Screening for Appropriate Assessment

OPW Arterial Drainage Schemes Routine Maintenance Works – Lower Shannon

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[1] Executive Summary

Ayesa was commissioned by the Office of Public Works (OPW) to provide environmental consultancy services in relation to proposed Arterial Drainage Scheme (ADS) maintenance activities in the Lower Shannon ADS.

This report is an Appropriate Assessment (AA) Screening to assess whether there are likely significant effects on European Sites (also known as 'Natura 2000 sites') within the zone of influence (ZoI) of the proposed Lower Shannon ADS maintenance works, in accordance with Article 6(3) of the Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora).

Using information collected from site surveys throughout the Lower Shannon ADS catchment with regard to habitats and other ecological receptors, as well as historical data obtained from the OPW, National Biodiversity Data Centre (NBDC), and National Parks and Wildlife Service (NPWS), the source > pathway > receptor assessment process was used to assess the likely significant effects of ADS maintenance activities on European Sites. From this Appropriate Assessment screening exercise, it has been determined that significant effects may arise on European Sites as a result of OPW maintenance activities in the Lower Shannon ADS.

The likely significant effects relating to sites within the ZoI are summarised below.

Table 1. Summary of Screened in European Sites for the Lower Shannon ADS.

European Site	Pathway for Likely Significant Effects			Comments
	Surface & Groundwater	Air	Land	
River Shannon and River Fergus Estuaries SPA (004077)	No	Yes	Yes	This large SPA, designated for 21 bird species and their supporting wetland habitat, may be affected by drainage maintenance activities through air and land, with likely significant effects attributable to noise disturbance, physical disturbance, loss of habitat, or loss of habitat connectivity.
Lower River Shannon SAC (002165)	Yes	Yes	Yes	This large SAC, containing a range of habitat types, can be affected by drainage maintenance activities via all three pathways. This site has identified 14 habitats, four fish species, two mammal species, and one aquatic bivalve mollusc species as Qualifying Interests, which are likely to incur significant effects through two pathways. Likely significant effects range from direct and indirect effects to aquatic species and habitats attributable to impaired water quality, direct disturbance to or habitat loss for aquatic species, and direct disturbance to Annex I habitats.
Newhall and Edenvale Complex SAC (002091)	No	No	Yes	This SAC is designated for the lesser horseshoe bat and the caves within which it dwells. Potential significant effects have been identified is relation to the foraging grounds of this species.

Tory Hill SAC (000439)	Yes	No	Yes	This SAC is designated for three habitats, two of which (fens) may be significantly affected via hydrological and land pathways.
Glen Bog SAC (001430)	Yes	No	Yes	This SAC is designated solely for alluvial woodland, which may be significantly affected via hydrological and land pathways.
Askeaton Fen Complex SAC (002279)	Yes	No	Yes	This SAC is designated for two fen habitats, both of which may be significantly affected via hydrological and land pathways.
Curraghchase Woods SAC (000174)	Yes	No	Yes	This SAC is designated for two woodland habitats, one mollusc species, and one mammal species. Potential significant effects have been identified via all three pathways in relation to the animal species.

The potential significant effects of the OPW ADS maintenance activities in the Lower Shannon ADS catchment will therefore be subjected to further assessment at a Stage 2 Appropriate Assessment.

[2] Introduction

[2.1] Project Background

Ayesa has been commissioned by the OPW to carry out an AA Screening for the proposed routine maintenance works as part of the Arterial Drainage Scheme (ADS, also referred to herein as “the Scheme”) for the Lower Shannon Scheme Area, as shown below (Figure 2-1). The Scheme fulfils the OPW’s legal duty under the Arterial Drainage Acts of 1945, as amended in 1995, to maintain scheme channels and associated bridge and/or culvert structures that provide drainage for the benefiting lands. Only standard maintenance works are assessed in this report and any works that are not described in this report will be assessed on a project level where necessary.

Between 1945 and 1995, under the Arterial Drainage Act (1945), the OPW completed 34 Arterial Drainage Schemes on river catchments, along with five estuarine embankment schemes (over 11,500 km of channel and 730 km of embankments). Since their completion, maintenance of these Arterial Drainage Schemes has been ongoing, with the majority of channels maintained every five years. However, larger channels tend to be maintained only every ten years, while some channels may be maintained on an annual or biannual basis (e.g. urban channels).

