 4.12 Site S5 supported abundant bryophyte-rich cobble and boulder

4.1.6 Site S6 – Cross River, R446 road crossing

Site S6 was located on the lower reaches of the Cross River at the R446 road crossing (RN-446-001), approximately 8km downstream of site S5. The high energy lowland river (FW2) had been modified historically (deepened with bank revetment) but retained a good diversity of instream habitats. The river was 5-7m wide and 0.4-1.4m deep with a profile comprising fast-flowing glide and pool with localised riffle. The substrata were dominated by bedded cobble and boulder with localised coarser gravels and sand. In contrast to upstream sites, siltation was moderate with significant plumes underfoot despite high flow rates. Macrophyte cover was locally high with frequent unbranched bur-reed (*Sparganium emersum*) and water crowfoot (*Ranunculus* sp.) with occasional iris (*Iris psuedacorus*) and branched bur-reed along the littorals. Water mint, fine-leaved water dropwort (*Oenanthe aquatica*) and fool's watercress were also present. Aquatic bryophyte coverage was high with abundant *Fontinalis antipyretica*, *Leptodictyum riparium* and *Rhynchostegium riparioides*. The aquatic vegetation community was representative of the Annex I habitat Water courses of plain to montane levels, with submerged or floating vegetation of the *Ranunculion fluitantis* and *Callitricho-Batrachion* (low water level during summer) or aquatic mosses [3260]'. Filamentous algal and floc[4] cover was moderate, indicating enrichment (*Cladophora* & *Vaucheria* sp.). The typically open banks supported abundant reed canary grass and a nitrophilous community with scattered grey willow and ash. The site was bordered by residential areas (BL3) and semi-improved pasture (GA1).

Brown trout (*n*=36), gudgeon (*Gobio gobio*) (*n*=20) and non-native roach (*Rutilus rutilus*) (*n*=2) were recorded via electro-fishing at site S6 (**Figure 4.6**). The site was of high value for salmonids, with deep glide/pool, macrophyte beds and bank undercuts supporting relatively high densities of adult trout.

[4] floc is defined as an aggregation of (mostly dead) organic material, mainly from algae and diatoms, but also with potential origins from decaying macrophytes and associated decomposers (bacteria and fungi) (Moorkens & Killeen, 2020)

The site was a moderate quality nursery only given historical modifications in addition to significant siltation and eutrophication pressures - a low density of juveniles was present. Likewise, the quality of spawning habitat was compromised due to siltation, with bed compaction (colmation) further reducing spawning opportunities. Lamprey nursery habitat was sparse and sub-optimal where present given high flow rates, with no ammocoetes recorded via targeted electro-fishing. Despite good suitability for European eel and white-clawed crayfish, none were recorded. An old otter spraint site (1, 3) was recorded on the bridge ledge (ITM 601029, 740203).

Biological water quality, based on Q-sampling, was calculated as **Q3-4 (moderate status)** (**Appendix B**). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

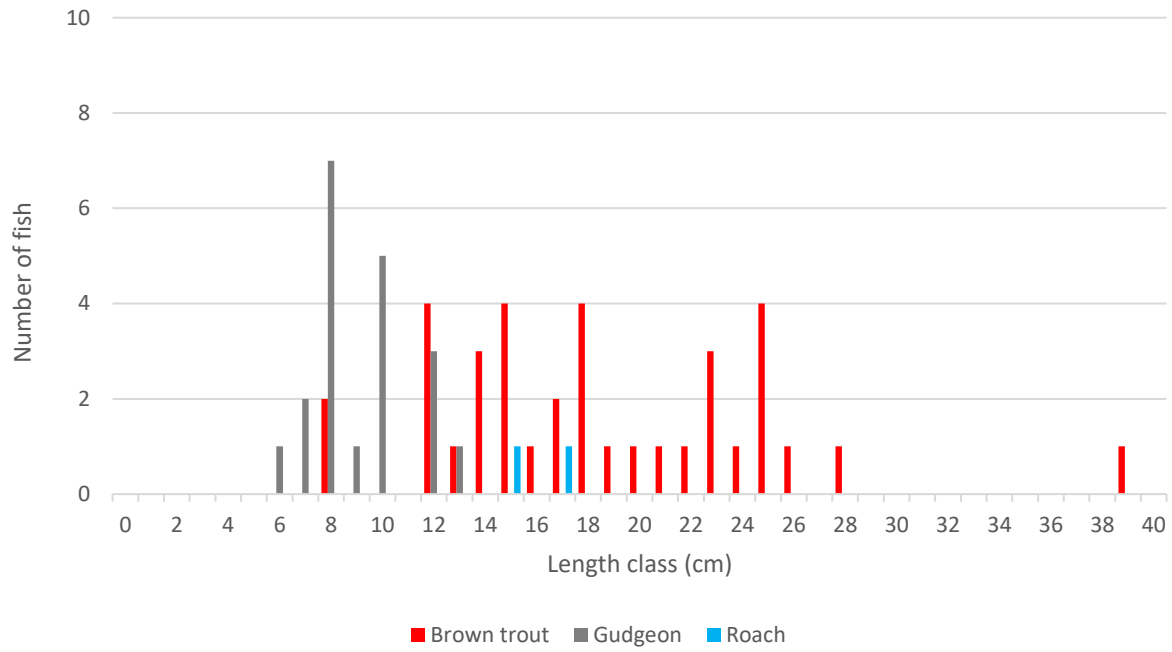

Figure 4.6 Length frequency distribution recorded via electro-fishing site S6, August 2024

Plate 4.13 Large adult brown trout recorded at site S6, August 2024

Plate 4.14 Gudgeon and juvenile brown trout recorded at site S6, August 2024

Plate 4.15 Representative image of site S6 on the lower reaches of the Cross River, August 2024

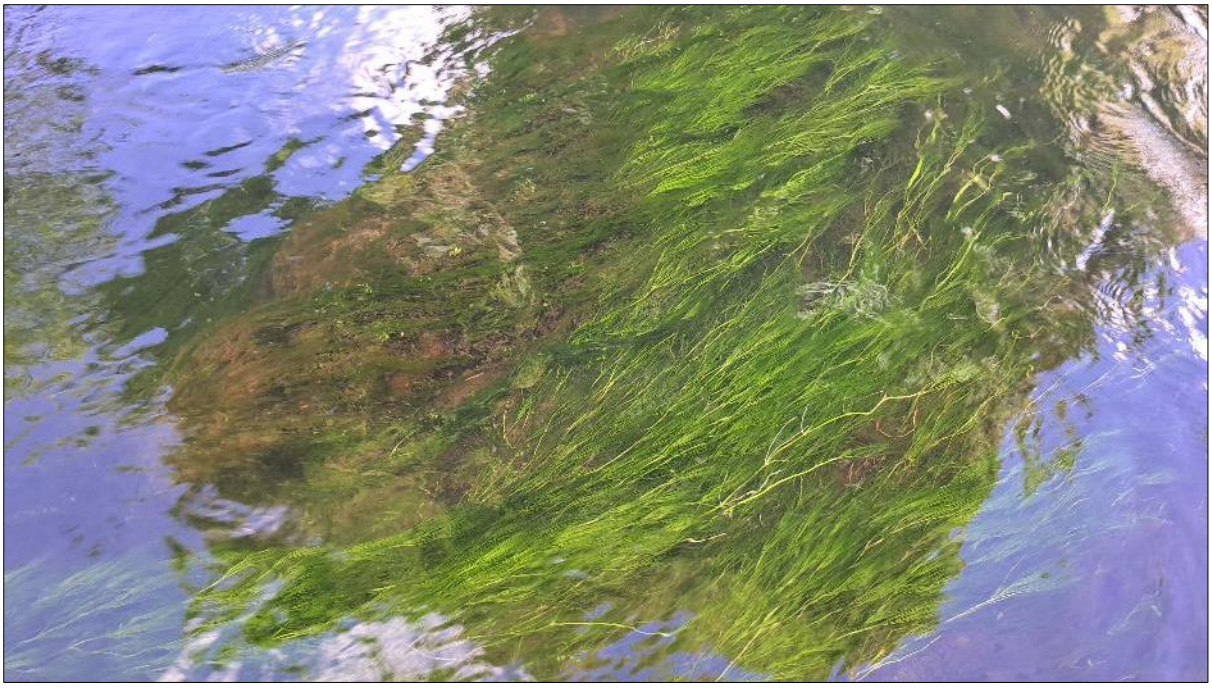

Plate 4.16 High cover of filamentous algae and floc on the bed and macrophytes at site S6 - indicative of significant eutrophication

4.1.7 Site S7 – Cross River, Kilnamanagh

Site S7 was located on the lowermost reaches of the Cross River at a local (Clonown) road crossing, approximately 250m upstream of the River Shannon confluence. The lowland river (FW2) had been deepened historically but not straightened with low-lying clay banks adjoined by extensive flood plains. The river was 8-10m wide and >1.5m deep with a profile of deep glide and pool (no riffle). The

water was turbid at the time of survey. The substrata were dominated by deep silt with scattered compacted/bedded boulder and cobble, mostly confined to the bridge apron. Hard substrata were calcified (with cyanobacterial crusts). Given the predominance of deep glide, macrophyte cover was low although unbranched bur-reed and broad-leaved pondweed (*Potamogeton natans*) was present locally. Littoral areas also supported scattered water mint and great yellow cress (*Rorippa amphibia*). The banks supported abundant reed canary grass with some purple loosestrife (*Lythrum salicaria*) and scattered grey willow. The site was bordered by wet grassland (GS4) and semi-improved (reclaimed) grassland (GA1).

Electro-fishing was not undertaken at site S7 given prohibitive depths. However, roach and pike (*Esox lucius*) were observed from the bridge during the survey. The site was primarily of value as a coarse fish habitat, with suitable nursery and spawning habitat for a range of species present. The heavily-silted site was not of value as a salmonid nursery or spawning habitat although deep glide and pool offered good quality holding habitat for migratory, adult salmonids. There was good suitability for European eel although downstream barriers on the River Shannon heavily restrict the species' presence in the middle and upper Shannon catchment. Although soft sediment accumulations were abundant, these were of poor suitability for lamprey ammocoetes given a high clay content. Steep clay banks were of high value for white-clawed crayfish with frequent burrows visible in vicinity of the bridge. The species was detected via eDNA sampling at this site (**Table 4.1**). No otter signs were recorded in vicinity of the site (few marking opportunities present).

Biological water quality, based on Q-sampling, was calculated as **Q3 (poor status)** (**Appendix B**). However, it should be noted that this was a tentative rating given an absence of suitable riffle areas for sampling (Toner et al., 2005). No macro-invertebrate species of conservation value greater than 'least concern', according to national red lists, were recorded via Q-sampling.

Plate 4.17 Representative image of site S7 on the lowermost reaches of the Cross River, August 2024

Plate 4.18 View from the road bridge showing heavily silted bed

Plate 4.19 Crayfish burrows were abundant in steep clay banks at site S7

4.2 White-clawed crayfish survey

Despite good physical and physiochemical suitability in the Cross River, no white-clawed crayfish were recorded via hand searching or sweep netting across 7 no. sites in August 2024. However, the species was detected via eDNA sampling at site S7 in the lower reaches (**Table 4.1**).

4.3 Environmental DNA analysis

Lamprey (*Lampetra* sp.) were detected at all three sampling locations on the Cross River (11, 12 & 12 positive replicates out of 12, respectively; **Table 4.1**, **Appendix A**). White-clawed crayfish were detected at site S7 (lower reaches) but not sites S1 (upper reaches) or S4 (middle reaches).

All samples were negative for Atlantic salmon and freshwater pearl mussel eDNA (0 of 12 qPCR replicates, respectively).

Table 4.1 eDNA results for the Cross River, August 2024 (positive qPCR replicates out of 12 in parentheses)

Site	White-clawed crayfish	Atlantic salmon	Lamprey (*Lampetra* spp.)	Freshwater pearl mussel
S1	Negative (0/12)	Negative (0/12)	**Positive (11/12)**	Negative (0/12)
S4	Negative (0/12)	Negative (0/12)	**Positive (12/12)**	Negative (0/12)
S7	**Positive (5/12)**	Negative (0/12)	**Positive (12/12)**	Negative (0/12)

4.4 Biological water quality (macro-invertebrates)

None of the 7 no. survey sites on the Cross River achieved greater than **Q3-4 (moderate status)** and thus all sites failed to meet the target good status (≥Q4) requirements of the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 and the Water Framework Directive (2000/60/EC) (**Figure 4.7**).

Sites S4, S5 and S6 achieved **Q3-4 (moderate status)** water quality. Despite the presence of the EPA group A (most pollution sensitive) mayflies *Ecdyonurus dispar*, *Heptagenia sulphurea* and or an unidentified Leptophlebiidae species, these were only recorded in low numbers (<5% of total sample) and thus did not meet the qualifying criteria for good status as set out by Toner et al. (2005).

The remaining sites S1, S2, S3 and S7 achieved **Q3 (poor status)** water quality based on an absence of group A species, low numbers or an absence of group B species and a dominance of group C species such as the mayflies *Baetis rhodani* and *Seratella ignita*, freshwater shrimp (*Gammarus duebeni*), riffle beetle (*Elmis aenea*) and blackfly larvae (Simuliidae) (**Appendix B**).

It should be noted that the Q-rating for sites S4 and S7 are tentative only given poor flows and Leptophlebiid the absence of suitable riffle areas for sampling (as per Toner et al., 2005).

4.5 Physiochemical water quality

The pH levels of the Cross River sample sites ranged from 7.64 to 8.04, reflecting the calcareous influences within the survey area (**Table 4.2**). Similarly, calcareous influences resulted in high alkalinity (≥237mg $CaCO_3$) and conductivity (≥479 µs/cm) at all sites.

Levels of total oxidised nitrogen (TON) were within normal parameter for a lowland river, ranging from 0.636 to 1.561 N/l. TON is comprised mainly of nitrate (N as NO_3) given that the concentration of nitrite is typically negligible (O'Boyle et al., 2019). The European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (S.I. 77 of 2019) sets no specific boundary conditions for nitrate. However, EPA assessment of high-quality water sources has set boundary conditions of ≤0.8mg/l NO_3-N (nitrate as nitrogen) for high quality waters and ≤1.8mg/l NO_3-N for good quality waters. Thus, all sampling sites on the Cross River fell within accepted parameters for good quality water based on TON levels.

All sampling sites met the good status targets for total ammonia (i.e. ≤0.040 mg N/l) as set out under the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (S.I. No. 77/2019). Levels of unionised ammonia were low across the sites (≤0.001).

All sampling sites showed low levels of Levels of Molybdate Reactive Phosphorus (MRP) (the amount of phosphorus bioavailable for plant uptake) (i.e. ≤0.011 mg P/l) and thus complied with the Surface Water Regulations (S.I. 77 of 2019) good status target for rivers of ≤0.035 mg P/l.

Biochemical oxygen demand (BOD) levels were low (≤1.1mg O_2/l) with all sites meeting the high status threshold of ≤1.3mg O_2/l as set out under the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (S.I. No. 77/2019).

Dissolved oxygen levels were within acceptable limited for salmonids (>6mg/l as per European Communities (Quality of Salmonid Waters) Regulations, 1988, S.I. No 293.1988).

Table 4.2 Physiochemical water quality results for the Cross River, August 2024

Parameter	S1	S2	S3	S4	S5	S6	S7
pH	7.71	7.64	7.85	7.50	7.62	7.92	8.04
Conductivity @25°C (µs/cm)	718	716	706	691	479	579	576
Total Alkalinity (mg $CaCO_3$/l)	377	374	370	350	237	257	258
Total Oxidised Nitrogen (mg N/l)	1.108	1.113	1.021	1.561	0.636	1.36	1.228
Nitrate (mg N/l) [1]	1.103	1.107	1.015	1.556	0.627	1.352	1.223
Nitrite (mg N/l)	0.005	0.006	0.006	0.005	0.009	0.008	0.005
Total ammonia (mg N/l)	0.030	0.031	0.028	0.019	0.039	0.014	0.027
Unionised ammonia (mg N/l)	0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.001
MRP (mg P/l)	0.009	0.008	0.011	0.011	0.008	0.011	0.010
BOD (mg O_2/l)	1.1	0.6	0.8	0.9	0.9	0.8	0.8
COD (mg O_2/l)	14.4	14.9	14.9	17.9	18.7	19.6	21.3
Suspended solids (mg/l)	1.3	1.3	1.0	7.2	1.0	2.0	2.0
Chloride (mg Cl/l)	13.3	13.4	13.2	15.8	12.9	29.2	28.0
Dissolved oxygen (mg O_2/l)	7.7	7.9	8.2	8.9	12.7	10.8	10.1

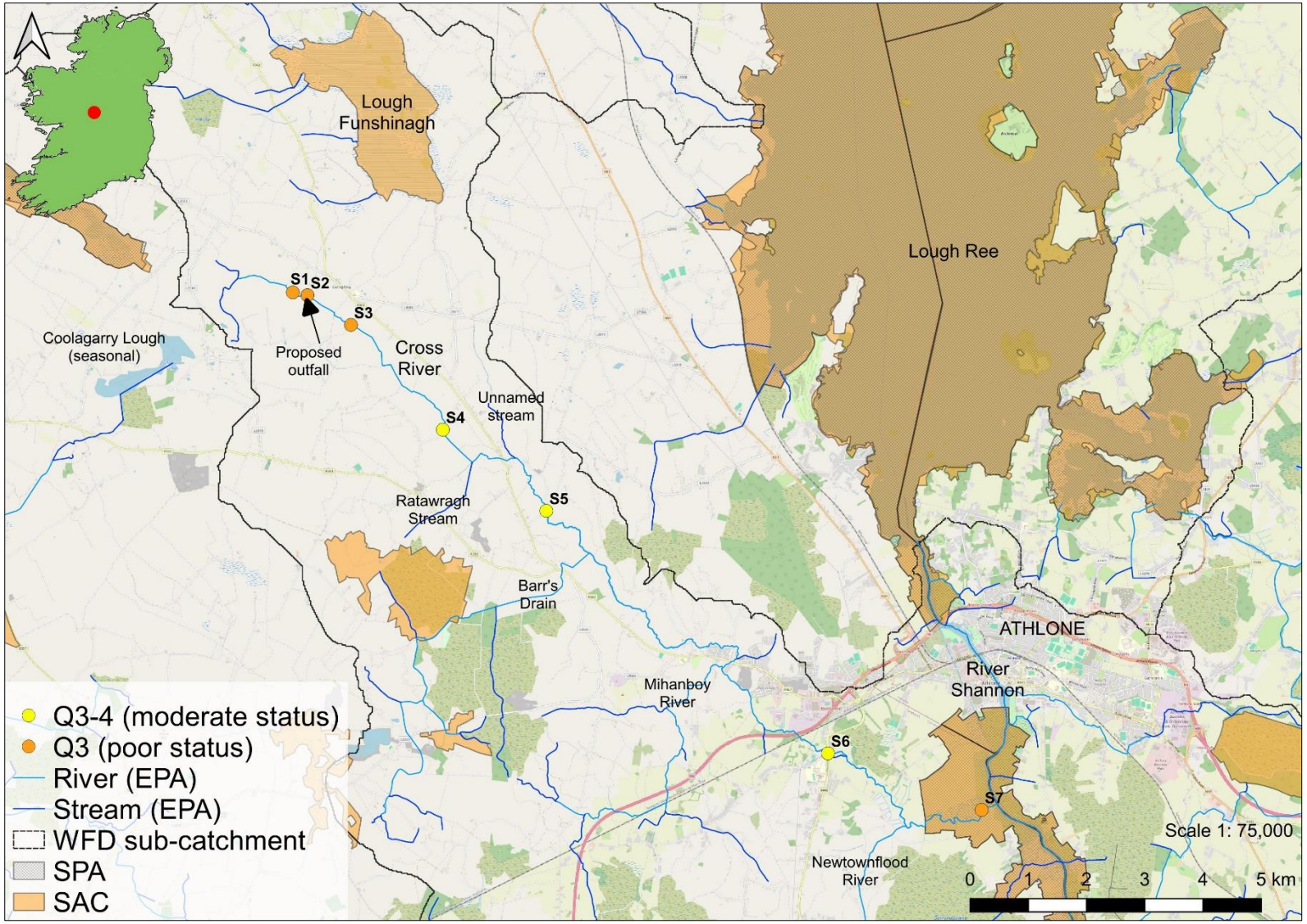

Figure 4.7 Overview of the biological water quality status in the vicinity of the proposed interim scheme, August 2024