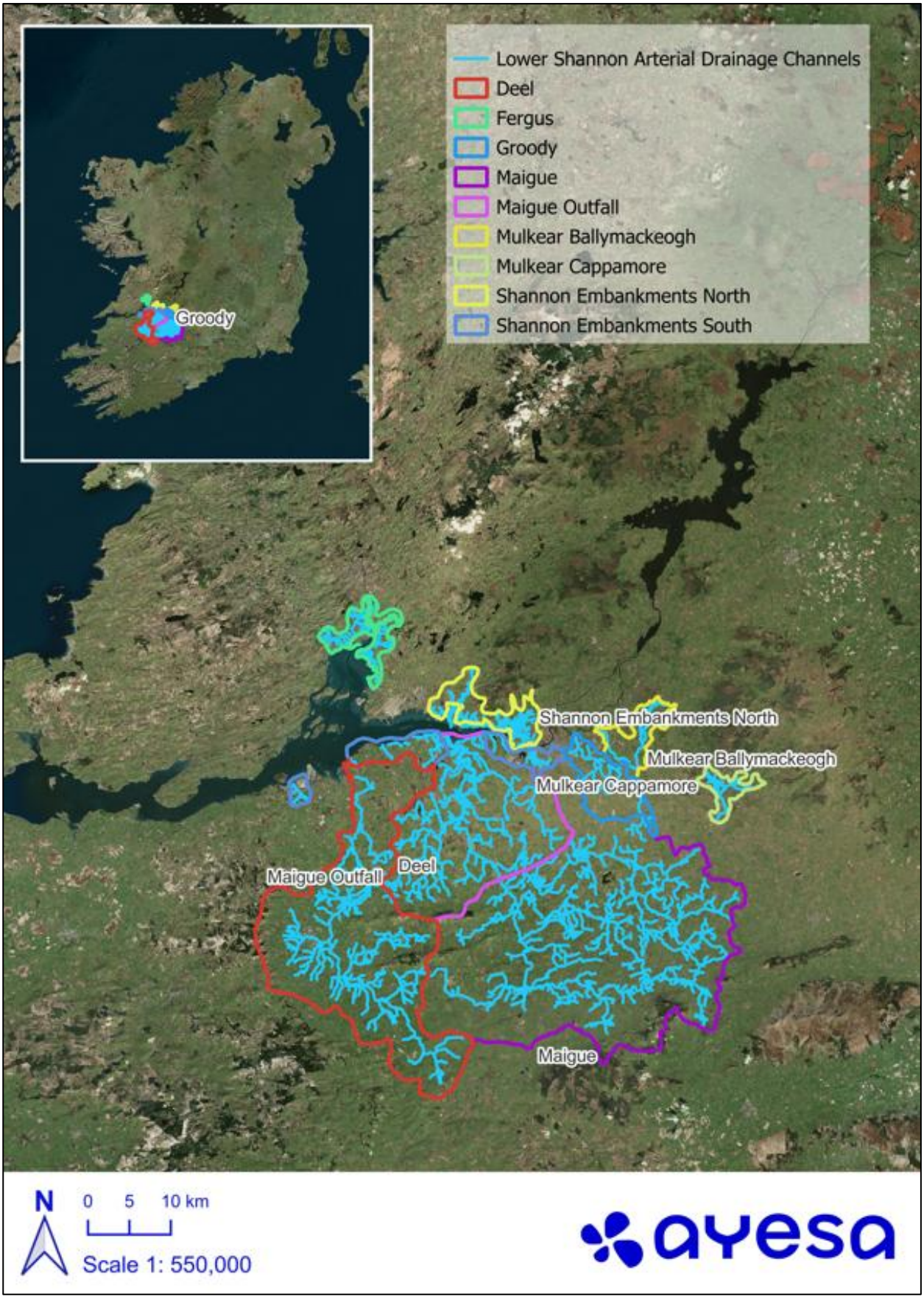

Figure 2-1: Location and extent of the Lower Shannon ADS catchment, Co. Limerick.

[2.2] Project Setting

The Lower Shannon ADS is located in County Limerick, encompassing 1,538.8 km of watercourse, including the River Shannon, the River Maigue, River Mulkear and the River Fergus, and 230.7 km of embankment. The landscapes surrounding the Lower Shannon catchments primarily encompass agricultural lands used for domestic livestock.

[2.3] Proposed Works

[2.3.1] Drainage Maintenance Activities

Arterial drainage maintenance includes a range of operations such as silt and vegetation management, mowing, and gate installation, as detailed in Table 2-1, and categorised as channel maintenance or embankment maintenance.

Table 2-1. OPW Drainage Maintenance Types.

Category	Code	Maintenance Type
Channel maintenance	A	Silt and vegetation management
	B	Aquatic vegetation cutting
	C	Bank protection
	D	Bush cutting / branch trimming
	E	Tree cutting
	K	Other
Embankment maintenance	D	Bush cutting / branch trimming
	E	Tree cutting
	F	Mulching
	G	Mowing
	H	Gate installation

[2.3.2] Routine Channel Maintenance Activities

Channel maintenance operations normally involve removing the build-up of foreign or natural material that impedes the free flow of water. Predominately, this consists of the removal of water-entrained silt and associated vegetation from the bed of the channel by hydraulic excavators. Restrictions in channels due to bank slippage or damage would necessitate re-grading to the original profile. Maintenance is thus carried out to restore the channel to the original arterial drainage design.

For larger vegetation such as trees, which impinge on channel capacity, impingement is reduced by selective removal of lower branches. The material removed during the maintenance operations is normally spread away from the top of the bank. Tree and branch storage is set aside on farmers lands. Works are also required to maintain the machine access corridor (MAC), which includes access to the channel. Tree management may be required to access the channel, and this may consist of limb removal, tree clearance for machine access, fallen tree removal, pollarding, floodplain clearance, and/or removing vegetation from overgrown riverbanks. In most cases, no alterations to the bank are required and, in some cases, the channel is left undisturbed if no build-up of material is present.

Most ADS maintenance works are on smaller low-lying channels, with 90% of works in channels with a base width of less than three metres. The average channel requires maintenance every four to six years. Channels with prolific weed growth may require maintenance annually, particularly where downstream bridges are at risk of being blocked due to a flow of decaying vegetation in autumn. Conversely, some channels may only require maintenance every twenty years due to the self-cleaning characteristics of the channel. Where channels are too wide or bank conditions are not suitable for maintenance via excavator, weed cutting boats are utilised.

Typically, scheme channel maintenance works are completed by hand or by using excavators operated by trained OPW drivers.

[2.3.3] Environmental Management of Drainage Maintenance Activities

Environmental management of the OPW's arterial drainage work is captured in the OPW's publication 'Environmental Guidance: Drainage Maintenance & Construction' (Brew & Gilligan, 2019). This guidance aims to deliver good drainage and flood relief functions while reducing the associated environmental impacts. The Environmental Procedures (EPs) are designed to limit the potential for environmental impacts and to improve habitats for many species.

[2.4] Preparation of this Report

Table 2-2. Summary of Staff Qualifications.

Title	Name	Role	Qualifications	Years' experience
Technical Director	Barry Sheridan	Report review	MSc Environmental Management IES Chartership	20+
Project Manger	Lynn Morrissey	Report sign off	MSc (Agr) Environmental Resource IES Member	20+
Senior Ecologist	Jeff Hean	Survey lead	PhD Zoology IES Member	10
Senior Ecologist	Maran Lowry	Report preparation	BSc (Hons) Marine Biology	10
Consultant Ecologist	Joe Butler	Survey assistant	MSc Wildlife Conservation and management CIEEM: Qualifying Membership	5
Consultant Ecologist	Meadhbh Stack	Survey assistant	BSc (Hons) Ecology & Environmental Biology CIEEM: Qualifying Membership	3

Graduate Ecologist	John Tobin	Survey assistant	BSC (Hons) Environmental Science with Ecology	1

John Tobin is a Graduate Ecologist with Ayesa and has provided support for field surveys to inform this report. John has been working as a Graduate Ecologist since August 2024. He has experience in conducting protected species surveys and ecological report writing in both voluntary and professional capacities.

Meadhbh Stack is a Consultant Ecologist at Ayesa and was responsible for site surveys to inform this report. Meadhbh has worked as an Ecologist since 2022 and has completed numerous ecological and environmental assessments, including AA and NIS reports, for submission to various regulatory bodies in Ireland.

Joe Butler has worked as a Consultant Ecologist since 2018. He has conducted numerous ecological and environmental assessments, including AA Screening reports, NIS reports, and Ecological Impact Assessment (EcIA) reports for submission to various regulatory bodies across Ireland. He was involved in the surveys to inform this report.

Maran Lowry is a Senior Ecologist at Ayesa and was responsible for reviewing and revising this report. He is experienced in both terrestrial and aquatic ecology and has significant experience in relation to the Habitats Directives and associated Regulations, having prepared and reviewed numerous ecology reports for a wide variety of proposed developments, including wastewater treatment plants, water schemes, flood relief schemes, and solar farms, as well as extensive experience assessing forestry applications for the purposes of AA.

Jeff Hean is the Lead Project Ecologist for this report and was responsible for conducting site surveys and the compilation of this report. He is an expert in ecological matters and the full spectrum of environmental assessment techniques, methodologies, and statutes. Jeff has significant experience in relation to the Habitats Directives and associated Regulations, having prepared numerous reports for AA, NIS, and Environmental Impact Lynn Morrissey is a Principal Consultant and the Project Manager for this project. Lynn is qualified in Environmental Resource Management and has 20 years' experience in Environmental Management, across a diverse range of sites, geographies and ecosystems. Lynn has significant experience in relation to AA, NIS and EIA reports for a wide variety of the proposed developments, including local authority wastewater treatment plants, road and rail developments, electrical infrastructure, landfills and large industrial developments.

Lynn Morrissey is a Principal Consultant and the Project Manager for this project. Lynn is qualified in Environmental Resource Management and has 20 years' experience in Environmental Management, across a diverse range of sites, geographies and ecosystems. Lynn has significant experience in relation to AA, NIS and EIA reports for a wide variety of the proposed developments, including local authority wastewater treatment plants, road and rail developments, electrical infrastructure, landfills and large industrial developments.