Table 4.3 Fish species densities per m^2 recorded via electro-fishing on the Cross River, August 2024 (**bold** indicates highest density recorded per species)

Site	Watercourse	CPUE (elapsed time)	Approx. area fished (m^2)	Fish density per m^2				
				Brown trout	*Lampetra* sp.	Roach	Gudgeon	Three-spined stickleback
S1	Cross River	10	240	0.000	0.000	0.000	0.000	0.013 (*n*=3)
S2	Cross River	10	180	0.000	**10 per m^2 (*n*=20)**	0.000	0.000	0.017 (*n*=3)
S3	Cross River	10	200	0.000	0.000	0.000	0.000	0.015 (*n*=3)
S4	Cross River	5	150	0.000	0.000	0.000	0.000	**0.060 (*n*=9)**
S5	Cross River	10	300	0.083 (*n*=25)	0.000	0.000	0.000	0.007 (*n*=25)
S6	Cross River	10	270	**0.133 (*n*=36)**	0.000	**0.007 (*n*=2)**	**0.074 (*n*=20)**	0.004 (*n*=2)
S7	Cross River	n/a	n/a - too deep	n/a	n/a	n/a	n/a	n/a

Table 4.4 Relative abundance of fish species of higher conservation value recorded in the vicinity of the proposed interim scheme, August 2024

Site	Watercourse	Brown trout	*Lampetra* sp.	European eel	Other species
S1	Cross River	None recorded	None recorded	None recorded	Three-spined stickleback
S2	Cross River	None recorded	Medium		Three-spined stickleback
S3	Cross River	None recorded	None recorded	None recorded	Three-spined stickleback
S4	Cross River	None recorded	None recorded	None recorded	Three-spined stickleback
S5	Cross River	Medium	None recorded	None recorded	Three-spined stickleback
S6	Cross River	Medium	None recorded	None recorded	Roach, gudgeon
S7	Cross River	Fisheries appraisal only – ***Lampetra* sp. detected via eDNA**			

Table 4.5 Summary of aquatic species and habitats of higher conservation value recorded in the vicinity of the proposed interim scheme, August 2024

Site	Watercourse	White-clawed crayfish	Otter signs[2]	Annex I aquatic habitats	Rare or protected macrophytes/ aquatic bryophytes	Rare or protected macro-invertebrates	Other species/habitats of high conservation value
S1	Cross River	None recorded; negative eDNA sample	None recorded	None recorded	None recorded	None recorded	***Lampetra* sp. (via eDNA)**
S2	Cross River	None recorded	None recorded	None recorded	None recorded	None recorded	***Lampetra* sp. (via electro-fishing)**
S3	Cross River	None recorded	None recorded	None recorded	None recorded	None recorded	
S4	Cross River	None recorded; negative eDNA sample	None recorded	None recorded	None recorded	None recorded	***Lampetra* sp. (via eDNA)**
S5	Cross River	None recorded	**2 no. spraint sites**	None recorded	None recorded	None recorded	
S6	Cross River	None recorded	**1 no. spraint site**	**Floating river vegetation [3260]**	None recorded	None recorded	
S7	Cross River	**Detected via eDNA**	None recorded	None recorded	None recorded	None recorded	***Lampetra* sp. (via eDNA)**

Conservation value: White-clawed crayfish (*Austropotamobius pallipes*), brook lamprey (L*ampetra planeri*), river lamprey (*Lampetra fluviatilis*) and Eurasian otter (*Lutra lutra*) are listed under Annex II and Annex V of the Directive on the Conservation of Natural Habitats of Wild Fauna and Flora (92/43/EEC) ('EU Habitats Directive'). White-clawed crayfish and otter are protected under the Irish Wildlife Acts 1976-2023. White-clawed crayfish (Füreder et al., 2010) are listed as 'Endangered' according to the IUCN Red List.

[2] Otter signs within 150m of the survey site

5. Discussion

The Cross River is a semi-natural, calcareous lowland watercourse that flows through a landscape dominated by agricultural pasture. The upper reaches have been extensively modified (historically straightened and deepened), resulting in a channel with typically poor hydromorphology. Siltation and eutrophication pressures from adjoining agricultural land uses evidently impacted biological water quality (**Appendix B**), although the measured physiochemical parameters fell within acceptable limits (**Table 4.2**) . Relatively low summer flows and natural bed calcification further reduced the quality of aquatic habitats in the upper reaches. However, water flows and volumes increased significantly between survey sites S4 and S5 (i.e. downstream of the Ratawragh Stream and unnamed stream confluences; **Figure 2.1**). This, coupled with the retention of more natural characteristics in the middle and lower reaches (albeit still often deepened) resulted in better quality aquatic habitats which supported a number of high conservation value aquatic species. These included salmonids, lamprey (*Lampetra* sp.), otter and white-clawed crayfish. Site S6 supported an example of Annex I floating river vegetation [3260] habitat given the presence of several indicator species, including water crowfoot (*Ranunculus* sp.) (EC, 2013).

5.1 Fisheries

A low diversity of fish species was recorded during the electro-fishing survey, with brown trout, lamprey (*Lampetra* sp.), gudgeon, three-spined stickleback and non-native roach[5] captured (**Table 4.1, 4.2**). Despite physical suitability, including spawning and nursery habitat, the upper reaches of the Cross River (sites S1, S2, S3 & S4) did not support salmonids. This was in keeping with previous surveys of the river which only recorded stickleback in these areas (Triturus 2021-2023 data). The upper reaches are accessible to salmonids and so their absence is indicative of other factors such as low summer flows and influence of calcification (bed compaction) on spawning habitat. Dissolved oxygen levels were also relatively low (and significantly higher downstream) and this may have had a bearing on salmonid distribution.

Brown trout were present from site S5 downstream, where higher flow volumes and better quality instream habitats persisted. Sites S5 and S6 provided particularly good quality holding and foraging habitat for adult trout, which were present in good densities. Overall, salmonid spawning habitat in the alkaline river was typically of poor quality in light of historical modifications and natural bed compaction (calcification). Siltation was an evident pressure on spawning habitat in the lower reaches (e.g. site S6, S7).

Despite some good physical suitability in the middle to lower reaches, no Atlantic salmon were recorded via electro-fishing or eDNA sampling during the current survey. This reflects the significant downstream barriers on the River Shannon (hydroelectric dams) which heavily restricts the numbers of returning adults to the Upper Shannon catchment (TEGOS, 2023)[6]. However, salmon have been recorded from the Cross River in the recent past (at Millbrook Bridge, Triturus 2021-2023 data) and

[5] An invasive species in Ireland, listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011-2021 (S.I. 477/2011)

[6] Due to downstream migration barriers (such as hydroelectric dams and weirs), Atlantic salmon distribution is highly restricted in the upper Shannon catchment and the river is only achieving 5% of its conservation limit above Parteen weir in recent years (TEGOS, 2023).

occasional utilisation of the watercourse does occur. The aforementioned instream barriers also explain the absence of Red-listed and critically endangered European eel (Pike et al., 2020; King et al., 2011) in the current survey and paucity in the Upper Shannon.

Although lamprey (*Lampetra* sp.[7]) ammocoetes were only recorded via electro-fishing at site S2 (proposed outfall) (**Table 4.3, 4.4**), strong eDNA signatures of the species were detected throughout the Cross River (at sites S1, S4 and S7; **Table 4.1**). This would suggest lamprey are widely distributed throughout the watercourse. General observations were that while suitable lamprey spawning habitat (i.e. finer gravel) was present at most survey sites, areas of soft sediment with suitable characteristics for ammocoete burial were not. This was due to the predominance of higher energy conditions which discourage the settlement of deeper silt/sand deposits >5cm in depth required by larval lamprey (Aronsuu & Virkkala, 2014; Goodwin et al., 2008; Gardiner, 2003).

5.2 White-clawed crayfish

Despite good physical and physiochemical suitability (Demers et al., 2005) in the Cross River, no white-clawed crayfish were recorded via hand searching or sweep netting in August 2024. Furthermore, field inspection of otter spraint recorded at sites S5 and S6 did not reveal crayfish remains. However, the species was detected via eDNA sampling at site S7 in the lower reaches of the watercourse (**Table 4.1**) – a site where crayfish burrows were visibly abundant in clay banks. Records for white-clawed crayfish on the Cross River range from 1984 to 2014 (NPWS & EPA data) and were also detected via eDNA sampling at Millbrook Bridge[8] in August 2023 (Triturus survey data). Their absence from recent targeted surveys suggests a small, highly fragmented population, or even local extirpation from areas of the Cross River. This may be linked to the presence of the pathogenic crayfish plague (*Aphanomyces astaci*) in the Upper Shannon catchment, which includes a known outbreak on the River Al in nearby Athlone in 2018 (DCHG, 2018). The status of the Cross River crayfish population is uncertain and further survey effort is required for clarification on its distribution.

5.3 Otter

Otter signs (spraints) were recorded under road bridges at sites S5 and S6. In these middle to lower reaches of the river, superior foraging opportunities were available given the presence of salmonids and other fish species, the primary diet of otters (Krawczyk et al., 2016). In contrast , the modified upper reaches of the river, often only supporting stickleback, provided poor quality otter habitats and limited prey resources. It should be noted that the timing of surveys (August) was outside the optimal period for the detection of otter signs (the number of signs in summer is often low, despite otter presence; Triturus pers. obs.) and occasional utilisation of the Cross River's mid to upper reaches is likely. No breeding (holt) or couch (resting) areas were identified in the vicinity of the survey sites in August 2024.

[7] In light of impassable downstream barriers on the River Shannon, these would likely be potadromous brook lamprey (*Lampetra planeri*)

[8] located upstream of the Mihanboy River confluence, a Cross River tributary with records for the species

5.4 Biological and physiochemical water quality

No rare or protected macro-invertebrate species (according to national red lists) were recorded in the kick samples taken from 7 no. riverine sites in August 2024 (**Appendix B**).

All measured physiochemical parameters fell within acceptable limits and or good status thresholds (**Table 4.2**). However, in terms of biological water quality, all sampling sites failed to meet the target good status (≥Q4) requirements of the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 and the Water Framework Directive (2000/60/EC) (**Figure 4.1**). Low summer flows coupled with widespread hydromorphological modifications, siltation and enrichment pressures from adjoining agricultural lands and natural bed calcification (reducing available macroinvertebrate habitats) influenced the water quality of the Cross River in August 2024, most notably in the upper reaches. Eutrophication was more apparent at site S6, located within the peri-urban environs of Athlone. Examination of the most contemporary EPA data (2023) indicates the Cross River is achieving (Q4) good status at several monitoring sites although water quality is threatened by agriculture and hydromorphological modifications (EPA data).

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7. Appendix A – eDNA lab report

Triturus

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Contact:	Triturus Environmental Ltd
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eDNA Report

Technical Report

SureScreen Scientifics

Triturus

Folio No:	3336-2024
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Contact:	Triturus Environmental Ltd
Issue Date:	22.08.2024
Received Date:	20.08.2024

SureScreen Scientifics

eDNA Analysis

Summary

When aquatic organisms inhabit a waterbody such as a pond, lake or river they continuously release small amounts of their DNA into the environment. By collecting and analysing water samples, we can detect these small traces of environmental DNA (eDNA) to confirm the presence or absence of the target species within the waterbody.

Results

Lab ID	Site Name	OS Reference	Target Species	Sample Integrity Check	Result	Positive Replicates
FK2426	Cross River S1		Atlantic salmon	Pass	Negative	0
			Brook / River lamprey	Pass	Positive	11
			Freshwater pearl mussel	Pass	Negative	0
			White-clawed crayfish	Pass	Negative	0
FK2433	Cross River S4		Atlantic salmon	Pass	Negative	0
			Brook / River lamprey	Pass	Positive	12
			Freshwater pearl mussel	Pass	Negative	0
			White-clawed crayfish	Pass	Negative	0

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SureScreen Scientifics

FK2422	Cross River S7	Atlantic salmon	Pass	Negative	0
		Brook / River lamprey	Pass	Positive	12
		Freshwater pearl mussel	Pass	Negative	0
		White-clawed crayfish	Pass	Positive	5

Matters affecting result: none

Reported by:Chelsea Warner

Approved by: Lauryn Jewkes

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Folio No:	3336-2024
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Methodology

Samples have been analyzed for the presence of target species eDNA following readily available and scientifically published eDNA assays and protocols.

The analysis is conducted in two phases. The sample first goes through an extraction process where the filter is incubated in order to obtain any DNA within the sample. The extracted sample is then tested via real-time PCR (also called q-PCR) for each of the selected target species. This process uses species-specific molecular markers (known as primers) to amplify a select part of the DNA, allowing it to be detected and measured in 'real time' as the analytical process develops. qPCR combines amplification and detection of target DNA into a single step. With qPCR, fluorescent dyes specific to the target sequence are used to label targeted PCR products during thermal cycling. The accumulation of fluorescent signals during this reaction is measured for fast and objective data analysis. The primers used in this process are specific to a part of mitochondrial DNA only found in each individual species. Separate primers are used for each of the species, ensuring no DNA from any other species present in the water is amplified. If target species DNA is present, the DNA is amplified up to a detectable level, resulting in positive species detection. If target DNA is not present then amplification does not occur, and a negative result is recorded.

Analysis of eDNA requires scrupulous attention to detail to prevent the risk of false positive and false negative results. True positive controls, negative controls, and spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared. Stages of the analysis are also conducted in different buildings at our premises for added security. SureScreen Scientifics Ltd is ISO9001 accredited and participates in Natural England's proficiency testing scheme for GCN eDNA testing.

Interpretation of Results

Sample Integrity Check:

Laboratory Arrival:

When samples are received in the laboratory, they are inspected for any tube leakage, suitability of sample (not too much mud or weed etc.) and absence of any factors that could potentially lead to inconclusive results. Any samples which fail this test are rejected and eliminated before analysis.

Degradation and Inhibition check:

Analysis of the spiked DNA marker to see if there has been degradation or inhibition of the kit or sample, between the date it was made to the date of analysis. Degradation of the spiked DNA marker may indicate a risk of false negative results. If inhibition is detected, samples are purified and re-analyzed. Inhibitors cannot always be removed, if the inhibition check fails, the sample should be re-collected.

Result:

Presence of eDNA (Positive/Negative/Inconclusive)

Positive: DNA was identified within the sample, indicative of species presence within the sampling location at the time the sample was taken or within the recent past.

Positive Replicates: Number of positive qPCR replicates out of a series of 12. If one or more of these are found to be positive the pond is declared positive for species presence. It may be assumed that small fractions of positive analyses suggest low level presence, but this cannot currently be used for population studies. Even a score as low as 1/12 is declared positive. 0/12 indicates negative species presence.

Negative: eDNA was not detected or is below the threshold detection level and the test result should be considered as evidence of species absence, however, does not exclude the potential for species presence below the limit of detection.

Inconclusive: Controls indicate inhibition or degradation of the sample, resulting in the inability to provide conclusive evidence for species presence or absence.

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8. Appendix B – Biological water quality (Q-samples)

Table 8.1 Macro-invertebrate Q-sampling results for riverine sites, August 2024

Group	Family	Species	S1	S2	S3	S4	S5	S6	S7	EPA class
Ephemeroptera	Heptageniidae	*Ecdyonurus dispar*					1			**A**
Ephemeroptera	Heptageniidae	*Heptagenia sulphurea*					1	1		**A**
Ephemeroptera	Leptophlebiidae	sp. indet.				1				**A**
Ephemeroptera	Baetidae	*Alainites muticus*					8	14	4	**B**
Plecoptera	Leuctridae	*Leuctra hippopus*						4		**B**
Trichoptera	Cased caddis pupa	sp. indet.		1						**B**
Trichoptera	Glossosomatidae	*Agapetus fuscipes*	32	10	21	19	3	2		**B**
Trichoptera	Goeridae	*Silo pallipes*	3			2				**B**
Trichoptera	Hydroptilidae	*Hydroptila* sp.						1		**B**
Trichoptera	Limnephilidae	*Chaetopteryx villosa*	2	2			3			**B**
Trichoptera	Limnephilidae	*Halesus radiatus*				1				**B**
Trichoptera	Limnephilidae	*Limnephilus lunatus*					1			**B**
Trichoptera	Sericostomatidae	*Sericostoma personatum*	1		4					**B**
Odonata	Calopterygidae	*Calyopteryx splendens*					4			**B**
Ephemeroptera	Baetidae	*Baetis rhodani*	8	53	14	26	13	78	3	**C**
Ephemeroptera	Ephemerellidae	*Serratella ignita*	2	12	3	18	12	17		**C**
Trichoptera	Hydropsychidae	*Hydropsyche instabilis*						9		**C**
Trichoptera	Hydropsychidae	*Hydropsyche siltalai*						1		**C**
Trichoptera	Polycentropodidae	*Plectrocnemia conspersa*				1				**C**
Trichoptera	Polycentropodidae	*Polycentropus kingi*							1	**C**
Crustacea	Gammaridae	*Gammarus duebeni*	52	58	88	47	113	123	36	**C**
Gastropoda	Tateidae	*Potamopyrgus antipodarum*			7	1		6	15	**C**
Coleoptera	Elmidae	*Elmis aenea*	48	104	86	42	5	8		**C**
Coleoptera	Halipliidae	*Brychius elevatus*		2			3	2		**C**
Coleoptera	Hydraenidae	*Hydraena gracilis*							1	**C**

Group	Family	Species	S1	S2	S3	S4	S5	S6	S7	EPA class
Diptera	Chironomidae	Non-*Chironomus* spp.	1	3	1	1		3	1	**C**
Diptera	Pediciidae	*Dicranota* sp.	7	6	2					**C**
Diptera	Simuliidae	sp. indet.	87	67	4	69	5	109	2	**C**
Arachnida	Hydrachnidiae	sp. indet.						2		**C**
Crustacea	Asellidae	*Asellus aquaticus*			2		3		45	**D**
Hirudinidae	Glossiphoniidae	*Glossiphonia complanata*			1				1	**D**
Megaloptera	Sialidae	*Sialis lutaria*				1				**D**
Diptera	Chironomidae	*Chironomus* spp.				2		1	5	**E**
Annelidae	Oligochaeta	sp. indet.	1			1			4	**n/a**
Abundance			**244**	**318**	**233**	**232**	**175**	**381**	**118**	
Q-rating			Q3	Q3	Q3	Q3-4	Q3-4	Q3-4	Q3	
WFD status			Poor	Poor	Poor	Mod.	Mod.	Mod.	Poor	

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Appendix I – Construction Environmental Management Plan

ARUP

Roscommon County Council

Lough Funshinagh Interim Flood Relief Scheme

Construction Environmental Management Plan

Reference:

Issue | September 2024

Job number 303666-00

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Contents

Tables

Figures

1. Introduction

1.1 Overview

This Construction Environmental Management Plan (CEMP) has been prepared by Arup on behalf of Roscommon County Council (RCC) for the planned interim flood relief scheme for Lough Funshinagh, County Roscommon, herein referred to as "the proposed scheme". All works associated with the construction of the proposed scheme will be undertaken by RCC and their appointed contractor(s).

The purpose of the CEMP is to demonstrate how the proposed construction works can be delivered in a logical, sensible and safe sequence with the incorporation of specific environmental control measures relevant to construction works of this nature. The CEMP sets out the mechanism by which environmental protection is to be achieved during the construction phase of the proposed scheme. Implementation of the CEMP will ensure disruption and nuisance are kept to a minimum.

Due to the short-term duration of the proposed scheme (24 months), it is considered appropriate that this CEMP will also cover the decommissioning phase of the scheme.

The CEMP has been prepared in accordance with industry best practice guidance including:

- TII's Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan; and
- CIRIA (4th Edition, 2015); Environmental Good Practice on Site Guide.

The CEMP has been prepared in conjunction with the Environmental Impact Assessment (EIA) Screening Report and the Screening for Appropriate Assessment (AA) & Natura Impact Statement Report prepared for the proposed scheme and is structured as follows:

- Section 1 introduces the proposed scheme and outlines the purpose of the CEMP
- Section 2 describes in detail the proposed scheme
- Section 3 sets out the construction strategy for the proposed scheme
- Section 4 sets out the decommissioning strategy for the proposed scheme
- Section 5 outlines the procedures to be employed during construction to manage environmental aspects
- Section 6 outlines the management of construction traffic
- Section 7 sets out the framework and mechanisms through which environmental requirements will be managed
- Section 8 describe the general requirements and environmental commitments to be implemented to minimise likely significant negative effects, as far as practicable, during the construction of the proposed scheme.

2. Project Description

2.1 Overview

Lough Funshinagh is defined as a turlough or 'disappearing lake' located approximately 13km to the northeast of Athlone town in Co. Roscommon. In recent years, and in particular since 2016, water levels in the lough have risen, resulting in flooding of nearby property and increasing the flood risk to Curraghboy village which is 1.7 km to the southwest of the lough. Roscommon County Council is in the process of designing a more permanent scheme to manage flood risk in the vicinity of the lough. The proposed scheme is an interim scheme for up to two years only. Prior to the implementation of the permanent scheme, more immediate measures are needed to manage flood risk, particularly for local property and for the village of Curraghboy. To that end, an interim scheme has been designed, with the aim to extract enough water from Lough Funshinagh to prevent flooding in the surrounding areas. This will involve pumping water for up to 24 months when the lough level exceeds 67.50 metres above Ordnance Datum (mOD). Pumping rates will be adjust based on the receiving river (Cross River) flow conditions and will not exceed 300 litres per second. A remote monitoring system will control the pumping process, allowing for changes in flow rate or shutdowns as needed. Monitoring river flow in the Cross River will also help to ensure effective management of the overall system.

The proposed scheme comprises two pumps working in parallel, pumping water from the lough, into an overland pipe which will run from Lough Funshinagh to the Cross River, approximately 2.5km southwest of the lough. The overland pipe will discharge the pumped volume of water to the Cross River. The proposed scheme has been designed with due cognisance for the sensitivity of the lough, the River Cross and the pipe route.

The system will be remotely monitored and controlled.

The main elements of the proposed scheme consist of:

- Pump intake system
- Intake compound
- Pipeline Route
- Pipeline Outfall at the Cross River.

2.2 Project Location

The proposed scheme is located southwest of Lough Funshinagh. The route runs from the intake pump within the lough for approximately 2.2 km to the outfall location on the Cross River, as shown in Figure 1.

The land use surrounding the proposed route is agricultural lands and sporadic residential dwellings. The intake pump will be placed within the lough and connected to two diesel-powered hydraulic pump units (HPUs) located on purpose-built compound in an agricultural field near the edge of the lough. The overground pipeline will run through agricultural fields and transverse underneath three roads (R362, L2013 and a private access road adjacent to the R362 road) to the outfall point at the Cross River.

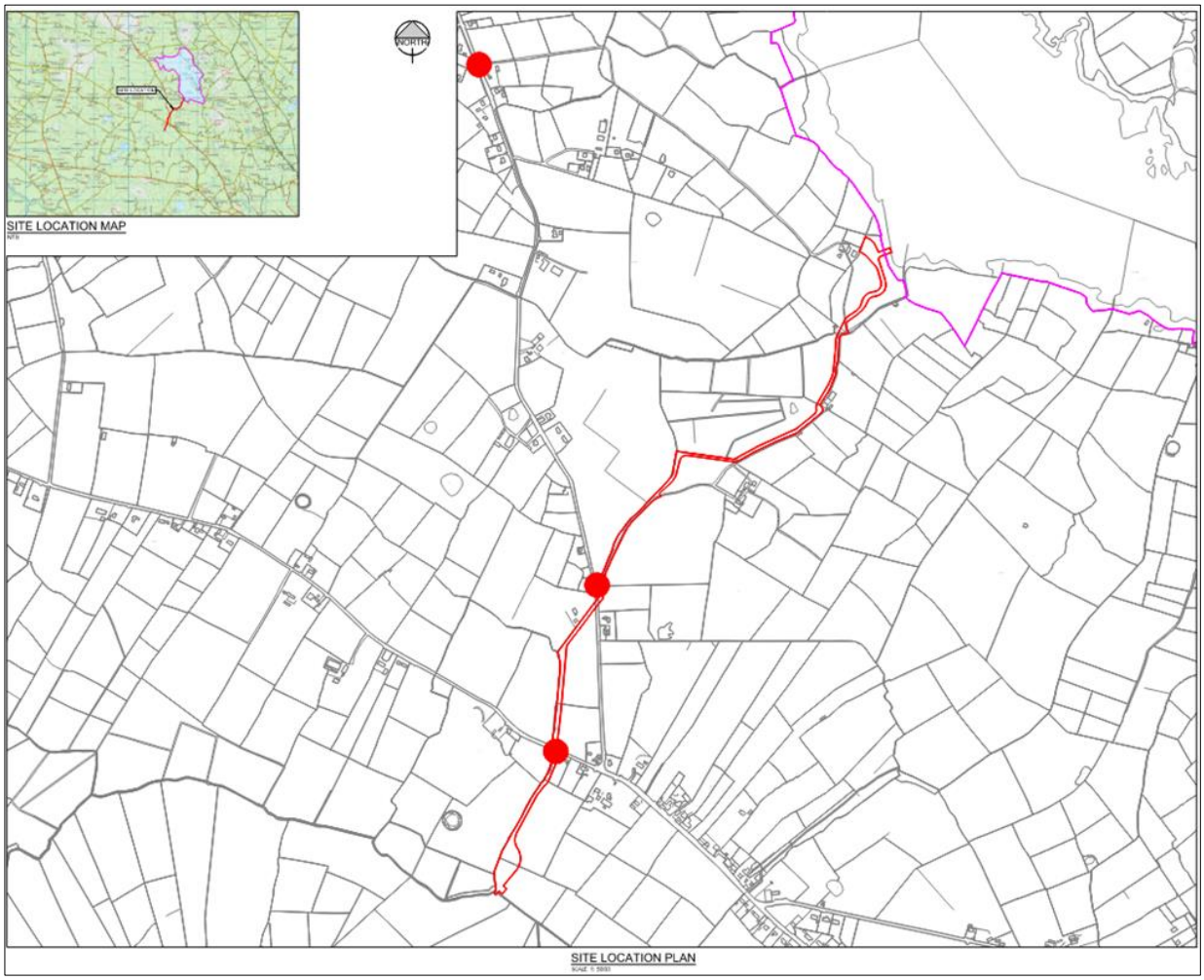

Figure 1 Location of the proposed scheme. Source Dwg. 24821-MWP-00-00-DR-C-0001 (MWP) | not to scale

2.3 Project Participants

Roscommon County Council will appoint a contractor for the construction of the proposed scheme who will ensure all requirements of the CEMP are met.

Table 1 lists the main project participants for the proposed scheme.

Table 1 List of Main Project Participants

Role	Company Name
Client	RCC
Project Manager	RCC
Contractor (construction and decommissioning phases)	To be appointed by RCC
Planning Consultant	Malachy Walsh & Partners (MWP)
Environmental Consultant	Arup
Project Environmental, Health and Safety Manager	To be appointed by RCC or the Contractor
Project Supervisor Construction Stage (PSCS)	To be appointed by RCC

3. Construction Strategy

This section describes the works required to construct, install and commission the proposed scheme.

3.1 Phasing of works

Some works may be carried out concurrently where possible however the overall phasing of the works will likely be as follows:

- Construction of the intake compound
- Installation of the pump intake system i.e. HPUs, pump pontoon and floating access pontoon
- Laying of pipeline along the pipeline route including road crossings and fencing
- Installation of outfall and
- Equipment installation and setup.

It is anticipated that the construction works will take approximately one month to complete. It is expected that the civil works will be completed in 3-4 weeks and that the installation and setting up of equipment will take one week.

3.2 Intake Compound

The compound will be constructed without excavating the existing ground. A combination of geogrid and geotextile will be placed over the vegetation on the existing surface within the footprint of the compound. A minimum thickness of 450mm of imported stone (Class 6F or similar) will be placed on top of the geogrid and geotextile. The total footprint of the hardstand area at the will be c. 1,150 m^2.

A site inspection by the design engineering team and landowner knowledge of the land have determined the ground conditions to be suitable for the size and nature of compound designed for the proposed scheme.

3.2.1 Intake Compound

The construction of the intake compound will involve the following sequence:

- The appointed contractor will mark out the line of the proposed compound using a GPS / total station
- A layer of geogrid / geotextile will be rolled out by hand along the line of the proposed compound
- The stone aggregate used to construct the compound will be imported from a local quarry using trucks. The trucks will reverse tip the stone onto the geogrid / geotextile and an excavator will be used to spread the stone before compaction. Compaction of the stone material will be completed using the Transport Infrastructure Ireland (TII) Specification for Roadworks. This is typically completed in layers with the use of a vibratory roller or similar
- The compound will be constructed with a minimum crossfall of 3% to ensure that water can flow off the surfaces and to reduce the risk of rutting / potholes occurring
- Surface water runoff from the compound will be discharged directly over the edge of the stone embankment and a continuous silt fence will be constructed on the downslope side to capture any sediment that may run off the surfaces
- The timber posts in the stockproof fence will be driven into the existing soil without any excavation.

3.2.2 Concrete Bund

- A concrete bund measuring 11m x 8m will be constructed inside the compound to support the HPU's and fuel tanks and to contain any fuel in the event of a spillage. The slab will be cast directly onto the imported stone used to construct the compound. The slab will include reinforcement to prevent leakage. The upstand walls will be cast in-situ using conventional formwork
- The acoustic barrier, 4m in height, will be fixed directly to the HPU bund upstand walls or slab
- The paladin fence posts will be secured to concrete blocks (Kelley Blocks or equivalent) so as to avoid disturbance of the underlying ground. Refer to the drawing in Figure 2 for details of fences.

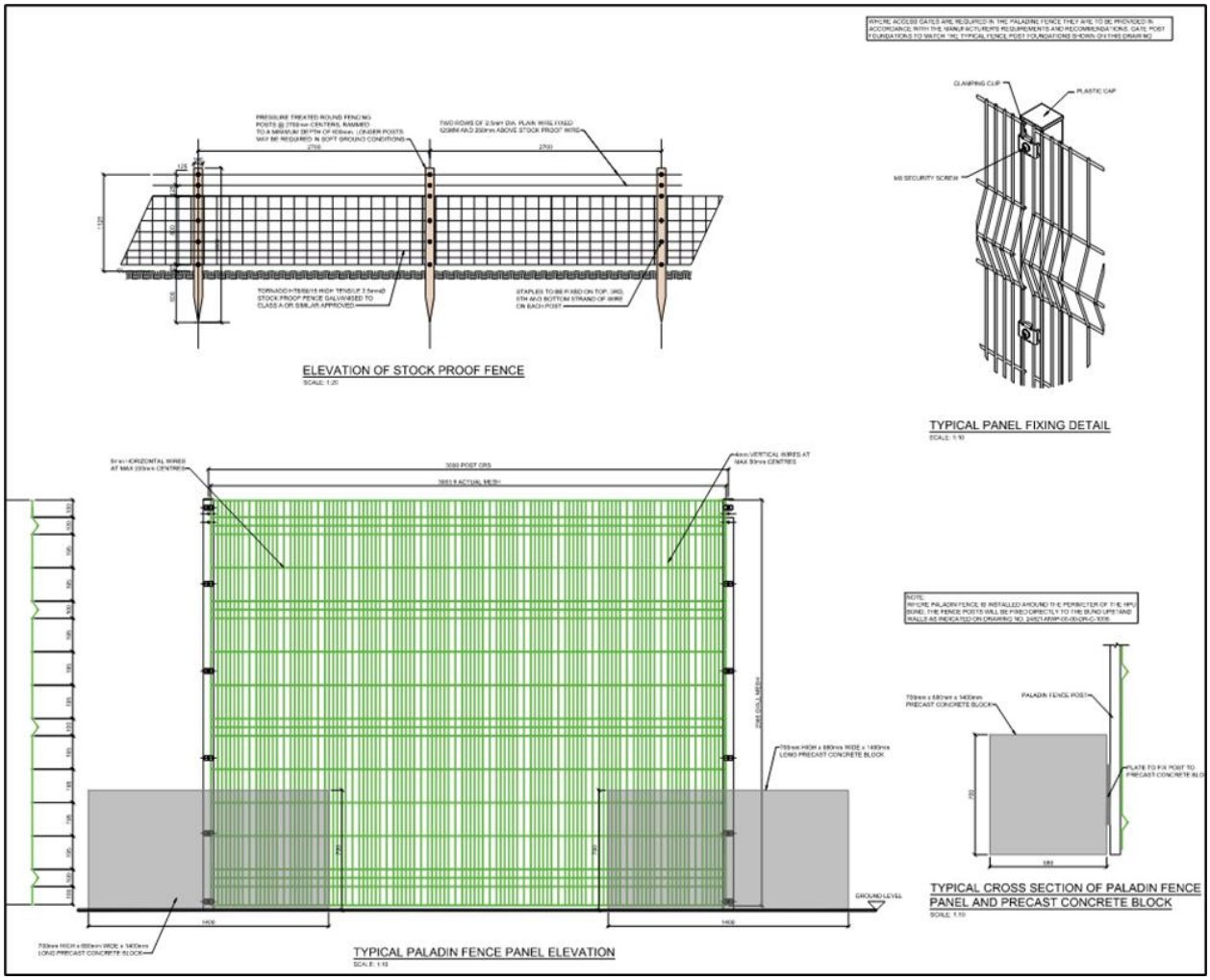

Figure 2 Design detail of paladin fence installation. Source Dwg. 24821-MWP-00-00-DR-C-0403 (MWP) | not to scale

3.3 Pump Intake System

The construction of the pump intake system will involve the following sequence:

- The pump pontoon and access pontoons will be manufactured in the Netherlands and will be transported to site on an articulated truck. The HPU's and fuel tanks will also be transported from the Netherlands on an articulated truck. The trucks will deliver all these components to the intake compound
- A 60-tonne mobile crane will be used to lift the pump pontoon (with the pumps already installed within it) from the truck in the compound to the lough. The pump pontoon will be floated into its final position and held in place horizontally using 4 no. spud legs (100 mm diameter) fixed with end plates, which will rest on the ground beneath the water. A small boat will be in the water to assist with positioning
- The same crane will lift the HPU's and fuel tanks into position within the HPU bund

- The floating access pontoons will be transported to the site in 5 no. 6.4m lengths. Each section will be lifted into position in the lough using the crane and bolted together
- The hydraulic hoses and 2 no. c.300 mm diameter pipes will be mounted on the sides of the floating pontoons using brackets
- The fuel tanks will be filled with diesel using a fuel truck
- The pump system will be tested and, after installing the remainder of the pipeline, it will be commissioned.

3.4 Pipeline Route to the Cross River

3.4.1 Laying of Pipeline

Vegetation clearance will be required where the pipes must cross ditches however only space for the two pipes will be required and these locations will be replanted on removal of the temporary pipeline. Similarly, it may be necessary to cut through concrete walls or dismantle stone walls to allow the pipeline through such boundaries. All such boundaries will be reinstated once the pipeline is removed.

The construction of the pipeline will involve the following sequence:

- The flexible layflat hose and PE ribbed pipe system will be supplied from the Netherlands and will be transported to site on articulated lorries
- The layflat hose will be supplied in 50 m to 200 m lengths (typically 200 m) and will be housed in a container for transport. The container will be lifted off the trucks and onto a flatbed trailer which will be attached to a tractor or excavator. The tractor or excavator will drive along the route of the pipeline and deploy the hose directly onto the ground surface. The final positioning of the hose will be done by hand
- The pipeline will need to pass through a number of field boundary fences/hedgerows, as shown on the engineering report drawings (24821-MWP-00-00-DR-C-0100-S21-P01, 24821-MWP-00-00-DR-C-0101, 24821-MWP-00-00-DR-C-0102, 24821-MWP-00-00-DR-C-0103.At each location, the existing boundary fence/hedgerows will be removed over a width of 5 m which is required to allow both the pipeline and a tractor/excavator to pass through
- Cross drains consisting of HDPE drainage pipes will be laid beneath the ‘layflat’ flexible pipes at appropriate intervals to maintain the existing drainage regime on the site. This approach eliminates the need to excavate new drainage channels or alter the existing flow regime
- The PE ribbed pipeline will be supplied in lengths varying between 5 m and 12 m and will be connected using rigid joints. The pipe sections will be loaded from the articulated lorry to a flatbed trailer attached to a tractor or excavator. The tractor or excavator will drive along the route of the PE ribbed pipe and will be followed by an excavator which will be used to lift the pipes from the trailer to the required position on the ground
- Due to the existing surface condition, which has a number of localised humps and depressions, the line of the 500mm diameter PE ribbed pipe will be smoothened out. This will be achieved using an excavator to compact and level out any localised humps/depressions. The maximum depth change will be 150mm which is less that the depth of influence in conventional agricultural tilling
- The layflat flexible pipes will be connected to the PE ribbed pipe using a bespoke fabricated manifold section
- A provision will be made for badgers to cross the PE ribbed pipe by installing ‘Badger Gates’ in the fencing. This consists of sections 300mm diameter pipe placed through and perpendicular to the wire fencing to allow badgers to travel through.

3.4.2 Fencing Installation

A stock proof fence will be provided both sides of the pipeline along the full length of the route and will incorporate timber posts which will be driven into the existing soil without any excavation. The stock-proof fence will consist of wooden post and wire fencing. Refer to Figure 2.

3.4.3 Road Crossings

There will be two public road crossings along the route (the R362 and L2013) and one crossing of a private road. A shallow trench will be excavated across each road and a concrete pipe installed through which the flexible pipes will subsequently be pulled. It is anticipated that the trenching works will take up to two days for each installation and one lane of traffic will be kept open to maintain traffic flow. It is known that an existing Uisce Éireann watermain and a fibre optic cable are present in the roads.

The construction of road crossings will involve the following sequence:

- On the public roads, in order to allow traffic to continue to use the roads, the pipe will be installed in two segments such that at least one traffic lane remains open at all times
- Prior to undertaking any works, a CAT scan will be undertaken to identify any services in the road
- An 1800 mm wide trench will be excavated across the road to accommodate 2 no. 600 mm diameter HDPE carrier pipes. The overall trench depth will be approximately 2,000 mm to provide sufficient cover to the pipe and to ensure that the existing services can be avoided
- The HDPE carrier pipe will be positioned onto a 100 mm thick layer of pipe bedding material placed at the bottom of the trench. Once the carrier pipe is in position the trench will be backfilled and the road will be reinstated
- The existing hedgerow will be removed on both sides of the road over a width of approximately 3 m. These will be reinstated following installation of the carrier pipes
- At each side of the road, the trench will extend past the pipe into the field and will be sloped upwards to meeting the existing field level as shown Figure 3 and Figure 4. A handrail will be erected around the trench in the field
- The flexible pipes will be placed through the carrier pipe.