Barry Sheridan is the Director for the Assessment and Planning Division of Ayesa. Barry has more than 20 years of experience in environmental assessment and planning projects and provides oversight on all environmental reporting deliverables produced by Ayesa.

[3] Appropriate Assessment Legislation and Process

[3.1] Process

The AA process is a sequential process consisting of four potential stages. If it is determined that there will be no significant effect on a European Site at the first stage in the process, the process is effectively completed. The four stages are as follows:

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

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

[3.1.1] Stage 1: Screening (current stage)

Stage1 of the AA process involves assessing if the plan or project is directly connected with or necessary to the management of a European Site(s), or, based on best scientific knowledge, if the plan or project, individually or in combination with other plans or projects, is likely to have a significant effect on a European Site. This is done by examining the proposed plan or project and any sites' conservation objectives that might be affected. If screening determines that there are likely to be significant effects, or the potential significance of effects is uncertain or unknown, it will be recommended that a project is brought forward to full AA (i.e., Stage 2).

[3.1.2] Stage 2: Appropriate Assessment

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

[3.1.3] Stage 3: Assessment of Alternative Solutions

If it is not possible during Stage 2 to reduce impacts to acceptable, non-significant levels by avoidance and/or mitigation, Stage 3 of the process must be undertaken to objectively assess whether alternative solutions exist by which the objectives of the plan or project can be achieved. Explicitly, this means alternative solutions that do not negatively impact the integrity of a European Site. It should also be noted that EU guidance on this stage of the process states that “other assessment criteria, such as economic criteria, cannot be seen as overruling ecological criteria” (EC, 2001). In other words, if alternative solutions exist that do not negatively impact European Sites, they should be adopted regardless of economic considerations.

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

Stage 4 of the AA process is undertaken when it has been determined that negative impacts on the integrity of a European Site will result from a plan or project but that no alternatives exist. At this stage of the AA process, the characteristics of the plan or project itself will determine whether the competent authority can allow the plan or project to progress. This is the determination of 'over-riding public interest'. It is important to note that in the case of European Sites that include in their qualifying features' priority' habitats or species, as defined in Annex I and II of the Directive, the demonstration of 'overriding public interest' is not sufficient and it must be demonstrated that the plan or project is necessary for 'human health or safety considerations'. Where plans or projects meet these criteria, they can be allowed, provided adequate compensatory measures are proposed. Stage 4 of the process defines and describes these compensation measures.

[3.2] Stage 1: AA Screening

This AA screening report has been completed in the following logical order:

- Definition of the ZoI for the proposed works;
- Identification of the European Sites that are situated (in their entirety or partially) within the ZoI of the proposed works;
- Identification of the most up-to-date Qualifying Interests (QIs) for each European Site occurring either wholly or partially within the ZoI;
- Identification of the environmental conditions that maintain the QIs at the desired conservation status;
- Identification of the threats/impacts, actual or potential, that could negatively impact the environmental conditions of the QIs within the European Sites;
- Highlighting the activities of the proposed works that could give rise to significant negative impacts; and
- Identification of other plans or projects for which in-combination impacts would likely have significant effects.

The following issues have been considered:

- The nature and quality of habitats within the site of the proposed development;
- Information relating to the ecology of the European Site;
- The status of QIs (Annex I habitats and Annex II species of the EU Habitats Directive) or SCIs (Annex I species of the EU Birds Directive) of the European Site and the relevant conservation status and objectives for these features;
- The key structural and functional relationships maintaining the integrity of the European Site;
- The status of other annexed habitats and species occurring in proximity to the site of the proposed development; and
- The scale and nature of the aspects of the project in relation to the European Site.

[3.3] Legislative Background and Guidance Documents

[3.3.1] International Legislation

The Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora, better known as the "Habitats Directive", provides legal protection for habitats and species of European importance. Articles 3 to 9 provide the legislative means to protect habitats and species of community interest by establishing and conservating an EU-wide network of sites known as Natura 2000. These are Special Areas of Conservation (SACs) designated under the Habitats Directive and Special Protection Areas (SPAs) designated under the Conservation of Wild Birds Directive (79/409/ECC) as codified by Directive 2009/147/EC.

Articles 6(3) and 6(4) of the Habitats Directive set out the decision-making tests for plans and projects likely to have a significant effect on or to adversely affect the integrity of European Sites (Annex 1.1). Article 6(3) establishes the requirement for AA screening, stating the following:

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

Article 6(4) states:

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

[3.3.2] The Requirement for AA Screening

Section 42(1) of S.I. No. 477 of 2011, the European Communities (Birds and Natural Habitats) Regulations 2011, states:

"A screening for Appropriate Assessment of a plan or project for which an application for consent is received, or which a public authority wishes to undertake or adopt, and which is not directly connected with or necessary to the management of the site as a European Site, shall be carried out by the public authority to assess, in view of best scientific knowledge and in view of the conservation objectives of the site, if that plan or project, individually or in combination with other plans or projects is likely to have a significant effect on the European site."