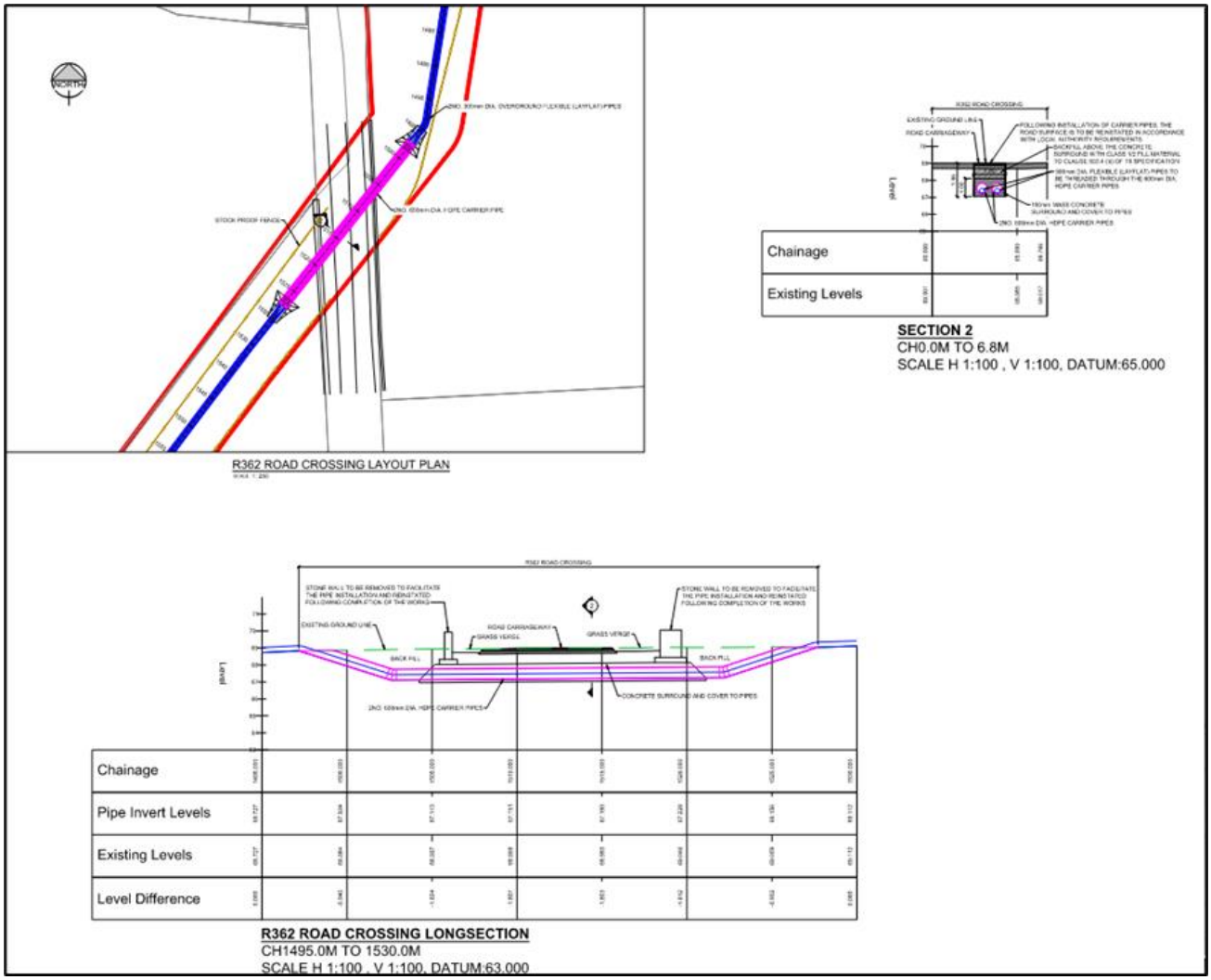

Figure 3 Proposed R362 road crossing detail. Source Dwg. 24821-MWP-00-00-DR-C-0401 (MWP) | not to scale

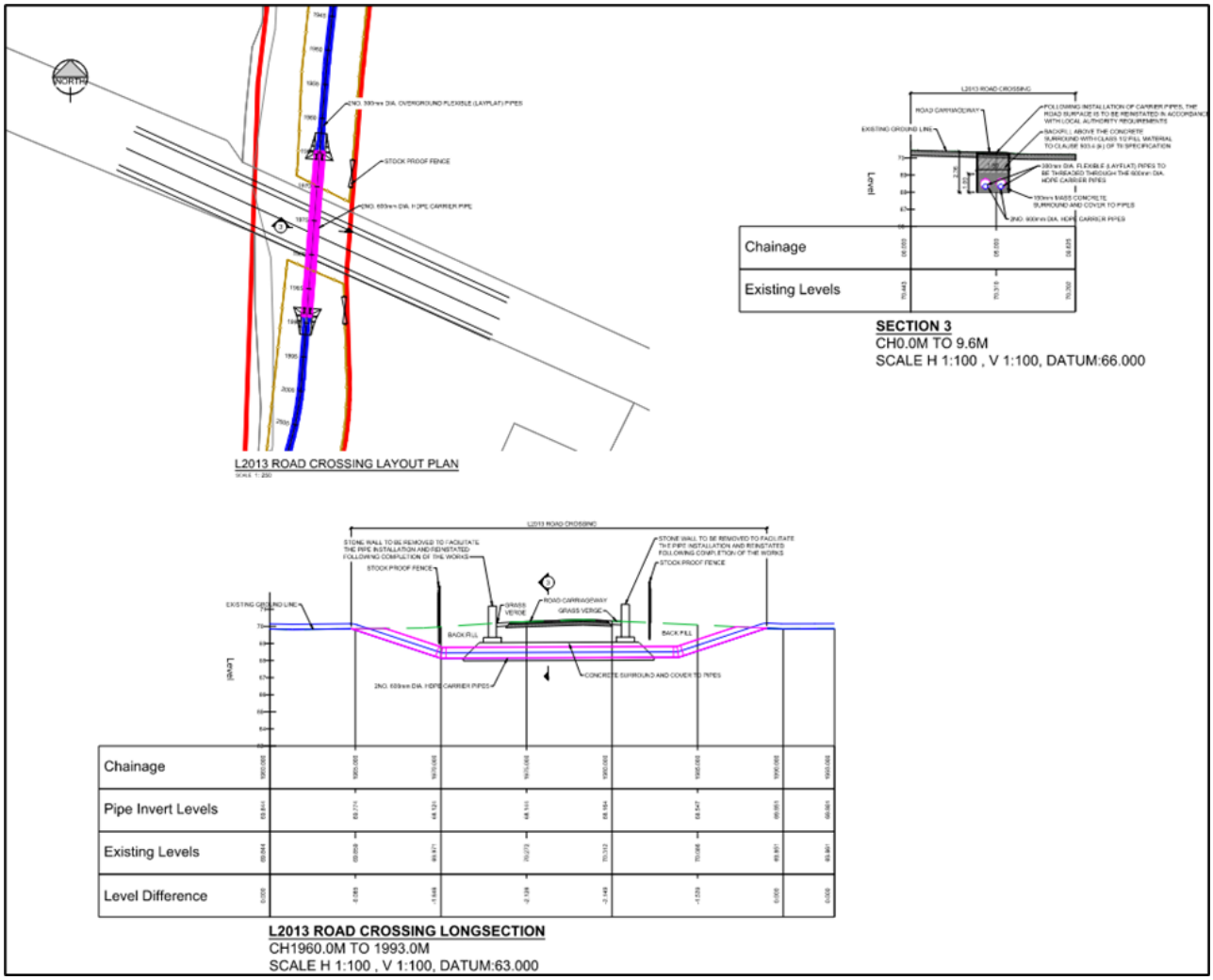

Figure 4 Proposed L2013 road crossing detail. Source Dwg. 24821-MWP-00-00-DR-C-0402 (MWP) | not to scale

3.5 Outfall

No excavation works or vegetation removal will be required at the outfall location.

The construction of the outfall will involve the following sequence:

- The geotextile will be supplied in a roll and transported to the outfall location by an excavator
- The rock armour and natural flag stones will be transported to the outfall location using a tipper truck or tracked dumper
- As noted on drawing 24821-MWP-00-00-DR-C-1003:
  - All rock shall be quarried with a minimum saturated surface dry density of 2600 kg/m³
  - Stone should be crushed and angular from strong inert rock, which shall exclude shales and weak sandstones
  - All individual stones shall be dense, sound, durable rock, free from all cracks, joints and bedding planes, which could result in breakdown of the rock in a fluvial or marine environment. It shall be capable of being handled and placed without fracture or damage
  - Individual pieces shall be blocky and take the basic shape of a cuboid. Armour units shall be hand selected and individually placed to the approval of the Employers Representative so each rock is securely held by its neighbours. Rocks shall not be placed so that they obtain their stability on a plane by frictional resistance alone

  - Armour stone is to be placed in a systematic way such that the finished construction consists of close packed layers of rock of the specified thickness for the appropriate zone. The surface of the rock shall present a close packed uneven face
  - The contractor shall provide details of the source of supply for approval prior to delivery to site.

- The geotextile will be rolled out across the full width of the channel from top of bank to top of bank
- An excavator will be used to systematically position rock armour and natural flag stones onto the geotextile, starting at the bottom and working upwards to ensure stability is maintained. The finished construction consists of close packed layers of rock of the specified thickness for the appropriate zone. A 1.60 metre width of the riverbed will be covered with natural flag stones. The leading edge and tail edge flag stones at the upstream and downstream interfaces with the existing riverbed will be level
- The PE ribbed pipe will be laid as far as the top of the channel bank using the method outlined in the previous sub-section. The pipe will be mitre cut and jointed to another pipe section by fusion welding a coupler so that the jointed section will be oriented downwards following the riverbank gradient
- The diffuser tee will have been pre-fabricated and will be fixed to the end of the pipe with a rigid joint
- Additional rock armour will be placed around the ends of the diffuser tee to ensure that water discharging from the ends must flow around and through the rock armour before entering the river.

3.6 Service Diversions

Services will potentially be encountered during the road crossing works. As noted above in Section 3.4.3, the overall trench depth will be approximately 2,000 mm to provide sufficient cover to the pipe and to ensure that the existing services can be avoided.

3.7 Traffic Management

As noted in Section 3.4.3, traffic management measures will be required during the installation of the pipeline under the public roads. One lane of traffic on the public roads will be maintained at all times.

3.8 Landowner and Community Liaison

Roscommon County Council (RCC) will coordinate communications and liaise with affected landowners and the local community during all phases of the proposed scheme. RCC will liaise with residents and the general community during the construction phase to ensure that any disturbance is kept to a minimum and to ensure that all anticipated nuisances are minimised and that the construction activity will have the lowest possible impacts on the residents and other properties.

3.9 Construction Management

RCC will have a construction management team on site for the duration of the construction phase. This team will supervise the construction of the scheme including monitoring the contractors' performance to ensure that the proposed construction phase mitigation measures are implemented and that construction impacts and nuisance are minimised.

3.10 Construction Safety

All contractors and subcontractors must progress their works with reasonable skill, care and diligence and, at all times, proactively manage the works in a manner most likely to ensure the safety, health and welfare of those carrying out construction works, pedestrians, road users and other interacting stakeholders. Measures related to construction health and safety are detailed in the CEMP.

A Project Supervisor Design Process (PSDP) has been appointed by RCC.

RCC will appoint the Project Supervisor Construction Stage (PSCS) for the construction stage of the project to manage and co-ordinate health and safety matters during the construction stage. The PSCS will be appointed before the construction work begins and remains in that position until all construction work on the project is completed.

4. Decommissioning Strategy

The proposed scheme is planned to be in operation on an interim basis, for up to two years. At the end of the scheme all equipment and structures will be removed, and the land will be restored to its previous state. To ensure no adverse effects are caused by the decommissioning phase, information on the decommissioning strategy and specific mitigation measures have been included in the CEMP.

4.1 Pump Intake System

Decommissioning of the pump intake system will involve the following:

- The pumps will be shut down and disconnected from the pipeline and hydraulic hoses
- A 60-tonne mobile crane will be used to lift the pump pontoon (with the pumps inside) from the lough to an articulated truck parked in the intake compound. A small boat will be in the water to assist
- The floating access pontoons will be dismantled (unbolted) and lifted from the edge of the lough to a truck parked in compound using the 60-tonne crane
- The same crane will lift the HPU's and fuel tanks onto the truck.

4.2 Intake Compound

Decommissioning of the intake compound will involve the following sequence:

- The stock proof fence and paladin fence will be taken up and loaded onto a flatbed truck for reuse
- The concrete HPU bund will be demolished using an excavator with a rock breaker and removed to a licensed facility
- The Class 6F stone (compound) as well as the geogrid / geotextile used to construct the compound will be taken up and brought to a licensed facility. A reuse for the stone aggregate will be sought where possible following confirmation of acceptability
- The ground beneath the footprint of the compound will be rotovated and tilled to reinstate the area to agricultural usage, similar to the surrounding lands.

4.3 Pipeline Route

Decommissioning of the pipeline will involve complete removal of all PE ribbed pipe and flexible 'layflat' pipe.

4.3.1 Road Crossing

Decommissioning of the road crossings will involve the following sequence:

- The HDPE carrier pipes will remain in place after the pipeline has been removed
- Each end of the pipe will be blocked by filling in the trench at the ends. The redundant pipe beneath the road will not be of concern

- The existing hedgerow which was removed will be replanted using native hedge species and/ or walls/ fences will be restored.

4.4 Outfall

Decommissioning of the outfall will involve the following sequence:

- The PE ribbed pipe and diffuser tee will have been removed in conjunction with the remainder of the pipeline
- The rock armour and natural flag stones will be carefully removed from the surface of the geotextile using an excavator and placed into a tipper truck or tracked dumper
- The geotextile will be pulled across the river and removed by hand without entering the water.

4.5 Waste Arising

All waste arising will be managed in accordance with the waste hierarchy, in compliance with the provisions of the Waste Management Act, 1996, as amended, and to contribute to achieving the objectives set out in the Waste Action Plan for a Circular Economy (DECC, 2020).

Opportunities for reuse of materials, by-products and wastes will be sought throughout the decommissioning phase. Where possible, metal, timber, glass and other recyclable material will be segregated and removed off site to a permitted / licensed facility for recycling.

The contractor appointed for the decommissioning of the scheme will record the quantity in tonnes and types of waste and materials leaving the site. The name, address and authorisation details of all facilities and locations to which waste and materials are delivered will be recorded along with the quantity of waste in tonnes delivered to each facility. Records will show the type of material, specifying those that are recovered, recycled, and disposed of. The relevant appropriate waste authorisation will be in place for all facilities that wastes are delivered to (i.e., EPA Licence, Waste Facility Permit or Certificate of Registration).

The following are the expected wastes to be generated during the decommissioning phase:

- Concrete from HPU bund and Paladin post bases to be removed to a licensed facility
- Geotextiles/ geogrid to be taken to licensed facility and reused following confirmation of acceptability
- Stone aggregate to be taken to licensed facility and reused following confirmation of acceptability
- Natural flag stones to be taken to licensed facility and reused following confirmation of acceptability
- Fencing (posts, wire and paladin) to be gather for re-use
- Rock amour to be taken to licensed facility
- Pipeline to be gather and re-used where possible.

Mitigation measures for the management of waste are set out below in Section 8.4.9.

5. Site Management

The following site management measures will be implemented for both the construction and decommissioning phases. The contractor will be required to implement these measures for the duration of the contract.

RCC and their contractor(s) will also be obliged to address any issues as and when they arise and coordinate with the contractor throughout the works of the proposed scheme to avoid and minimise any adverse effects during construction and decommissioning.

5.1 Working Hours

Construction operations on site are proposed to be between the hours of 07:00 and 19:00, Monday to Friday, and 07:00 to 16:00 on Saturdays. Similarly, deliveries of materials to site will generally be between the hours of 07:00 and 19:00, Monday to Friday, and 08:00 to 16:00 on Saturdays and will be scheduled to avoid peak times.

This will ensure construction traffic will have limited impact on the peak periods of 07:30-08:30 in the morning and 16:15-17:15 in the evening.

Due to the urgent nature of construction activities, or if required to mitigate disruption to the local environment, there may be a requirement for working outside these hours. Should this be required, it will be by agreement with Roscommon County Council.

5.2 Good Housekeeping

A “good housekeeping” policy will be employed at all times. This will include, but not necessarily be limited to, the following requirements:

- General maintenance of working areas and cleanliness of welfare facilities and storage areas
- Provision of site layout map showing key areas such as first aid posts, material storage, spill kits, material and waste storage, welfare facilities etc
- Maintain all plant, material and equipment required to complete the construction work in good order, clean, and tidy
- Keep construction compounds, access routes and designated parking areas free and clear of excess dirt, rubbish piles, scrap wood, etc. at all times
- Details of site managers, contact numbers and warning signs will be provided at the boundaries of the working areas
- Provision of adequate welfare facilities for site personnel
- Installation of appropriate lighting and fencing each working area as required
- Effective prevention of oil, grease or other objectionable matter being discharged from any working area
- Provision of appropriate waste management at each working area and regular collections as per the existing arrangements on site
- Excavated material generated during construction will be reused on site as far as practicable and surplus materials/soil, should it be deemed a by-product, will be recovered or if considered to be waste material, disposed of to a suitably authorised waste facility site
- Open fires will be prohibited at all times
- The use of less intrusive noise alarms which meet the safety requirements, such as broadband reversing warnings, or proximity sensors to reduce the requirement for traditional reversing alarms; and

- Material handling and/or stockpiling of materials, where permitted, will be appropriately located to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.

5.3 Health and Safety

The primary aim of planning for safety on this site is ensuring the safety of people involved in and affected by the development. This includes pedestrians, road users, neighbours, site staff and visitors to site.

The following are examples of some site-specific issues that will have to be addressed during the construction of the works:

1. Protecting existing roadways against damage.
2. Managing vehicular traffic on the surrounding roadways for the duration of the construction works.
3. Maintaining existing public and private access roads.

All contractors and subcontractors must progress their works with reasonable skill, care and diligence and, at all times, proactively manage the works in a manner most likely to ensure the safety, health and welfare of those carrying out construction works, pedestrians, road users and other interacting stakeholders.

Contractors and subcontractors are further required to ensure that, as a minimum, all aspects of their works and project facilities comply with legislation, good industry practice and all necessary consents.

Health and safety requirements will be further expanded and developed within the contractor's Construction Management Plan and Construction Stage Health and Safety Plan required to be prepared by the Project Supervisor Construction Stage, prior to the commencement of construction works on site.

5.4 Public Relations

The site is located near to a number of residences. The contractor will be required to ensure that all agents, subcontractors, and suppliers act in a manner to minimise disruption to the surrounding locality. Keeping people informed of site operations will help create and maintain good relationships, fostering a co-operative atmosphere.

RCC will act as the main point of contact between the community, landowners and the contractor.

5.5 Site Security

The contractor will be responsible for the security of the site for the duration of the works. All reasonable precautions will be taken to prevent unauthorised access to the site, the works and adjoining property. Adequate safeguards will be put in place to protect the site, the works, products / materials, plant, and any existing buildings affected by the construction works from damage, theft and trespass.

As part of their site security responsibilities, the contractor will be required to:

1. Install and maintain adequate site fencing to the site boundary with adequate controlled access and egress points until the proposed fencing for the proposed scheme is fully installed.
2. Ensure restricted access is maintained to the works.
3. Monitor and record all deliveries to site and materials / waste taken off site.

All staff will be made fully aware of their individual responsibilities regarding safety and security and will undertake their work in accordance with such guidelines. All staff and operatives will be fully inducted into the security, health and safety and logistic requirements on site.

5.6 Road Maintenance

The following measures will be taken to ensure that the site and surrounding roads are kept clear, tidy and well maintained:

- A regular programme of site tidying will be established to ensure a safe and orderly site
- In the event of any fugitive solid waste escaping the site, it will be collected immediately and removed to storage on site, and subsequently disposed of in the appropriate manner
- The proposed scheme will require crossing of two public roads (R362 and L2013). If necessary an approved mechanical road sweeper will be used to remove any soil or debris generated by the trenching works and hedgerow or wall removal works
- The private access road used for the intake compound will continue to be used by the landowner and the contractor will be responsible for maintaining access for the landowner, regular inspection and ensuring construction materials or rubbish is removed as soon as possible.

6. Traffic Management

The following traffic management will be implemented for the construction and decommissioning phases.

6.1 Site Access

The construction traffic for the intake system and intake compound will enter the site from the private access road off the R362 as shown in Figure 5. Agricultural access gates will be provided at the compound to facilitate access for the landowner.

Access to the outfall site will be through a private access road located on the L2013.

Traffic management measures will be required during the installation of the pipeline under the public roads. One lane of traffic will be maintained open at all times.

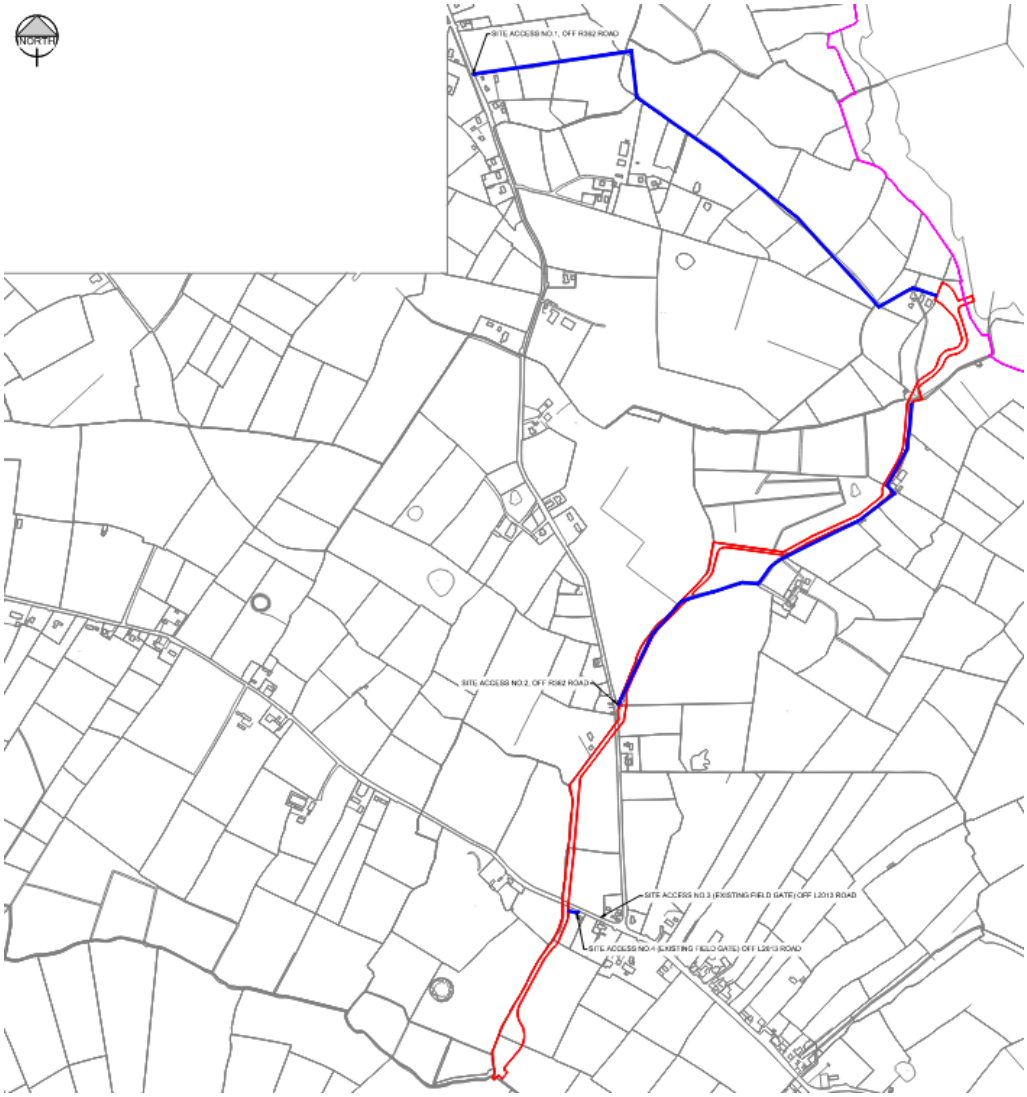

Figure 5 Roads context and potential site entrances for construction of the proposed scheme. Source Dwg. 24821-MWP-00-00-DR-C-0002 (MWP) | not to scale

6.2 Traffic Mitigation

6.2.1 Potential Impact

It is envisaged that no significant adverse effects on traffic will occur during the construction phase. The contractor will consider traffic management for the proposed scheme in agreement with RCC.

Traffic management and road signage for site access will be in accordance with the Department of Transport, Tourism and Sport (2019) Traffic Signs Manual, *Chapter 8: Temporary Traffic Measures and Signs for Roadworks*[1] and in agreement with Roscommon County Council.

It has been estimated that there will be approximately 20 construction staff on site on a typical day during the one-month construction period.

Working hours are outlined in Section 5.1. These hours will ensure construction traffic will have limited impact on the peak periods of 07:30-08:30 in the morning and 16:15-17:15 in the evening.

[1] Department of Transport, Tourism and Sport (2019) Traffic Signs Manual, Chapter 8: Temporary Traffic Measures and Signs for Road Works https://assets.gov.ie/34731/20abae155ee5458993122838cb317ca9.pdf

6.2.2 Traffic Management

The Contractor will agree traffic management measures with Roscommon County Council prior to commencement of the works. This will include information on the management of deliveries, control of site access and required signage.

During peak hours, ancillary, maintenance, and other site vehicular movements will be discouraged.

HGV routes to and from the works areas will be developed in agreement with Roscommon County Council and with the objective of minimising the impact in the local area for residents and businesses.

7. Environmental Management Framework

The following environmental management framework will be implemented for both the construction and decommissioning phases.

7.1 Overview

As part of the environmental management framework, RCC and their contractor(s) will be required to comply with all relevant environmental legislation and take account of published standards, accepted industry practice, national guidelines, and codes of practice appropriate to the nature of the proposed scheme works. Due regard should be given to the guidance and advice given by ISO14001 standard[2] and Construction Industry Research and Information Association (CIRIA) guidance[3,4,].

The contractor will be required to develop and implement an Environmental Management System (EMS) that follows the principles of ISO14001.

Further, the contractor's EMS should include an environmental policy, operational, monitoring and auditing procedures to ensure compliance with all environmental requirements and to monitor compliance with environmental legislation and the environmental management provisions outlined in the relevant documentation.

7.2 Responsibilities

Outlined below is a summary of the key roles for the works phase of the proposed scheme and their associated responsibilities in relation to the CEMP.

7.2.1 Employer

RCC will be the employer responsible for ensuring that competent parties are appointed to undertake construction/ decommissioning of the proposed scheme and that sufficient resources are made available to facilitate the appropriate management of risks to the environment.

7.2.2 Employer's Representative

RCC will act as the Employers Representative (ER) and will be responsible for monitoring compliance with the CEMP.

It is envisaged that the ER will coordinate with the contractor and facilitate any specialists appointed to implement on site procedures and monitor construction on behalf of the employer.

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[2] ISO (2015) ISO 14001:2015 Environmental management systems -- Requirements with guidance for use

[3] CIRIA (2015) Environmental Good Practice on Site (fourth edition) (C762)

[4] CIRIA (2001) Control of water pollution from construction sites. Guidance for consultants and contractors (C532)

7.2.3 The Contractor

The Contractor appointed by RCC will be responsible for the organisation, direction, and execution of environmental related activities during the detailed design and construction of the proposed scheme. The contractor is required to undertake all activities in accordance with the relevant environmental requirements including the consent documentation and other regulatory and contractual requirements.

7.2.4 Site Manager

A Site Manager will be appointed to oversee the day-to-day management of working areas within the site and ensure that effective, safe, planned construction activities are delivered on an ongoing basis to the highest standards.

The Site Manager will be a suitably qualified, competent, and experienced professional that will oversee site logistics, communicate regularly with construction staff, accommodate project-specific inductions for staff on site and ensure that all work is compliant with the relevant design standards and health and safety legislation.

7.2.5 Project Supervisor for the Construction Stage

The Project Supervisor for the Construction Stage (PSCS) will be appointed by RCC appointed and responsible for the organisation, direction, and execution of environmental related activities during the detailed design and construction of the proposed scheme. The PSCS is required to undertake all activities in accordance with the relevant environmental requirements including the consent documentation and other regulatory and contractual requirements.

7.2.6 Environmental Manager

An Environmental Manager will be appointed to ensure that the CEMP is effectively implemented. The Environmental Manager will be a suitably qualified, competent and experienced professional that would perform the necessary tasks, review environmental procedures and consult with the members of the construction team and stakeholders as required.

7.2.7 Environmental Specialists

To fulfil its obligations under the CEMP and to support the Environmental Manager, suitably qualified and experienced professionals will be appointed as required. Refer to Section 8.4 (Construction and Decommissioning Phase Mitigation and Monitoring Measures) below for those specialists required:

- Ecological Clerk of Works (ECoW), refer to Section 8.4.1.

7.2.8 Emergency Contacts

An emergency contact list will be established and made available to all construction staff employed. The contact list shall be displayed prominently on site as well as at suitable locations where construction activity is being carried out around working areas. The contact list will include key environmental representatives that may need to be contacted in the event of an incident.

7.2.9 Enquiries and Complaints

The Contractor will establish a process for handling all enquiries including complaints. All enquiries will be recorded, and a log will be maintained to include details of the response and action taken. This will be available upon request for inspection to RCC. All enquiries, whether a query or a complaint, will be dealt with in a timely manner.

The Environmental Manager will be immediately informed of any environmental-related issues that have been raised. Where appropriate, the environmental manager would be responsible for informing Roscommon County Council, relevant stakeholders, and statutory bodies.

8. Environmental Management Procedures

The following environmental management procedures will be implemented for both the construction and decommissioning phases.

8.1 Training, Awareness and Competence

The contractor (and their subcontractors, if any) will be selected with due consideration of relevant qualifications and experience. The contractor will be required to employ construction staff with appropriate skills, qualifications, and experience appropriate to the needs of the works to be carried out during construction.

A site induction will be provided to all construction staff before they commence work on site.

The contractor will ensure that all personnel receive adequate training prior to the commencement of construction activities. A baseline level of environmental awareness will be established through the site induction programme. Key environmental considerations and objectives will be incorporated into this induction. Specifically, site inductions will cover the following as a minimum:

- Introduction to the Environmental Manager
- Description of the CEMP and consequences of non-compliance
- The requirements of due diligence and duty of care
- Overview of conditions of consents, permits, and licences
- Identification of environmental constraints and notable features within the site; and
- Procedures associated with incident notification and reporting.

Nobody will work on site without first receiving environmental induction. Signed records of environmental training will be established, maintained, and made available to the Employers Representative.

Site briefings and talks would be carried out on a regular basis to ensure that construction staff have an adequate level of knowledge on environmental topics and community relations and can effectively follow environmental control procedures throughout construction.

8.2 Monitoring and Inspections

Given the health and safety aspects of the proposed works, all site visits related to monitoring and inspections will be arranged and agreed in advance between the contractor, RCC and its Employer's Representative and the Site Manager.

Records of all inspections carried out will be recorded on standard forms and all actions should be closed out in a reasonable time. The updated CEMP will include further details of inspection procedures.

8.2.1 Monitoring

Mitigation and monitoring will be carried out in accordance with the requirements of the CEMP and associated environmental/ecological reports so that construction activities are undertaken in a manner that does not give rise to significant negative effects. Suitable monitoring programmes will need to be developed, implemented, documented, and assessed.

The results of all environmental monitoring activities will be reviewed by the Environmental Manager on an ongoing basis to enable trends or exceedance of criteria to be identified and corrective actions to be implemented as necessary. The contractor will be required to inform the Employer's Representative of any exceedances of criteria, whether continuous or not.

8.2.2 Inspections

Routine inspections of construction activities will be carried out by the Environmetal Manager daily to ensure all necessary environmental measures relevant to the construction activities are being effectively implemented by construction staff, ensuring legal and contractual conformity.

8.3 Incident Response

8.3.1 Corrective Actions

Corrective actions are measures to be implemented to rectify any non-conformances identified during monitoring and inspections.

In the first instance, an investigation will be undertaken by the Environmental Manager to identify the cause of any non-conformances. Appropriate remedial measures will be identified and implemented as soon as practicable to prevent further exceedances. If necessary, the appropriate statutory authority and stakeholders will be notified.

Where new or amended measures are proposed, the relevant CEMP will be updated accordingly by the Environmental Manager and the Employer's Representative will be informed at the earliest opportunity.

8.3.2 Emergency Incidents

8.3.2.1 Overview

Emergency incidents are those occurrences that give rise to significant negative environmental effects including but not limited to the following:

- Any malfunction of any response measure and/or environmental protection system
- Any emission that does not comply with the requirements of the contract and relevant licences
- Any circumstance with the potential for environmental pollution; and
- Any emergency that may give rise to environmental effects e.g., release or spill of hazardous substance such as fuel, oil, concrete or fire outbreak.

The focus of including all the stringent measures in this CEMP is on prevention of an incident arising in the first place. However, an Emergency Response Plan (ERP) will be prepared to ensure that in the unlikely event of an emergency, response efforts are prompt, efficient, and suitable for particular circumstances. This plan will be a live document and will be updated by the Contractor following appointment and prior to commencing works on site.

8.3.2.2 Emergency Response Plan

A set of standardised emergency response procedures will govern the management of emergency incidents.

The Contractor will be required to detail emergency incident response procedures and to develop an Emergency Response Plan (ERP). The ERP to be prepared by the Contractor will be based on the following elements:

- Identification of all possible emergency scenarios
- Effective planning, e.g., availability of booms, spills kits at appropriate locations
- Identification of receptors/pathways (e.g., waterbodies)
- Identification and dissemination of contact numbers
- Definition of site-based staff responsibilities
- Appropriate site-based staff training
- Availability of suitable spill kits (and appropriately trained staff) at appropriate locations on the site

- Implement lessons learnt from previous incidents; and
- Ensure that all appropriate site staff are aware of the site emergency procedure(s) (e.g., spillage, leakage, fire, explosion, and flooding), that drain covers and spill kits are available, and they know how to use them.

8.3.2.3 Spill Control Measures

Every effort will be made to prevent pollution incidents associated with spills during the construction and decommissioning of the proposed scheme. The risk of oil/fuel spillages will exist on the site and any such incidents will require an emergency response procedure.

The following steps provide the procedure to be followed in the event of an oil/fuel spill occurring on site:

- Identify and stop the source of the spill and alert people working in the vicinity
- Notify the Environmental Manager immediately giving information on the location, type, and extent of the spill so that they can take appropriate action
- If applicable, eliminate any sources of ignition in the immediate vicinity of the incident
- Contain the spill using the spill control materials, track mats or other material as required. Do not spread or flush away the spill
- If possible, cover or bund off any vulnerable areas where appropriate such as drains, watercourses and/or sensitive habitats
- If possible, clean up as much as possible using the spill control materials
- Contain any used spill control material and dispose of used materials appropriately using a fully licensed waste contractor with the appropriate permits so that further contamination is limited
- The Environmental Manager will inspect the site as soon as practicable and ensure the necessary measures are in place to contain and clean up the spill and prevent further spillage from occurring; and
- The Environmental Manager will notify the Employer's Representative who will notify the Employer and appropriate stakeholders such as National Parks and Wildlife Service (NPWS), and/or the Environmental Protection Agency (EPA), if required.

Further spill prevention and control measures are set out in Section 8.3.2.3 below.

8.3.2.4 Fire Control

Every effort will be made to prevent the outbreak of a fire during the construction phase of the proposed scheme. Fire extinguishers and first aid supplies will be available in the works areas. In the event of such an incident, the health and safety of all personnel will be a priority. All relevant legislation and guidance on health and safety of people and in particular fire safety will be complied with.

8.3.3 Extreme Weather Events

The Contractor will consider the effects of extreme weather events and related conditions during construction. The Contractor will use a short to medium range weather forecasting service from Met Eireann or other approved meteorological data and weather forecast provider to inform short to medium term programme management, environmental control measures.

All measures deemed necessary and appropriate to manage extreme weather events will be considered and will specifically cover training of personnel and prevention and monitoring arrangements for staff. As appropriate, method statements will also consider extreme weather events where risks have been identified.

8.3.4 Unexpected Discoveries

Appropriate procedures will be put in place in the event of encountering unexpected archaeological or cultural heritage assets or subsurface contamination during intrusive ground works.

Appropriate procedures will be developed as part of the CEMP and the Environmental Manager will ensure that specialists are facilitated to ensure management in accordance with industry best practice and effective compliance with the relevant legislation. All unexpected discoveries will be reported to the appropriate authorities and documented in an appropriate manner and reported to the Employer's Representative who will inform the appropriate authorities.

8.4 Construction and Decommissioning Phase Mitigation and Monitoring Measures

Set out below are the key environmental mitigation and monitoring measures to be implemented during the construction and decommissioning phases.

8.4.1 Biodiversity

The following measures will apply to the construction and decommissioning phase.

These mitigation measures have been taken from the following reports:

- Arup (2024) Lough Funshinagh Interim Flood Relief Scheme – Screening for Appropriate Assessment & Natura Impact Statement
- Arup (2024) Lough Funshinagh Interim Flood Relief Scheme – Ecological Impact Assessment Report.

8.4.1.1 Ecological Clerk of Works

An Ecological Clerk of Works (ECoW) will be appointed for the duration construction and decommissioning of the project. In general, the ECoW duties will include daily supervision of on-site works during construction and decommissioning to review and confirm that mitigation measures are being implemented correctly and adhered to, and to identify any unforeseen effects which could not have been reasonably predicted in the drafting of this report. Further details on duties relating to specific risks are identified through this mitigation section of the AA and Natura Impact Statement.

The ECoW will be a qualified ecologist and member of a relevant professional body such as the Chartered Institute of Ecology and Environmental Management and will be employed by, and report directly to, Roscommon County Council. The ECoW shall have a broad range of onsite ecological and environmental supervision including freshwater ecology and fisheries specialism and experience of overseeing construction activities in or near water.

The ECoW will provide an introductory toolbox talk for any people working on site to highlight all sensitive receptors including the lough itself and any potential mobile species such as birds and otter which may be present.

The ECoW will carry out a pre-construction walkover of the site to confirm that there have been no further evidence of protected species or significant change in conditions on site.

8.4.1.2 Silt Measures

Silt fencing will be installed to eliminate any silt load entering the lough and any other waterbody. The silt fencing specification will be reviewed by a qualified surface water specialist on behalf of RCC. The installation of silt fencing will be supervised by the ECoW and will be inspected at least three times per day during the construction and decommissioning works to ensure it is performing as required and for example has not become clogged with any sediment. If any failures in sediment fencing are identified these shall be rectified immediately on identification.

No direct untreated point discharge of construction runoff to watercourses or groundwater bodies will be permitted.

The regular monitoring of downstream receptor water quality for sediments and hydrocarbons and the inspection of the pollution control facilities will be carried out during construction works.

Where a pollution incident is detected, construction works will be stopped until the source of the construction pollution has been identified and remedied.

All pollution control measures will be monitored daily to ensure their continued integrity and desired function.

Continuous monitoring of sediment concentrations in the receiving water, during construction activities near watercourses, will be carried out to ensure compliance and respond immediately to pollution events.

These measures are based on the following best practice guidelines to ensure that water bodies are adequately protected during construction work:

- Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (Inland Fisheries Ireland, 2016)
- Central Fisheries Board Channels and Challenges – The Enhancement of Salmonid Rivers
- CIRIA – Guideline Document C648 Control of Water Pollution from Linear Construction Projects, technical guidance
- CIRIA – Guideline Document C793 The SuDS Manual
- CIRIA – Guideline Document C624 Development and flood risk – guidance for the construction industry
- CIRIA (C649) Control of water pollution from linear construction projects, site guide (2006)
- CIRIA (C532) Control of water pollution from construction sites, guidance for consultants and contractors (2001)
- Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes (NRA, 2005).

8.4.1.3 Fuelling Activities

Fuelling of machines during construction or decommissioning will be carried out in accordance with OPW Protocols. During the construction and decommissioning phases, the refuelling of vehicles, equipment and machines will take place at a designated area that is no less than 50 m away from all watercourses. A spill kit will be present at this designated area.

Fuel trucks will be certified in accordance with regulations.