Where the screening process cannot exclude the possibility that a plan or project, individually or in combination with other plans or projects, could have a significant effect on a European site, there is a requirement under Article 42(9) of these regulations for the preparation of an NIS to inform the AA process.

[3.3.3] Screening Determination

In accordance with Regulation 42(7) of the Birds and Natural Habitats Regulations 2011 (S.I. No. 477/2011) as amended:

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

Further, under Regulation 42(8):

"(a)Where, in relation to a plan or project for which an application for consent has been received, a public authority decides that an Appropriate Assessment is required, the public authority shall give notice of the determination, including reasons for the determination of the public authority, to the following—

i. the applicant,

ii. if appropriate, any person who made submissions or observations in relation to the application to the public authority, or

iii. if appropriate, any party to an appeal or referral.

(b) Where a public authority has determined that an Appropriate Assessment is required in respect of a proposed development it may direct in the notice issued under subparagraph (a) that a Natura Impact Statement is required."

[3.3.4] National Legislation

The Habitats Directive has been transposed into Irish law by the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477/2011) as amended.

This Appropriate Assessment has been prepared in respect of this scheme being implemented under the Arterial Drainage Act 1945, as amended, which provides the statutory authority for the Office of Public Works (OPW) to carry out arterial drainage works in Ireland and they are the competent authority.

[3.3.5] Guidance Documents on Appropriate Assessment

Where an AA is necessary, the AA requirements of Article 6(3) of the Habitats Directive 92/43/EEC (European Communities 2001) follow a sequential approach as outlined in the following guidance documents:

- 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 NPWS 1/10 and PSSP 2/10.
- Guidance document on assessment of plans and projects in relation to Natura 2000 sites (2022) (European Commission Environment Directorate-General, 2022).

- Managing Natura 2000 Sites: The provisions of Article 6 of the Habitat's Directive 92/43/EEC Commission Notice (European Commission Environment Directorate-General, 2018).
- 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).
- The Department of the Environment, Heritage, and Local Government guidance "Appropriate Assessment of Plans and Projects in Ireland – guidance for Planning Authorities, 2009" and the European Commission (2001) guidelines "Assessment of plans and projects significantly affecting European Sites - Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC".
- Appropriate Assessment Screening for Development Management (OPR, March 2021).

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[4] Methodology

The scope of this assessment is to identify potential impacts (direct and indirect) as a result of the project and to determine the likelihood of significant effects, if any, that the project could have on European Sites.

[4.1] Desktop Information Consulted for this Report

Sources of data reviewed as part of the Screening process for this project included:

- National Parks and Wildlife Service (NPWS); site synopses and conservation objectives for relevant European Sites (accessible at https://www.npws.ie/).
- Birds of Conservation Concern in Ireland (BoCCI) lists of bird species outlined for conservation efforts 2020-2026 (accessible at https://birdwatchireland.ie/birds-of-conservation-concern-in-ireland/).
- The 2022 National Survey of breeding Hen Harrier in Ireland Irish Wildlife Manual 147 (NPWS).
- The Hen Harrier Project (HHP) EIP (2021) annual surveys (2017-2021).
- National Biodiversity Data Centre (NBDC) Maps – 1 km- and 2 km-square species reports and mapping (accessible at http://maps.biodiversityireland.ie/#/Map).
- Inland Fisheries Ireland (IFI) data (accessible at https://opendata-ifigeo.hub.arcgis.com/).
- The Status of EU Habitats and Species in Ireland 2013, NPWS, ed. D. Lynn.
- Article 17 Reports (NPWS, 2019).
- Environmental Protection Agency (EPA) Maps (accessible at https://gis.epa.ie/EPAMaps/).
- Aerial photographs (Google Earth/Maps 2024).
- Landcover Mapping (Táillte Éireann).
- European Commission (EC) (2019) Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg. European Commission.
- EC (2021) Assessment of plans and projects in relation to Natura 2000 sites - Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC. European Commission.
- EC (2013) Interpretation Manual of European Union Habitats. Version EUR 28. European Commission.
- Chartered Institute of Ecology and Environmental Management (CIEEM) (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland - Terrestrial, Freshwater and Coastal, Version 2.1.
- National Parks and Wildlife Service (NPWS) (2019) The Status of EU Protected Habitats and Species in Ireland. Volume 1: Summary Overview. Unpublished NPWS report.
- NPWS (2019) The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments. Unpublished NPWS report.
- NPWS (2019) The Status of EU Protected Habitats and Species in Ireland. Volume 3: Species Assessments. Unpublished NPWS report.

- OPR (2021) Appropriate Assessment Screening for Development Management. OPR Practice Note PN01.
- Ryan Hanley (2014a) Stage 1: Appropriate Assessment Screening Methodology for the Maintenance of Arterial Drainage Schemes.
- Ryan Hanley (2014b) Source » Pathway » Receptor Chains for Appropriate Assessment. Arterial Drainage Maintenance Categories.