8.4.1.4 Chemical Storage

Reference should also be made to mitigation measures for chemical storage described in Section 8.4.2 (Water) and 8.4.3 (Land, Soils, Geology and Hydrogeology).

During construction, the storage tanks for oils, fuels or chemicals will be sited on an impermeable base, surrounded by an impermeable bund, and inspected regularly for leaks. Any valve, filter, sight gauge, vent pipe or other ancillary equipment must be kept within the bund when not in use. The drainage system of bunded areas shall be sealed with no outlet to any watercourse, pond or underground strata.

Bunded areas will be located on stable and on level ground and located away from all waterbodies.

All bulk fuels storage for the construction stage must be contained within a double skinned bowser/container or have a bund. Double skinned tanks or bowsers must also be bunded unless the outer skin would provide secondary containment. The bund must have sufficient volume to contain 110% of the contents of the largest fuel/pipe container or 25% of the total storage capacity of all the containers, whichever is the greater.

- All fuel containers, including those containing waste fuels, must be stored on a drip tray/bunded area away from vehicle traffic within a designated storage area, where possible, to avoid damage

- Plant will be regularly inspected, serviced and maintained to minimise the risk of leaks/spills. At the end of each working day, driveable plant will be moved away from watercourses.

8.4.1.5 Spill Control Measures

An effective spillage procedure should be put in place. Any waste oils or hydraulic fluids should be collected, stored in appropriate containers and disposed of offsite in an appropriate manner. Site operatives should provide spill kits and they should be stored on-site during construction and used in the event of a fuel or chemical spillage. Such kits should contain absorbent materials (such as absorbent granules, booms or mats). Appropriate operatives responsible for handling chemicals or oils or for plant refuelling should be trained in the use of this kit.

Spill kits are to be available near all points of work and personnel trained in their use. Physical barriers will be installed wherever necessary to stop any material overspill.

No fuels, oils or other chemicals will be stored in high-risk locations such as:

- Within 50 metres of a spring, well or borehole
- Within 10 metres of a watercourse
- Places where spills could enter open drains or soak into groundwater or
- On a floodplain.

8.4.1.6 Vehicle and Plant Movements

Public and access roads will be regularly inspected and maintained to minimise sediment laden run-off.

All vehicles, plant and equipment will be regularly inspected and maintained in accordance with manufacturers' recommendations. Records of inspections will be maintained on site.

Areas of hard standing will be provided at site access and egress points, where practicable. The areas will be regularly inspected and cleaned.

8.4.1.7 Biosecurity

Biosecurity measures shall be implemented for the construction stage of the scheme. Measures will be required to specify no transfer of organic materials from outside the construction site without appropriate safeguards to avoid the introduction and/or spread of invasive non-native species to the site.

All loose stone material used for the compound and access road will be washed prior to import to site.

All machinery should be dry and free of mud or debris from all previous sites. If necessary, machinery and equipment will be washed down to remove any soil and organic material and then disinfected before entering site. No machinery and equipment will be allowed within 10m of the lough edge and any other waterbodies including the Cross River unless necessary for the construction and decommissioning of the infrastructure.

A visual inspection of plant machinery, equipment and material will be conducted by the ECoW when entering site to confirm absence of organic material. The most recent project working locations where all machinery and plant has been deployed shall be recorded and reviewed by RCC and the ECoW prior to entering the site. The contractor will confirm that machinery is not being brought onto site immediately from works on other waterbodies. If this is the case, then a record should be provided detailing disinfection methods as approved by IFI.

All boats, their trailers and any lines/ropes, equipment etc., that have the potential to be used within Lough Funshinagh for the purpose of the proposed scheme must adhere to the IFI biosecurity guidance[5] and the IFI Biosecurity Protocol for Field Survey Work[6] and the 'Check, Clean, Dry' protocol.

[5] IFI Biosecurity Theme. Accessed at https://www.fisheriesireland.ie/what-we-do/research/research-theme-biosecurity August 2024.
[6] IFI (2010) IFI Biosecurity Protocol for Field Survey Work. December 2010. Accessed at https://www.fisheriesireland.ie/sites/default/files/2021-06/research_biosecurity_biosecurity_for_fieldsurveys_2010.pdf

All boats, trailers and equipment must be thoroughly inspected prior to commissioning of works for attached plants, animals or mud. Any foreign material should be removed and disposed of responsibly. To ensure complete disinfection, boats, trailers, and equipment should be allowed to dry thoroughly for at least 48 hours before being used in another waterbody. Boat operators must be mindful of anchor lines, ensuring they do not drag along the bottom of the waterbody, which can disturb aquatic habitats.

All boats/equipment must clean and disinfect any live wells, baitwells or any other likely sources of contaminated water prior to entering Lough Funshinagh and this should be carried out at a controlled facility where waste can be safely disposed of. The bilge must be flushed with disinfectant before leaving the cleaning facility. Following works, all boats and equipment must be visually inspected for all surfaces and any attached plant and animal material, mud or associated debris must be removed in a controlled manner.

8.4.1.8 Disturbance to Otter

The potential for visual and noise disturbance to otter exists therefore mitigation measures are proposed.

The ECoW will be present on site every day during the construction and decommissioning stages. Prior to construction commencing each day the ECoW will carry out a walkover check of the lough edge in proximity to the works to identify if any otters are present. The ECoW will inform site personnel when works can commence without causing disturbance to otter.

The ECoW will carry out weekly checks of the pumping area and lough edge in proximity to identify any evidence of otter. During operations, these checks will be conducted by the Project Ecologist in addition to the weekly checks of remotely operated cameras for the presence of otter. If any evidence of otter is identified this will be reviewed and any necessary further measures to mitigate effects identified and implemented.

Working hours are set out in Section 5.1.

There is no lighting proposed during construction and operation however if required this will be directional and pointed away from waterbodies including Lough Funshinagh and its shoreline and the Cross River and its riparian corridor. Any lighting on site will be reviewed by the ECoW and if necessary, changes to lighting arrangements will be discussed and agreed to safeguard movement of otters.

8.4.1.9 Mitigation for Brook Lamprey

To protect brook lamprey during construction activities, it is advised to schedule in-stream work outside their critical life stages, particularly spawning and larval periods. Therefore, in-stream work should be avoided during the spawning period (March to May) to prevent disturbance of spawning adults and the disturbance of spawning beds where eggs are deposited. In addition, in-stream work should be avoided during larval development stages (June to August) as ammocoetes are vulnerable to sedimentation and habitat disruption. If it is not possible to adhere to these avoidance periods, it will be necessary to liaise with NPWS and IFI and other relevant stakeholders to agree timing of works and relevant mitigation if required.

The installation of the geotextile material and natural flag stones on the bed of the Cross River, should be carried out under the supervision of the ECoW. The ECoW will involve overseeing the installation process and fish translocation to move fish from impacted areas to avoid risk of fish mortality. Fish translocation would take place prior to the installation of this material to move fish from the impacted areas to suitable habitat upstream of the outfall location. Netting and/or electric fishing techniques would be used, under DECC licence.

Any areas of exposed sediment deemed at risk of erosion during heavy rainfall shall be protected using measures such as coir matting until vegetation is able to establish on these surfaces. The ECoW will identify locations likely to be at risk of erosion.

8.4.2 Water

The employment of good construction management practices will minimise the risk of impacts to surface water due to the construction and decommissioning of the proposed scheme.

The following measures will apply to the construction and decommissioning phase.

The Construction Industry Research and Information Association (CIRIA) in the UK has issued a guidance note on the control and management of water pollution from construction sites, 'Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors'[7] .

The guide is written for project promoters, design engineers and site and construction managers. It addresses the main causes of pollution of soil, groundwater and surface waters from construction sites and describes the protection measures required to prevent impacts to groundwater and surface waters and the emergency response procedures to be put in place so that any impacts, which occur, can be remedied. The guide addresses developments on green field and potentially impacted brownfield sites. The construction management of the site will take account of the recommendations of the CIRIA guidance to minimise as far as possible the risk of impacts to soil, groundwater, and surface water.

Site activities considered in the guidance note include concreting operations.

8.4.2.1 Chemical Storage

Reference should also be made to mitigation measures for chemical storage described in Section 8.4.1 (Biodiversity) and 8.4.3 (Land, Soils, Geology and Hydrogeology).

- A detailed spillage procedure will be put in place and all personnel will be trained with respect to the relevant procedures to be undertaken in the event of the release of any sediment, hydrocarbons into a watercourse
- Spill kits will be maintained on site and relevant staff will be trained in their effective usage. All site personnel will be trained and aware of the appropriate action in the event of an emergency. In the event of spillage of any polluting substance and/or pollution of a watercourse, the EPA, Inland Fisheries Ireland and the NPWS will be notified
- Hydrocarbons used will be appropriately handled, stored, and disposed of in accordance with recognised standards as laid out by the EPA
- Containers will be properly secured to prevent unauthorised access and misuse. Any waste oils or hydraulic fluids will be collected, stored in appropriate containers, and disposed of offsite in an appropriate manner
- Refuelling of vehicles and mobile plant will take place at designated locations on an impermeable surface and from any drains or watercourses. A spill kit, including an oil containment boom and absorbent pads, will be on site at all times
- Generators, diesel pumps and similar equipment will be placed in drip trays to collect minor spillages. These will be checked regularly, and accumulated oil removed
- No vehicles will be left unattended when refuelling
- Hoses and valves will be checked regularly for signs of wear and turned off when not in use
- All vehicles will be regularly maintained, washed, and checked for fuel and oil leaks.

8.4.2.2 Concrete Control Measures

Concrete, grout, and other cement-based products which would typically be used in the construction of structures are highly alkaline and corrosive and can have a devastating effect upon water quality. Cement-based products generate very fine, highly alkaline silt (11.5 pH) that can physically damage fish by burning their skin and blocking their gills.

The following measures will be implemented to prevent concrete entering watercourses:

- Hydrophilic grout and quick-setting mixes or rapid hardener additives to be used to promote the early set of concrete surfaces exposed to water

[7] CIRIA (2001) Control of water pollution from construction sites. Guidance for consultants and contractors (C532)

- Concreting works will be carried out in dry conditions where possible and concrete works will be strictly controlled and monitored
- No concrete washout will be allowed to discharge to watercourses. Wash out of concrete trucks will not be permitted on site
- Batch loads of concrete will be delivered on an as needed basis, to pre-prepared hardstand areas within the site
- All concrete mixing and batching activities will be located in areas away from watercourses and drains
- Small batch concrete loads will be delivered to specific construction locations by mini dumper or other enclosed contained system of transfer
- Trucks that deliver concrete to site will be washed out at the supplier's facilities and not on site
- A designated trained operator experienced in working with concrete will be employed during concrete pours
- Best practice in bulk-liquid concrete management addressing pouring and handling, secure shuttering / formwork, adequate curing times will be implemented; and
- Wash water from cleaning ready mix concrete lorries and mixers may be contaminated with cement and is therefore highly alkaline, therefore, washing will not be permitted on site.

8.4.2.3 Flood Risk Mitigation

During the construction and decommissioning phase, the following control measures will be adhered to:

- The construction compound will be located in area that is above the expected water level of the lough
- No construction materials or temporary stockpiles will be stored in areas which would impede flood flow paths; and
- In relation to effects of extreme weather events and related conditions the contractor will use a short to medium range weather forecasting service from Met Éireann or other approved meteorological data and weather forecast provider to inform short to medium term programme management, environmental control and mitigation measures.

8.4.2.4 Foul Waste

The foul drainage from the welfare facilities at the construction site will be associated with toilets. Wastewater will be disposed of by removal from site by a licensed waste contractor to an appropriately licensed treatment facility.

8.4.3 Lands, Soils, Geology, Hydrogeology

The proposed works will be constructed in accordance with the relevant design standards by means of good practice measures under appropriate engineering supervision. The following measures will apply to the construction and decommissioning phase.

8.4.3.1 Pollution of soil and groundwater

Measures to be implemented to minimise the risk of spills and contamination of soils and groundwater will include:

- Employing only competent and experienced workforce, and site-specific training of site managers, foreman and workforce, including all subcontractors, in pollution risk and preventative measures
- Ensure that all areas where liquids (including fuel) are stored, or cleaning is carried out, are in designated impermeable areas that are isolated from the surrounding area and within a secondary containment system, e.g. by roll-over bund, raised ramps or stepped access

- The location of any fuel storage facilities will be considered in the design of all construction compounds and will be fully bunded. These are to be designed in accordance with relevant current guidelines and codes of best practice at the time of construction
- Good housekeeping will be maintained at the site (daily site clean-ups, use of disposal bins, etc) during the entire construction and decommissioning phase
- All concrete mixing and batching activities will be located in designated areas away from watercourses and drains
- Potential pollutants will be adequately secured against vandalism in containers in a dedicated secured area
- Provision of proper containment of potential pollutants according to relevant and current codes of practice and legal requirements
- Thorough control during the entire construction and decommissioning stages to ensure that any spillage is identified at early stage and subsequently effectively contained and managed
- Spill kits to be provided and kept close to the temporary construction compounds. Staff to be trained on how to use spill kits correctly.

8.4.3.2 Protection of lands and soil

The contractor will reinstate all working areas and access routes as work proceeds during construction and decommissioning. All plant, equipment, materials, temporary infrastructure and vehicles will be removed at the earliest opportunity and the surface of the ground restored as near as practicable to its original condition.

Where trees and hedgerows are to be removed, tree protection fencing in accordance with BS5837:2012[8] will be installed to protect adjacent trees from construction traffic or activity to ensure their integrity and vitality.

Excavated topsoil and subsoil during trenching at road crossings will be stockpiled appropriately for later backfilling.

8.4.4 Noise

The contractor will be required to manage the noise and vibration aspects of the project in accordance with BS 5228 Part 1 (2009) and the European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001 '*Code of Practice for Noise and Vibration Control on Construction and Open Sites*'[9]. This document provides for practical measures that limit the hours in which noisy activities are permitted, provision of acoustic screening for noisy activities, use of silencers on equipment, siting of noisy mobile equipment away from sensitive receptors, and the provision of relevant training with respect to minimising noise disturbance.

BS 5228 includes guidance on several aspects of construction site practices, including, but not limited to:

- Selection of quiet plant
- Control of noise sources
- Screening.

Detailed information on these items is provided in the following paragraphs. Noise control measures that will be considered include the selection of quiet plant, enclosures, and screens around noise sources, limiting the hours of work and noise monitoring.

[8] British Standards Institution (BSI). (2012). BS5837:2012 Trees in Relation to Design, Demolition and Construction – Recommendations. BSI Standards Limited, London, UK.

[9] British Standards Institution (BSI). (2009). BS 5228-1:2009+A1:014 Code of Practice for noise and vibration control on construction and open sites. Part 1: Noise. BSI Standards Limited, London, UK.

8.4.4.1 Selection of quiet plant

This practice is recommended in relation to sites with static plant such as compressors and generators. It is recommended that these units be supplied with manufacturers' proprietary acoustic enclosures where possible. The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site.

The least noisy item should be selected wherever possible. Should a particular item of plant already on the site be found to generate high noise levels, the first action should be to identify whether or not said item can be replaced with a quieter alternative.

8.4.4.2 General comments on noise control at source

If replacing a noisy item of plant is not a viable or practical option, consideration should be given to noise control 'at source'. This refers to the modification of an item of plant or the application of improved sound reduction methods in consultation with the supplier. For example, resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can often be controlled by fixing resilient materials in between the surfaces in contact.

BS 5228 states that "*as far as reasonably practicable sources of significant noise should be enclosed*". In applying this guidance, constraints such as mobility, ventilation, access, and safety must be taken into account. Items suitable for enclosure include pumps and generators. Demountable enclosures will also be used to screen operatives using hand tools and will be moved around site as necessary.

8.4.4.3 Screening

Typically, screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to all other forms of noise control. The effectiveness of a noise screen will depend on the height and length of the screen and its position relative to both the source and receiver.

The length of the screen should be at least five times the height, however, if shorter sections are necessary then the ends of the screen should be wrapped around the source. The height of any screen should be such that there is no direct line of sight between the source and the receiver.

BS 5228 states that on level sites the screen should be placed as close as possible to either the source or the receiver. The construction of the barrier should be such that there are no gaps or openings at joints in the screen material. In most practical situations the effectiveness of the screen is limited by the sound transmission over the top of the barrier rather than the transmission through the barrier itself. In practice screens constructed of materials with a mass per unit of surface area greater than 7 kg/m^2 will give adequate sound insulation performance.

In addition, careful planning of the site layout should also be considered. The placement of site buildings such as offices and stores and in some instances materials such as topsoil or aggregate can provide a degree of noise screening if placed between a noise source and receptor.

8.4.5 Air Quality

Dust emissions may occur during construction and decommissioning, although the prevailing weather, the nature of the works and the distance from sensitive receptors will determine the extent of the effects. The focus of the control procedures will therefore be to reduce the generation of airborne material.

Standard measures will be implemented, as per guidance presented in the TII document *Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes* (TII, 2011). These will include the following:

- During dry periods when dust generation is likely or during windy periods, working areas and vehicles delivering material with dust forming potential will also be sprayed with water, as appropriate
- Control of vehicle speeds, speed restrictions and vehicle access; and
- Surrounding public roads used by trucks to access to and egress from the works areas will be cleaned regularly using an approved mechanical road sweeper as required.

In addition, the following measures will be implemented. These measures are based on best practice as outlined in the British Research Establishment (BRE) document *Controlling particles, vapour and noise pollution from construction sites* (BRE, 2003) and the Institute of Air Quality Management (IAQM) document *Guidance on the assessment of dust from demolition and construction* (IAQM, 2024).

- Exhaust emissions from vehicles operating within the working areas, including trucks, excavators, diesel generators or other plant equipment, will be controlled through regular servicing of machinery
- Areas where materials will be handled and temporarily stockpiled will be designed to minimise their exposure to wind – all stockpiles will be kept to the minimum practicable height with gentle slopes
- There will be no long-term stockpiling within the working areas and storage time will be minimised
- Material drop heights from plant to plant or from plant to stockpile will be minimised
- Truck loads will be covered when carrying material likely to generate dust
- Employee awareness is also an important way that dust may be controlled on any site. Staff training and the management of operations will ensure that all dust suppression methods are implemented and continuously inspected.

8.4.6 Climate

The following measures will apply to the construction and decommissioning phase:

- Minimise wastage of materials due to poor timing or over ordering on site thus helping to minimise the embodied carbon footprint of the proposed works
- Where practicable, opportunities for materials reuse should be identified and incorporated within the extent of the proposed works including maximising the use of site-won material; and
- Where practicable, materials should be sourced locally to reduce the embodied emissions associated with transport.

8.4.7 Archaeological Heritage

The following measures will apply to the construction and decommissioning phase:

8.4.7.1 Construction

Table 2 Archaeological heritage mitigation and monitoring measures for the construction phase

No.	Works	Potential impact	Mitigation
1	Installation of pump intake system within the underwater section of the field	Unknown archaeology within the submerged field disturbed	Pump intake system will be installed to be supported by the pontoon and sit on thin metal legs with plates at the bottom to avoid settlement. Settlement into field submerged in water not expected to exceed 150mm.
2	Establishment of intake compound next to lough	Unknown archaeology within field impacted by compound	A combination of geogrid and geotextile will be placed over the vegetation on the existing surface within the footprint of the proposed intake compound. The intake compound will be located next to access from landowners' yard; therefore, access track is not necessary and as such, the field will not be impacted by any machinery or vehicles.
3	Excavation under and to either side of roads	Impact to unknown archaeology potentially under and to either side of roads	Impact unlikely due to depth similar to depths excavated for the laying of services previously. Regardless, the methodology for these excavations should be reviewed by an archaeologist. The excavations either side of the road should be subject to archaeological monitoring. Road crossings will necessitate pipes being run through hedgerows and stone walls. This will be done in such a way to minimise impact and hedgerows will be replaced by native species and stone wall repairs will be carried out by suitably experienced stonemasons.