[4.2] Development Site Habitat Assessment Methods

Ayesa Ecologists Jeff Hean, Meadhbh Stack, Joe Butler, and John Tobin conducted rapid river corridor surveys (RRCS) of watercourses associated with the Lower Shannon arterial drainage channels between July and October 2024. The rapid river corridor survey assessments aligned with previous surveys completed by the OPW on the ADS and were completed as described below. All surveys were completed by qualified ecologists and in accordance with relevant legislation, particularly the 'Guidelines for Ecological Impact Assessment in the UK and Ireland' (CIEEM, 2018) through the additional recording of specific features indicating the presence, or likely presence, of protected species or other species of nature conservation significance. Moreover, all site assessments aligned with the Heritage Council's Best Practice Guidance for Habitat Survey and Mapping (Smith et al*.,* 2011) and habitats were classified to level 3 of the Fossitt (2000) classification system. To illustrate the general aquatic and terrestrial habitat quality, photographs were taken using a digital camera. Grid references were recorded using a GPS handset. Site evaluation is based on the guidelines of the Chartered Institute of Ecology and Environmental Management (CIEEM, 2018).

Rapid river corridor surveys were completed according to the methods outlined by Mayfly Ecology (2023). The rapid river corridor surveys encompassed an assessment of the river channel, its banks, and adjacent land use. The channel length is divided into sections (approx. 500 m or 1000 m length, as described below); these survey sections of the ADS were selected prior to the field survey and were based on areas where maintenance works coincide with European Sites. The coordinates for the start and end of each survey section were downloaded onto digital maps (e.g., Google Maps or Mergin Maps) and used in the field to quickly pinpoint these locations. This negated the time-consuming task of choosing survey areas and measuring distances in the field. The start and end chainage for each survey section was noted also. The surveyors examined the structural features present, channel substrate, % shading, river profile and flow, and the width and depth of the survey section.

The survey channels were investigated for evidence of the presence of protected species including, but not limited to otters and kingfishers, and aquatic species such as lamprey, white-clawed crayfish and salmonids. At each site, a maximum of ten spot checks were made along each bank of the representative watercourse to inspect for key ecological receptors. Where evidence of these ecological receptors was observed, digital photographs were taken and a GPS location recorded. An evaluation of fisheries habitat potential was conducted for lamprey, crayfish, and salmonid species.

Potential Annex I habitats that were observed within/near survey sites were recorded and assessed for distribution, general health, and prevalent species. The determination of the presence or absence of Annex I habitats was carried out in consultation with the habitat descriptions provided in the most recent Article 17 Reports (NPWS, 2019).

The adjacent land use and habitats were recorded up to a distance of approximately 100 m back. All habitats were noted using 'A Guide to Habitats in Ireland' (Fossitt, 2000).

Notable aquatic and terrestrial plant species were recorded along the survey extent. The vegetation observed was identified and used to assign/verify Fossitt habitat designations. The sites and immediate surroundings were inspected for alien invasive plant species, as listed in the Third Schedule of the Birds and Natural Habitats Regulations (S.I. No. 477/2011). Regulation 49 (2) states that "*any person who plants, disperses, allows or causes to disperse, spreads or otherwise causes to grow in any place any plant listed in the Third Schedule, shall be guilty of an offence*". Biosecurity measures were implemented by surveyors where invasive species were present.

[4.3] Cumulative and In-Combination Impacts

It is a requirement of screening for Appropriate Assessment that the cumulative or in-combination effects of the proposed development together with other plans or projects are assessed. Cumulative impacts can be defined as a project/plan/programme likely to have a significant effect thereon, either individually or in combination with other plans or projects.

In accordance with EC Article 6 Guidance Document (EC, 2018), in order to ensure all impacts upon the site are identified, including those direct and indirect impacts that are a result of cumulative impacts, the following steps were completed:

- Identify all projects/plans which might act in combination: Identify all possible sources of effects from the project or plan under consideration, together with all other sources in the existing environment and any other effects likely to arise from other proposed projects or plans.
- Impacts identification: Identify the types of impacts that are likely to affect aspects of the structure and functions of the site vulnerable to change.
- Define the boundaries for assessment: Define boundaries for examination of cumulative effects which will be different for different types of impact and may include remote locations.
- Pathway identification: Identify potential cumulative pathways (e.g., via water, air, etc.; accumulations of effects in time or space).
- Prediction: Prediction of magnitude/extent of identified likely cumulative effects.
- Assessment: Comment on whether the potential cumulative impacts are likely to be significant.

[4.4] Screening Assessment of European Sites

This chapter provides a Screening Assessment to identify SACs and SPAs to be assessed fully in the Screening of Potential Impacts (Section 7).