No.	Works	Potential impact	Mitigation
4	Laying of pipe	Impact to unknown archaeology potentially within fields	Pipes will be laid overground (transported by tractor/excavator and trailer and laid by hand) across the field systems. They will not be pinned in place. In the field where the pipes transition to a single PE ribbed pipe, the ground beneath the PE ribbed pipe will be smoothed to remove bumps and depressions within the soil surface from livestock hoofs. The maximum depth change will be 150mm which is less that the depth of influence in conventional agricultural tilling.
5	Protection of Cross River from scour and erosion including laying geotextile and natural flag stones onto the riverbed	Compaction of riverbed, affecting potential archaeology within riverbed	It is not considered that impacts are likely due to the shallow depth of this intervention and the relatively modern nature of the riverbed due to modifications over time. However, archaeological monitoring is required to monitor the laying of the geotextile and natural flag

8.4.7.2 Decommissioning

- The site compound (concrete bund on compacted stone on geogrid and geotextile layers) along with the pump and pontoon will be carefully removed, the compound area rotavated to a maximum depth of 150mm and the field returned to its original use
- The flexible pipes and fences will be removed and rolled by hand
- The removed sections of hedgerows will be replaced by native species and the removed sections of stone walls will be replaced and repaired by experienced stone masons
- The geotextile layers, natural flag stones and rock armour will be carefully removed from the riverbanks
- The PE ribbed pipe will be removed by cutting it into transportable lengths (typically 5-12m lengths) using a consaw and lifted onto a flatbed trailer using an excavator. The ground beneath the PE ribbed pipe will be rotovated to a maximum depth of 150mm if the pipe has made an indentation in the soil
- No impacts are foreseen from the decommissioning phase.

8.4.8 Traffic & Transportation

The traffic management is detailed in Section 6.

8.4.9 Resources and Waste

A suite of mitigation measures are outlined below which RCC will implement with agreement with the contractor, in any event, to ensure that waste arisings will be managed in accordance with the waste hierarchy, in compliance with the provisions of the Waste Management Acts, 1996[10], as amended, and to contribute to achieving the objectives set out in the Waste Action Plan for a Circular Economy[11] .

The following mitigation measures will be implemented during construction and decommissioning phase, where practicable, by the appointed contractor, to minimise waste and maximise material reuse:

- Where waste generation cannot be avoided, waste disposal will be minimised
- Opportunities for reuse of materials, by-products and wastes will be sought throughout the construction and decommissioning phase of the proposed works
- The site will be maintained to prevent litter and regular litter picking will take place throughout the site
- 'Just-in-time' delivery will be used, where practicable, to minimise material wastage

[10] Government of Ireland (1996) Waste Management Act, 1996. Number 10 of 1996. Irish Statute Book

[11] Department of Communications, Climate Action and Environment (2020) A Waste Action Plan for a Circular Economy, Ireland's National Waste Policy 2020-2025.

- All staff on-site will be trained on how to minimise waste (i.e., training, induction, inspections and meetings)
- Materials on-site will be correctly and securely stored
- Where possible, metal, timber, glass and other recyclable material will be segregated and removed off site to a permitted / licensed facility for recycling
- Waste bins, containers, skip containers and storage areas will be clearly labelled with waste types which they should contain, including photographs as appropriate
- Segregated skips will be used within a designated waste segregation area to be located in the on-site construction compound (particularly for hazardous, gypsum, metal, timber, inert waste and general waste)
- The appointed contractor will record the quantity in tonnes and types of waste and materials leaving the site during the construction phase
- The name, address and authorisation details of all facilities and locations to which waste and materials are delivered will be recorded along with the quantity of waste in tonnes delivered to each facility. Records will show the type of material, which is recovered, which is recycled, and which is disposed of
- Waste generated on-site will be removed as soon as practicable following generation for delivery to an authorised waste facility
- The appointed contractor will ensure that any off-site interim storage facilities for excavation material have the appropriate waste licences or waste facility permits in place; and
- The relevant appropriate waste authorisation will be in place for all facilities that wastes are delivered to (i.e., EPA Licence, Waste Facility Permit or Certificate of Registration).

8.4.10 Material Assets - Existing Services

The contractor will be obliged to put measures in place to ensure that there are no interruptions to existing services and that all services and utilities are maintained unless this has been agreed in advance with the relevant service provider and local authority. Where connections are required, the contractor will apply to the relevant utility company for a connection permit and adhere to their requirements.

Prior to undertaking any works, a cable avoidance tool (CAT) scan will be undertaken to identify any services in the road.

8.4.11 Landscape and Visual

As the construction of the proposed scheme is short in duration, with no potential for significant landscape and visual effects, no mitigation or monitoring measures are proposed.

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Appendix J – Monitoring Report

ARUP

Roscommon County Council

Lough Funshinagh Interim Flood Relief Scheme

Appendix J - Operations Phase Water Monitoring Strategy

Reference:

Issue 01 | 16 September 2024

Job number 303666-00

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1. Introduction

1.1 Overview

Ove Arup & Partners Ireland Ltd (Arup) has been appointed by Roscommon County Council (RCC) to prepare an Operations Phase Monitoring Strategy for a proposed interim flood relief scheme for Lough Funshinagh, Co. Roscommon.

Lough Funshinagh is a turlough or 'disappearing lake' located approximately 13km to the northeast of Athlone town in Co. Roscommon. In recent years, and in particular since 2016, water levels in the lough have risen, resulting in flooding of nearby property and increasing the flood risk to Curraghboy village which is 1.7 km to the southwest of the lough. Roscommon County Council is in the process of designing a more permanent scheme to manage flood risk in the vicinity of the lough. Prior to the implementation of the permanent scheme, more immediate measures are needed to manage flood risk, particularly for local property and for the village of Curraghboy. To that end, an interim scheme has been designed, to try to manage the level of the turlough such that it does not pose significant flood risk to the surrounding area. The intent is to pump water from the turlough, for a period of up to two years, with the intent of reducing to, and maintaining, a level in the lough of 67.5m above ordnance datum. This level has been determined following expert review and independent analysis of historical lough levels and is well above historical 'natural' lough levels.

The proposed scheme comprises two pumps working in parallel, pumping water from the lough, into an overland pipe which will run from Lough Funshinagh to the Cross River, approximately 2.5km southwest of the lough. The pumps will operated 24 hours per day, at a combined flow rate of 300 l/sec, until the lough levels reduce to 67.5mO.D and will then operate intermittently to maintain this level. The overland pipe will discharge the pumped volume of water to the Cross River. The proposed scheme has been designed with due cognisance for the sensitivity of the lough, the River Cross and the pipe route.

A more detailed description of the proposed scheme is provided in the main report.

1.2 Report Aim

The Operations Phase Monitoring Strategy aims to provide a comprehensive plan designed to safeguard water resources during the operational phase of the proposed scheme. This strategy outlines the systematic approach that will be implemented to monitor water quality, detect and mitigate potential risks, and ensure ongoing compliance with regulatory and environmental standards.

2. Consultation

2.1 Inland Fisheries Management

Inland Fisheries Ireland (IFI) was contacted requesting guidance regarding the waterbodies at Lough Funshinagh and the Cross River in relation to the proposed scheme. The purpose was to understand any potential concerns IFI might have about the proposed scheme and obtain advice on the design of the pump intake, screen, mesh sizes, outfall to the Cross River and any potential general impact on fisheries from the proposed scheme and mitigation which might be necessary to minimise or eliminate impacts. Additionally, Arup requested any available data for the Cross River and Lough Funshinagh to inform the relevant reports (AA, EcIA and WFD Assessment). In response to Arup's inquiry, IFI sent a letter on August 13th requesting further information, to which Arup provided a detailed response on August 16th. On August 30th Arup received a response via email from IFI, suggesting several additional mitigation strategies to prevent erosion and water quality impacts are embedded within the proposed scheme. These mitigation strategies can be read within the Ecological Impact Assessment report and Screening for Appropriate Assessment and Natura Impact Statement report.

3. Baseline

3.1 Water Quality

Water quality records were reviewed via freely accessible records on the Environmental Protection Agency[1] (EPA) and Catchments[2] websites. In addition, water quality samples were taken from both Lough Funshinagh and across locations within the River Cross (See Figure 1). One sample from the River Cross was taken upstream from the proposed scheme to act as a control. The remaining six sample locations within the watercourse were taken downstream of the proposed scheme. In total, three samples were taken from Lough Funshinagh.

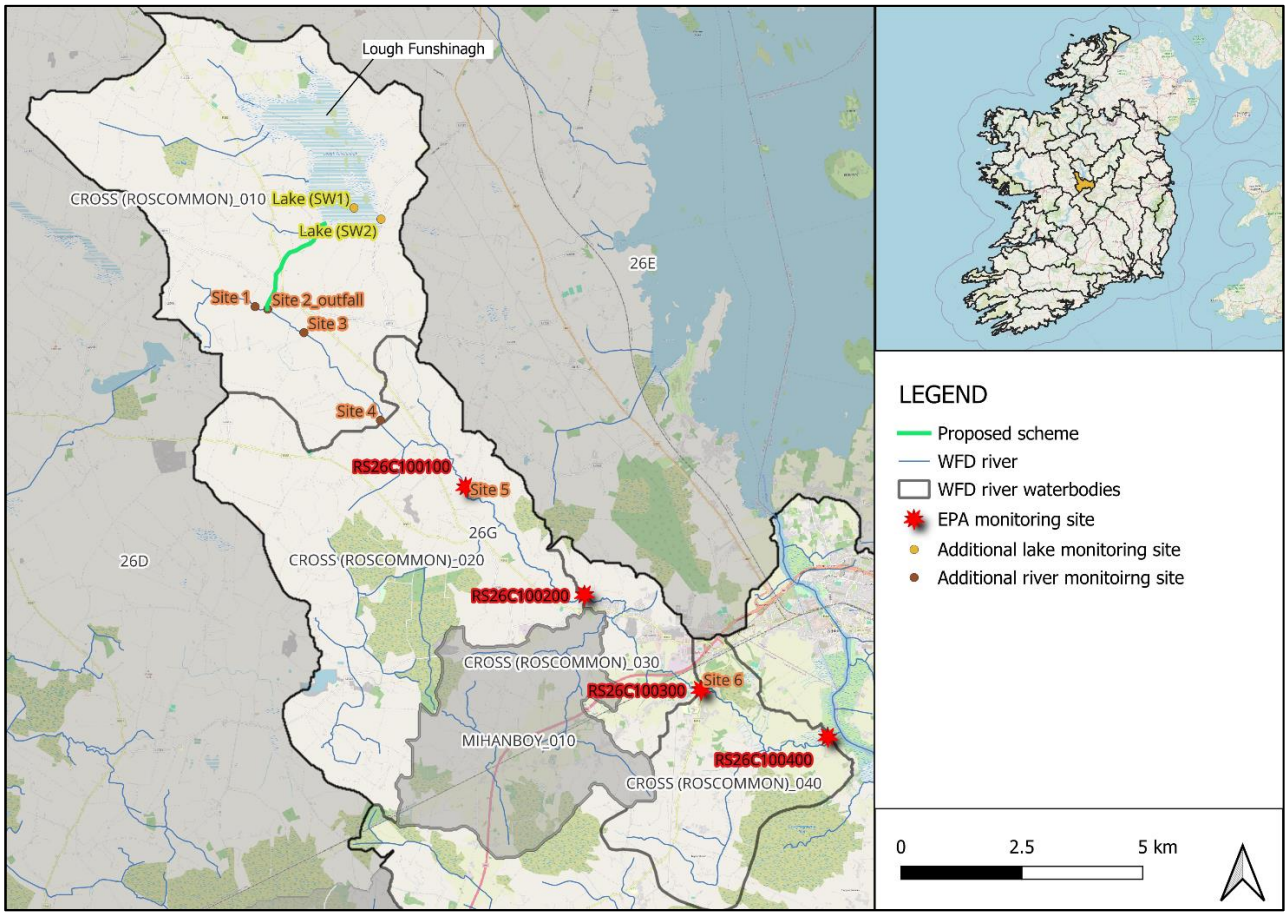

Figure 1 Location of water quality monitoring sites and select EPA water quality monitoring stations in relation to the proposed scheme

The baseline water quality results (i.e. Sites S1-S7 for Cross River and Sites F1-F3 for Lough Funshinagh) are presented in Table 1 below and will underpin the water quality monitoring throughout the operational phase of the proposed scheme. Full details of the comprehensive water quality assessment are described within the Arup (2024) Lough Funshinagh Interim Flood Relief Scheme – Water Framework Directive Compliance Report[3]. Monitoring will be conducted according to the methodologies outlined in Section 4 of this report.

[1] Home | Environmental Protection Agency (epa.ie) [Accessed August 2024]
[2] Catchments.ie - Water, from source to sea. [Accessed August 2024]
[3] Arup (2024). Lough Funshinagh Interim Flood Relief Scheme – Water Framework Directive Compliance Report.

Table 1 Cross River and Lough Funshinagh Water Quality Baseline

Sample	S1	S2	S3	S4	S5	S6	S7	F1	F2	F3
pH	7.71	7.64	7.85	7.5	7.62	7.92	8.04	8.16	8.2	8.24
Conductivity @25°C (µs/cm)	718	716	706	691	479	579	576	333	334	330
Total Alkalinity (mg CaCO3/l)	377	374	370	350	237	257	258	159	160	157
Total Oxidised Nitrogen (mg N/l)	1.108	1.113	1.021	1.561	0.636	1.36	1.228	0.014	0.04	0.037
Nitrate (mg N/l) 1	1.103	1.107	1.015	1.556	0.627	1.352	1.223	0.011	0.036	0.033
Nitrite (mg N/l)	0.005	0.006	0.006	0.005	0.009	0.008	0.005	0.003	0.004	0.004
Total ammonia (mg N/l)	0.03	0.031	0.028	0.019	0.039	0.014	0.027	0.021	0.014	0.007
Unionised ammonia (mg N/l)	0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.001	0.001	0.001	<0.001
MRP (mg P/l)	0.009	0.008	0.011	0.011	0.008	0.011	0.01	<0.001	<0.001	<0.001
BOD (mg O2/l)	1.1	0.6	0.8	0.9	0.9	0.8	0.8	-	-	-
COD (mg O2/l)	14.4	14.9	14.9	17.9	18.7	19.6	21.3	-	-	-
Suspended solids (mg/l)	1.3	1.3	1	7.2	1	2	2	4.5	5.8	6
Chloride (mg Cl/l)	13.3	13.4	13.2	15.8	12.9	29.2	28	11.51	11.42	11.42
Dissolved oxygen (mg O2/l)	7.7	7.9	8.2	8.9	12.7	10.8	10.1	-	-	-
Chlorophyll a (µg/l)	-	-	-	-	-	-	-	39.4	47.2	49.7
Total P (mg/l)	-	-	-	-	-	-	-	0.043	0.05	0.051

3.2 Hydrology

The assessment of potential changes in hydrological processes in watercourses affected by the proposed scheme is underpinned by hydrological modelling[4] detailed within the MWP (2024) Lough Funshinagh Interim Pumping System – Engineering Report[4]. The modelling has been undertaken to assess the potential impacts that the proposed scheme would have upon the hydrological function of Lough Funshinagh and the River Cross. The assessment includes a review of available flow gauge data, estimations of the flow (m^3/s) during both high and low flow events with and without the proposed scheme (i.e. additional pumped water) and the flow discharge (m^3/s). Flood risk at both low and high flows is provided within the engineering report.

The baseline results, as detailed in the MWP (2024) Lough Funshinagh Interim Pumping System – Engineering Report, will underpin the hydrological monitoring throughout the operational phase of the

[4] MWP (2024) Lough Funshinagh Interim Pumping System. Engineering Report. Roscommon County Council. September 2024.

proposed scheme. Monitoring will be conducted according to the methodologies outlined in Section 4 of this report.

3.3 Fluvial Geomorphology

To date, no fluvial geomorphological assessment has been undertaken. Therefore, a fluvial geomorphological assessment will be undertaken prior to construction of the proposed scheme to evaluate the current state of the river's morphology, identify potential erosion or sedimentation issues as a result of the proposed scheme, and inform the development of targeted management strategies to mitigate any identified risks.

4. Operations Phase Monitoring

4.1 Overview

This section outlines the methodologies that will be deployed to conduct monitoring during the operations phase of the proposed scheme, specifically focusing on water quality, hydrology, and fluvial geomorphology. The aim is to ensure that these aspects are closely observed and managed throughout the operational lifespan of the project, thereby minimising potential negative impacts on the water environment.

4.2 Water Quality

4.2.1 Locations

Water quality monitoring will be undertaken at the 7 locations on the Cross River and three locations in Lough Funshinagh indicated in Table 2 below.

Table 2 Water Quality Monitoring Locations

Site no.	Watercourse	EPA code	Location	X (ITM)	Y (ITM)
S1	Cross River	26C10	250m upstream of proposed outfall	591827	748120
S2	Cross River	26C10	Proposed outfall	592078	748072
S3	Cross River	26C10	Curraghboy	592825	747561
S4	Cross River	26C10	Derryglad	594403	745763
S5	Cross River	26C10	Millnagh Mill	596180	744369
S6	Cross River	26C10	R446 road crossing	601017	740204
S7	Cross River	26C10	Kilnamanagh	603656	739232
F1	Lough Funshinagh	-	South basin	594349	749659
F2	Lough Funshinagh	-	Central basin	593915	751852
F3	Lough Funshinagh	-	North basin	593045	753002

4.2.2 Methodology

Each of these locations should be made clearly identifiable using marker posts, photographs and physical features as a reference to enable locations to be consistently identified for the duration of the programme.

At each sampling location photographs and notes of possible influencing factors, such as weather conditions, ambient air temperature, the weather, the presence of dead fish floating in the water or of oil slicks, growth of algae, any unusual sights or smells, and recent management of the watercourse, will be recorded as these may have a bearing on the water quality results. Where no water is present, this will be recorded.

4.2.2.1 In-situ monitoring

The following parameters should be monitored in-situ, reducing the potential for contamination or degradation of the samples. The appropriate field kit for undertaking in-situ spot sampling should be acquired, and the manufacturer's instructions followed carefully. Calibration of the in-situ monitoring

equipment should be undertaken as per the manufacturer's instructions and a log detailing the type of calibration and results kept.

The in-situ parameters to be sampled at all locations include:

- Thermal Conditions:
  - Temperature: Water Temperature influences several other water quality parameters metabolic rates and biological activity of aquatic organisms;
- Acidification:
  - If the pH is too low (acidic) aquatic organisms will die. pH can also affect solubility and toxicity of chemicals and heavy metals in water;
- Salinity:
  - Conductivity is a measure of waters capability to pass electrical flow. Conductivity is the basis of salinity and total dissolved solids calculations. Conductivity is an early indicator of change in a water system;
- Oxygenation Conditions:
  - Dissolved oxygen (DO): DO is needed for aquatic organisms to respire. If the level is too high or low it can harm aquatic life and affect water quality;
  - Chemical Oxygen Demand (COD): measures the total quantity of oxygen required to chemically oxidize organic and inorganic matter in water. It provides a quick estimate of the level of pollutants, particularly those that are not easily biodegradable.
  - Biological Oxygen Demand (BOD): measures the amount of dissolved oxygen required by microorganisms to biologically break down organic matter over a specific period, typically five days at 20°C. BOD is a direct indicator of the organic pollution load and the potential for oxygen depletion in the water body.
- Nutrient Conditions:
  - Nitrate: represents the presence of nitrogen compounds in the water. Elevated levels of nitrates can indicate agricultural runoff, sewage, or industrial pollution, and can lead to eutrophication.
  - Nitrite: is an intermediate compound in the nitrogen cycle, often formed during the breakdown of ammonia by bacteria. Although naturally occurring in small amounts, elevated nitrite levels can be toxic to aquatic organisms and indicate pollution from agricultural runoff, sewage, or industrial discharges.
  - Ortho-Phosphate: is a soluble form of phosphorus commonly found in fertilizers, detergents, and organic matter. It is a key nutrient that can contribute to algal blooms when present in excessive amounts, leading to reduced water quality and oxygen levels.
  - Ammonia-Total: includes both ammonia (NH_3) and ammonium (NH_4^+), which exist in equilibrium depending on the pH and temperature of the water. Ammonia is highly toxic to fish and other aquatic organisms, and its presence often indicates contamination from agricultural runoff, sewage, or industrial processes.
- Chlorophyll a: This is the primary type of chlorophyll used in photosynthesis and is the most common measure for assessing algal biomass. High concentrations of chlorophyll a can indicate excessive algal growth, which may lead to problems such as oxygen depletion, reduced water quality, and potentially harmful algal blooms.
- Total Suspended Solids (TSS): TSS are the main cause of turbidity. High TSS blocks light from reaching aquatic plants which may in turn cause them to die due to a reduction in photosynthesis. High TSS can often mean higher concentrations of metal in water;

- Turbidity: Turbidity is caused by particles and coloured material in water. TSS are the main cause of turbidity; and
- Alkalinity: In-situ measurements of alkalinity will allow more accurate characterisation of supersaturated waters in areas of identified and potential tufa formations.

4.2.2.2 Laboratory sampling

Testing of the above parameters should follow standard water quality sampling laboratory procedures and be undertaken in a Environmental Protection Agency (EPA) accredited laboratory facility. Samples should be transported to a certified laboratory for testing within 24 hours from sampling, or within the holding times of the certified laboratory for the parameters sampled (if shorter) in a sturdy insulated box to protect samples from sunlight, prevent the breakage of sample bottles, and the use of cool packs should allow a temperature of 4°C to be maintained during transport. The samples should be delivered to the laboratory.

4.2.2.3 Frequency

Water quality sampling is to be undertaken on a weekly basis, with samples taken at a similar time of day throughout the programme and be approximately 1 week apart from the previous round. The water quality data will be analysed for trends each week to identify any exceeded water quality thresholds according to relevant Directives. Data will be reviewed in line with an adaptive monitoring strategy.

4.3 Hydrology

4.3.1 Methodology

Due to the length of the Cross River and the significant change in catchment area along the reach, flows will be monitored at three locations. The flow will be monitored by an automated data logger or similar at 15-minute intervals for the duration of pumping. The discharge from the pumps will also be remotely monitored so that the flow rate can be changed or shut off remotely. Although the analysis shows that most of the Cross River channel has sufficient capacity to convey the Index Flood (i.e., the 2-year return period flow), it is proposed to stop pumping at or before this flow is reached.

The location of flow monitoring stations relates to the location of water quality monitoring stations S2, S5 and S6 (Figure 1). Additional flow gauges will be installed by the Office of Public Works (OPW) in support of the monitoring programme.

Details of the monitoring locations are highlighted in Table 3. Full details of trigger flows to control pump operations are provided within the MWP (2024) Lough Funshinagh Interim Pumping System – Engineering Report[4].

Table 3 Flow monitoring locations

Site Number	Location	X	Y
Site 2	Pipeline Outfall	592078	748072
Site 5	Mid-Point – Near cross section 92	596180	744369
Site 6	EPA gauge at Summerhill (Station 26221)	601017	740204

5. Adaptive Monitoring

The adaptive monitoring process should include regular consultation with key stakeholders, such as IFI, to systematically review collected monitoring data and identify emerging issues at an early stage through trend analysis. As part of the adaptive approach, the monitoring program may be adjusted to address any detected changes in water quality and hydrology. This could involve increasing the sampling frequency to capture more detailed data, expanding the range of recorded parameters to include additional indicators that may signal shifts in water quality or reviewing trigger thresholds at the gauge monitoring stations. This approach will enable targeted interventions that address the source of water quality degradation or significant changes to hydrology through the operational phase of the proposed scheme.

Any changes to the monitoring approach will be carefully coordinated with stakeholders to ensure that the management actions during the operational phase of the proposed scheme remain effective. This approach will help to maintain the integrity of the water environment, allowing for effective responses to any potential changes identified as a result of the proposed scheme.

Appendix K – Addendum to aquatic baseline report for the Lough Funshinagh Interim Flood Relief Scheme

Addendum to aquatic baseline report for the Lough Funshinagh Interim Flood Relief Scheme

Prepared by Triturus Environmental Ltd. for Ryan Hanley

August 2024

Please cite as:

Triturus (2024). Addendum to aquatic baseline report for the Lough Funshinagh Interim Flood Relief Scheme. Report prepared by Triturus Environmental Ltd. for Ryan Hanley. August 2024.

Table of contents

1. Introduction

1.1 Background

Triturus Environmental Ltd. were commissioned by Ryan Hanley to conduct baseline aquatic and fisheries surveys to inform EIAR/NIS preparation for the proposed Lough Funshinagh Interim Flood Relief Scheme. This included detailed aquatic and fisheries surveys of both the Lough Funshinagh basin (in preparation) and of the Cross River (Triturus, 2024).

The aim of the interim measures is to extract a sufficient volume of water from Lough Funshinagh so as to mitigate the predicted increase in level over the short to medium term and to limit the peak water level to a level that will allow the flood risk at the properties around the lough to be successfully managed. This interim scheme is proposed prior to the interim scheme of a permanent scheme to manage flood risk in the vicinity of the lough. To achieve this, the proposed interim scheme is to pump water from Lough Funshinagh to the Cross River.

This addendum report provides preliminary summary information on the aquatic ecology baseline of Lough Funshinagh following the site surveys completed during June 2024. The current addendum report summaries key information to inform EIAR/NIS preparation. It includes physiochemical water quality (to establish the existing lake trophy), aquatic invertebrate communities (i.e. presence of red listed or rare species and or invasive species) and high level fisheries information. It also summarises the presence of rare aquatic habitats (e.g. macrophyte communities corresponding to Annex I Habitats) inclusive of invasive macrophyte plants. These findings would inform mitigation to prevent impacts to extant rare species or habitats in addition to the potential transfer of invasive species to the Cross River inclusive of downstream connecting aquatic habitats.

2. Results of lake aquatic survey

2.1 Aquatic habitats & macrophytes

An assessment of the aquatic vegetation community of Lough Funshinagh identified any corresponding rare macrophyte species listed under the Flora (Protection) Order, 2022 and or relevant Irish Red lists (Wyse-Jackson et al., 2016; Lockhart et al., 2012). It also helped establish any macrophyte plant communities corresponding to Annex I habitats such as 'Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp. [3140]' and 'Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation [3150]'. Furthermore, the aquatic surveys helped ascertain the presence of Annex I Habitats for which Lough Funshinagh SAC (000611) is designated, notably, 'Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation' [3270] (NPWS, 2018).

Conclusively, Lough Funshinagh supported local representations of the Annex I habitat 'Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation [3150]' (aka rich pondweed lake habitat). This classification is not eponymous with 'naturally eutrophic' waterbodies in Ireland given Ireland lacks natural rich phosphorous deposits (O' Connor, 2015) and where lakes are enriched it is of anthropogenic origin. Indeed, the physiochemical water samples collected as part of this study supported the lake being the eutrophic band.

The rich pondweed lake habitat [3150] macrophyte assemblage at Lough Funshinagh was characterised by pondweed species including *Potamogeton lucens, Potamogeton natans, Potamogeton crispus, Potamogeton perfoliatus, Potamogeton berchtoldii, Stuckenia pectinata* with non-Potamogeton community associates, notably *Myriophyllum spicatum* and *Lemna trisulca.* The diagnostic *Potamogeton-Myriophyllum* and *Lemna* species were often associated with more widespread *Oenanthe aquatica* and *Persicaria amphibia*. The rich pondweed lake habitat was specifically restricted to shallower depositional bays (opposite the windward eroding seiche) in the western basin. Following the abnormal deepening of the Lough Funshinagh Turlough basin, it must be noted that many of the macrophyte plants had adapted by elongating their stems to reach the new lake level and avail of available light. These communities of plants previously existed at much shallower depths (pers. obs.) and thus were exhibiting morphological plasticity (adaption) to the new lake conditions (i.e. deeper and more turbid water from the previous clear water shallow state).

No invasive macrophyte plant species were recorded apart from the invasive macrophyte Canadian pondweed (*Elodea canadensis*) that was frequent throughout the lake basin. The species is widespread in Ireland including much of the Shannon catchment and is listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011- 2021 (S.I. 477/2011). It is considered a high-risk invasive species in Irish waters (O' Flynn et al., 2014).

Lough Funshinagh SAC (000611) is also designated for the Annex I Habitat, Turloughs [3280] and Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation [3270] (NPWS, 2018) that is one of the main habitats supported in the inundation plains of turloughs. However, at the time of the survey the shallow plains of exposed wet muddy ground (critical for the habitat structure and function) were inundated and no visible examples of Rivers with muddy banks with Chenopodion rubri p.p. and Bidention p.p. vegetation (3270) were present in Lough Funshinagh.

2.2 Macro-invertebrates

No rare or protected macro-invertebrate species (according to national red lists) were recorded in the sweep samples collected from Lough Funshinagh during June 2024 (**Appendix A**). However, of note the composite sweep samples collectively recorded a high diversity of aquatic invertebrate species (*n*=71 taxa). The samples supported a community of species typical of shallow, weedy alkaline lakes and turloughs. Of the caddis species recorded, Leptocerids dominated the composition given their known association with turloughs (O' Connor, 2020). Four leptocerid species including *Athripsodes aterrimus*, *Mystacides longicornis, Oecetis furva and Triaenodes bicolor* were recorded during the survey. The Limnephilid species *Limnephilus marmoratus* and the Phryganid species *Agrypnia obsoleta* were also recorded present. These species are nationally well-distributed with no notable species recorded.

Common gastropod molluscs of lentic enriched habitats including *Ampullacaena balthica*, *Bithynia tentaculata*, *Planorbis planorbis*, and *Physa fontanlis* were recorded during the survey. No red-listed or rare species were encountered according to the national list for non-marine molluscs (Byrne et al. 2009).

A high diversity of aquatic beetles (*n*=18) were recorded during the survey. These species were characteristic of shallow lakes and lentic waterbodies including species known in turlough habitats. However, as stated no red-listed species were present (Foster et al., 2009). The near threatened lipped diver (*Agabus labiatus*)(Foster et al., 2009) for example was known previously from Lough Funshinagh (NPWS, 2018) but was not recorded during the current survey. The species is a turlough specialist where no large fish occur (Foster et al., 2009). Given that large shoals of coarse fish such as roach are now present in Lough Funshinagh, the habitat is considered poorly suitable for the species and this may account for the species absence. Other aquatic beetle species previously known from the lake i.e. *Haliplus obliquus*, *Helophorus minutus, Laccobius colon* and *Ochthebius minimus* (all least concern species) were not recorded during the current survey.

No non-native or invasive aquatic invertebrate species were recorded during the current survey (**Appendix A**).

2.3 Fish community

Lough Funshinagh is known to support a moderate diversity of fish species including eel (*Anguilla anguilla*), pike (*Essox lucius*), perch (*Perca fluviatilis*), roach (*Rutilus rutilus*), minnow (*Phoxinus phoxinus*), three-spined stickleback (*Gasterosteus aculeatus*) and ten-spined stickleback (*Pungitius pungitius*). These were either captured as bye-catch during sweep sampling or visually observed. Roach (*Rutilus rutilus*) is a coarse fish species that is listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011-2021 (S.I. 477/2011) and is considered a high-risk impact species in Ireland (O' Flynn et al., 2014). While the species is present in Lough Funshinagh it is also present in the Cross River and is one of the most widespread and numerous fish species in the Shannon catchment.

2.4 Physiochemical water quality

Three composite physiochemical water quality samples were collected from Lough Funshinagh (north 1, central 2 and southern basin 3 samples) on the 12th August 2024. The results informed the preliminary classification of lake trophy. The results of the laboratory analysis are summarised below in **Table 2.1** below with mean values also shown.

The pH level of Lough Funshinagh was high (mean 8.2) and indicative of hard water, reflecting local calcareous geologies. The lake also had a high alkalinity (mean 158.7mg/l $CaCO_3$) and a moderately high conductivity (mean 332.3µS/cm) typical of high-alkalinity waterbodies. The recorded alkalinity, size and depth best fell under a WFD Water Framework Directive (WFD) classification lake typology 12 (i.e., high alkalinity (>100 mg/1 $CaCO_3$), deep (>4m) and large (>50 ha).

The level of total phosphorus (mean 0.048mg P/l) did not meet the good status threshold as required in the European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (S.I. 77/2019) (i.e., good status is ≤0.025mg P/l). The levels of total phosphorus place Lough Funshinagh within the hyper-eutrophic band for lakes (OECD, 1982). This was also supported by the correlated high chlorophyll α concentrations (mean value of 45.4; **Table 2.1**). However, it should be noted that lake trophic status is only reliably calculated from annual maximum values of chlorophyll a, total phosphorus and water transparency (Secchi disc depth readings) across ≥10 samples during months with the greatest planktonic growth (O'Boyle et al., 2019).

Whilst S.I. 77/2019 sets no specific boundary conditions for nitrate in lakes, EPA assessment of high-quality water (riverine) sources has set boundary conditions of 0.8 mg/l NO3-N for high quality waters and 1.8 mg/l NO3-N for good quality waters (O'Boyle et al., 2019). Levels in Lough Funshinagh may be considered good overall (mean 0.027 mg/l N). Furthermore, biological uptake of the available nitrogen by plants and algae during the growth season may result in lower annual concentrations in August and true values may be higher over the course of a year. The ammonia levels were also low for both total ammonia and unionised ammonia factions (**Table 2.1**), the latter being toxic to aquatic life when high.

Table 2.1 Summary of physiochemical water quality results for Lough Funshinagh, August 2024

Parameter	Lough Funshinagh 1	Lough Funshinagh 2	Lough Funshinagh 3	Mean
Total Alkalinity (mg $CaCO_3$/l)	159	160	157	158.7
Conductivity @25°C (µS/cm)	333	334	330	332.3
pH	8.16	8.20	8.24	8.2
Total Ammonia (mg N/l)	0.021	0.014	0.007	0.014
Unionised Ammonia (mg N/l)	0.001	0.001	<0.001	0.001
Nitrate (mg N/l)	0.011	0.036	0.033	0.027
Nitrite (mg N/l)	0.003	0.004	0.004	0.004
MRP (mg P/l)	<0.001	<0.001	<0.001	<0.001
Total P (mg P/l)	0.043	0.050	0.051	0.048
Chlorophyll a (µg/l)	39.4	47.2	49.7	45.4
Suspended solids (mg/l)	4.5	5.8	6.0	5.4
Chloride	11.51	11.42	11.42	11.5

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4. Appendix A – Macro-invertebrate community

Table 4.1 Macro-invertebrate results for Lough Funshinagh, June 2024

Taxon	Family	Binomial name	Native Status
Ephemeroptera	Baetidae	*Cloeon dipterum*	**Native**
Ephemeroptera	Caenidae	*Caenis horaria*	**Native**
Trichoptera	Leptoceridae	*Athripsodes aterrimus*	**Native**
Trichoptera	Leptoceridae	*Mystacides longicornis*	**Native**
Trichoptera	Leptoceridae	*Oecetis furva*	**Native**
Trichoptera	Leptoceridae	*Triaenodes bicolor*	**Native**
Trichoptera	Limnephilidae	*Limnephilus marmoratus*	**Native**
Trichoptera	Limnephilidae	sp. indet.	**Native**
Trichoptera	Phryganeidae	*Agrypnia obsoleta*	**Native**
Coleoptera	Dytiscidae	*Agabus nebulosus*	**Native**
Coleoptera	Dytiscidae	*Colymbetes fuscus*	**Native**
Coleoptera	Dytiscidae	Dytiscidae larva	**Native**
Coleoptera	Dytiscidae	*Helophorus minutus*	**Native**
Coleoptera	Dytiscidae	*Hydrobius fuscipes*	**Native**
Coleoptera	Dytiscidae	*Hydroporus palustris*	**Native**
Coleoptera	Dytiscidae	*Hydroporus erythrocephalus*	**Native**
Coleoptera	Dytiscidae	*Hygrotus impressopunctatus*	**Native**
Coleoptera	Dytiscidae	*Laccophilus minutus*	**Native**
Coleoptera	Dytiscidae	*Nebrioporus depressus depressus*	**Native**
Coleoptera	Dytiscidae	*Oreodytes sanmarkii*	**Native**
Coleoptera	Dytiscidae	*Porhydrus lineatus*	**Native**
Coleoptera	Dytiscidae	*Rhantus exsoletus*	**Native**
Coleoptera	Dytiscidae	*Rhantus frontalis*	**Native**
Coleoptera	Gyrinidae	Gyrinidae larva	**Native**
Coleoptera	Gyrinidae	*Gyrinus aeratus*	**Native**
Coleoptera	Gyrinidae	*Gyrinus substriatus*	**Native**
Coleoptera	Halipliidae	*Haliplus ruficollis* group	**Native**
Coleoptera	Halipliidae	*Haliplus sibiricus*	**Native**
Coleoptera	Hydrophilidae	Enochrus sp.	**Native**
Coleoptera	Hydrophilidae	*Helophorus brevipalpis*	**Native**
Coleoptera	Hydrophilidae	*Helophorus grandis*	**Native**
Coleoptera	Hydrophilidae	*Hygrotus inaequalis*	**Native**
Coleoptera	Hydrophilidae	*Hygrotus quinquelineatus*	**Native**
Coleoptera	Hydrophilidae	*Ilybius ater*	**Native**
Coleoptera	Hygrobiidae	*Hygrobia hermanni*	**Native**
Coleoptera	Noteridae	*Noterus clavicornis*	**Native**
Coleoptera	Noteridae	*Noterus crassicornis*	**Native**
Diptera	Ceratopogonidae	Ceratopogonidae larva	**Native**
Diptera	Chaoboridae	Chaoboridae pupa	**Native**
Diptera	Chironomidae	Chironomus spp.	**Native**
Diptera	Chironomidae	Non-chironomus spp.	**Native**
Diptera	Culicidae	sp. indet.	**Native**

Taxon	Family	Binomial name	Native Status
Hemiptera	Corixidae	*Callicorixa praeusta*	**Native**
Hemiptera	Corixidae	*Corixa punctata*	**Native**
Hemiptera	Corixidae	Corixidae nymph	**Native**
Hemiptera	Corixidae	*Hesperocorixa linnaei*	**Native**
Hemiptera	Corixidae	*Hesperocorixa sahlbergi*	**Native**
Hemiptera	Corixidae	*Sigara dorsalis*	**Native**
Hemiptera	Corixidae	*Sigara lateralis*	**Native**
Hemiptera	Gerridae	Gerris sp.	**Native**
Hemiptera	Nepidae	*Nepa cinerea*	**Native**
Hemiptera	Notonectidae	Notonectidae nymph	**Native**
Hemiptera	Notonectidae	*Notonecta glauca*	**Native**
Hirudinidae	Glossiphoniidae	*Glossiphonia complanata*	**Native**
Megaloptera	Sialidae	*Sialis lutaria*	**Native**
Mollusca	Bithnyiidae	*Bithynia tentaculata*	**Native**
Mollusca	Lymnaeidae	*Ampullacaena baltica*	**Native**
Mollusca	Lymnaeidae	*Lymnaea stagnalis*	**Native**
Mollusca	Lymnaeidae	*Stagnicola fuscus*	**Native**
Mollusca	Physidae	*Physa fontinalis*	**Native**
Mollusca	Planorbidae	*Bathyomphalus contortus*	**Native**
Mollusca	Planorbidae	*Gyraulus albus*	**Native**
Mollusca	Planorbidae	*Gyraulus crista*	**Native**
Mollusca	Planorbidae	*Planorbis planorbis*	**Native**
Mollusca	Sphaeriidae	sp. indet.	**Native**
Mollusca	Valvatidae	*Valvata piscinalis*	**Native**
Odonata	Coenagrionidae	sp. indet.	**Native**
Odonata	Libellulidae	*Sympetrum sanguineum*	**Native**
Amphipoda	Gammaridae	*Gammarus lacustris*	**Native**
Isopoda	Asellidae	*Asellus aquaticus*	**Native**
Arachnida	Hydrachnidiae	sp. indet.	**Native**

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