As per the outcomes of the Judgement in Case C-721/21: Keegan Land Holdings vs. An Bord Pleanála, this screening assessment has been completed with consideration of "*Article 6(3) of Directive 92/43 must be interpreted as meaning that: in order to determine whether it is necessary to carry out an appropriate assessment of the implications of a plan or project for a site, account may be taken of the features of that plan or project which involve the removal of contaminants and which therefore may have the effect of reducing the harmful effects of the plan or project on that site, where those features have been incorporated into that plan or project as standard features, inherent in such a plan or project, irrespective of any effect on the site".*

[4.5] Source-Pathway-Receptor (SPR) Model

The likely significant effects of the proposed development on any European Site have been assessed using the source-pathway-receptor model, where:

- A 'source' is defined as the individual element of the proposed works that has the potential to impact on a European Site, its qualifying features, and its conservation objectives.
- A 'pathway' is defined as the means or route by which a source can affect the ecological receptor. Pathways constitute surface water & groundwater, air, or land.
- A 'receptor' is defined as the SCI of SPAs or QI of SACs for which conservation objectives have been set for the European Sites being screened.

This methodology is based on source > pathway > receptor chain principles and involves assessing likely significant effects on European Sites within the ZoI of the proposed drainage maintenance in relation to three pathways: 1) surface water & groundwater 2) air 3) land. The screening assessment involves assessing the impacts of drainage maintenance operations within the ADS and its ZoI in relation to each of the three pathways individually. The results for each pathway are then combined in a concluding section to identify if/where significant effects may arise.

Where a source-pathway-receptor link between the proposed development and a European Site exists, and there is a potential negative impact, further assessment is required. This assessment is undertaken in accordance with the EC Article 6 Guidance Document (EC, 2018) outlined in previous sections.

The screening process uses a combination of GIS analysis and qualitative assessment to identify which drainage maintenance activities, on which specific watercourses, are likely to have significant effects on the integrity of European Sites. This screening report has been produced with currently available information, with the most up-to-date versions used. When new or updated information becomes available, the OPW will consider and review this screening assessment if necessary.

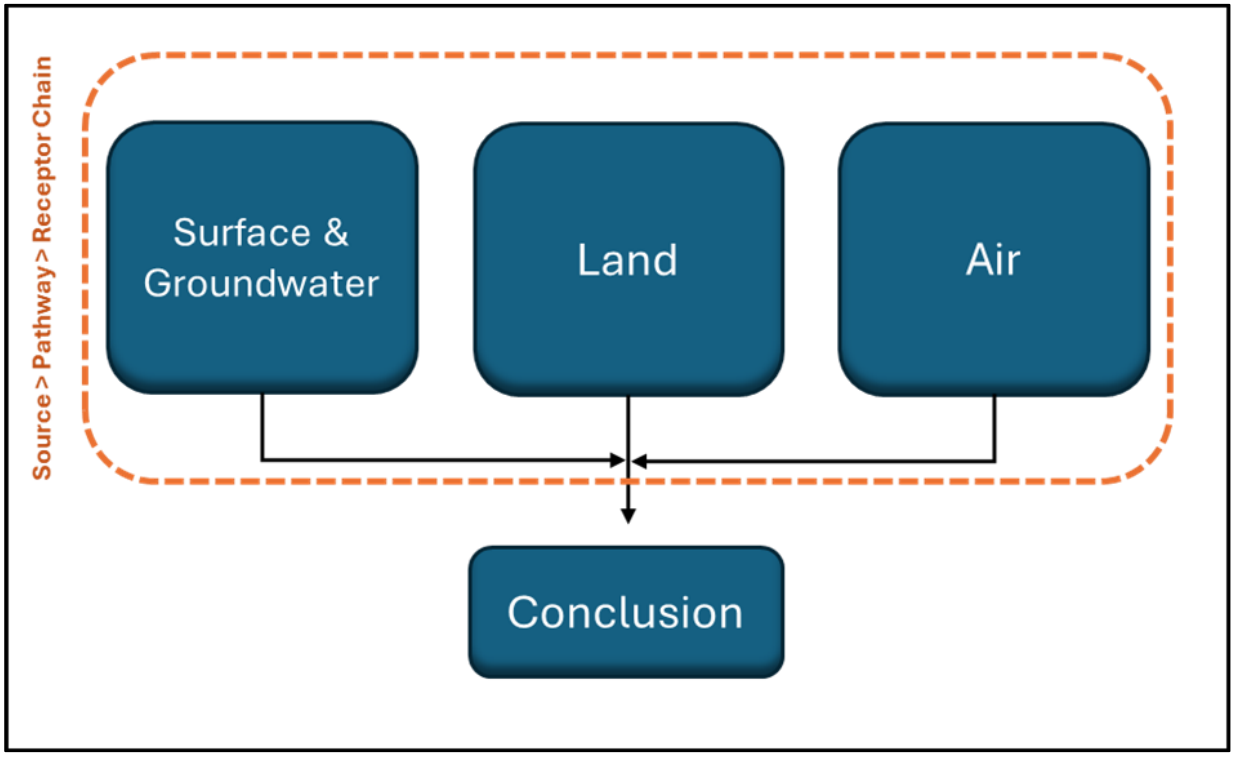

Figure 4-1. Assessment Process.

[4.5.1] Zone of Influence (ZoI)

A practice note issued by the Office of the Planning Regulator (OPR, 2021) states that, "*The zone of influence of a proposed development is the geographical area over which it could affect the receiving environment in a way that could have significant effects on the Qualifying Interests of a European site. This should be established case-by-case using the Source-Pathway-Receptor framework and not by arbitrary distances*".

The ZoI from drainage maintenance activities is generally very small. Small crews operate a single machine and hand tools, or sometimes a pontoon or weed-cutting boat. The majority of impacts will occur within the immediate vicinity of the works (<10 m). However, some effects may be transmitted further afield. For noise, vibration, and visual disturbance, impacts on species can occur at some distance. The TIDE toolkit suggests 500 m is a useful precautionary distance, particularly near estuaries (Cutts et al. 2013), although the scientific basis for this remains uncertain (Williams et al. 2020). There is evidence that Greenland white-fronted geese, which are highly sensitive to disturbance, are likely disturbed at distances of up to 1000 m (NatureScot, 2022). Therefore, on a precautionary basis, this distance is used for screening sites for land impacts.

Some SACs are designated for mobile species that use aquatic and riparian habitats, including otter, salmon, lampreys, and white-clawed crayfish, while SPAs are designated for bird species which are highly mobile. Bird screening distances will be assessed on a case-by-case basis, as different species have different foraging ranges.

At the coast and in tidal and transitional waterbodies, marine species may also be found outside of their core SAC boundaries. Although by definition the SAC provides the core area of their habitat, scheme channels may form part of the supporting habitat for mobile aquatic species. For the purpose of screening for likely significant effects, it is assumed that the most important supporting habitat for crayfish and other invertebrates will be within 300 m of the SAC (Robinson, 2000), and for otters, which have much larger ranges (Chanin, 2003), up to 25 km; but in all cases only where surface water pathways exist for the species to move between Scheme channels and the SAC. In marine and transitional waters, a distance of 15 km is used to account for marine mammal movements. While the works do not present barriers to migration, migratory fishes associated with European Sites may temporarily utilise the waters near or downstream of the ADS works, which may subject them to negative effects attributable to impaired water quality. Therefore, the screening distance for such fishes equates to that outlined below for surface water quality effects.

Effects transmitted through surface water and groundwater water can be carried considerable distances, although the dilution effect within surface water significantly reduces effects across greater lengths. In-channel maintenance works do not introduce new suspended solids to the system but rather mobilise materials that have settled out since the previous maintenance period. In streams wherein there are higher levels of silt to clear as part of maintenance, higher baseline levels of suspended solids in the water are likely. There is no published evidence on how quickly any suspended solids released during maintenance activities remain at levels that would negatively affect wildlife, but based on experience and professional opinion, effects rarely persist more than 2 km downstream due to the small-scale nature of the works. However, a precautionary distance of 5 km is used for screening of sites for surface water quality effects. The same detail applies to nutrients released into the water, when no new nutrients are added, and those re-mobilised will also be quickly diluted. The screening distance is extended to 35 km downstream for sites designated for freshwater pearl mussel (FPM) and where suitable FPM habitat exists downstream, or where the works are carried out within an FPM sub-catchment, due to the unique sensitivity of this species to suspended solids (Ryan Hanley, 2014).

Upstream effects are limited to changing water levels. Observation of OPW channels during previous walkover surveys and maintenance audits have shown that build-up of silt and vegetation in the channel is not strong enough to create changes in water levels of more than a few centimetres. On removal of the obstruction, the effects on upstream water levels are only conveyed a limited distance as there are a range of control levels throughout a river system, including natural areas such as bedrock reaches as well as artificial structures such as bridges. It is highly unlikely that any clearance will result in changes in water levels more than 1 km upstream. Therefore, a precautionary distance of 1 km is used for the screening assessment to identify potentially sensitive sites.

[4.6] Assessment of Likelihood of Significant Effects

In assessing the likelihood of the occurrence of significant effects, the logic is as follows:

- The likelihood of an effect occurring is assessed considering the process/emission magnitude, duration, timing, and frequency, as well as the connectivity with the proposed project site and the sensitivity of the QI/SCI to the process/emission in question.
- Additionally, where a pathway between the proposed works and a European Site is determined to exist, the likelihood of significant effects is assessed in respect to the conservation objectives of habitats and species identified for those receptor European Sites (e.g., distribution, abundance, maintenance of biotic and abiotic factors, and/or species composition). For example, where it is determined that the proposed works will affect a given habitat, ultimately influencing the abundance of foraging species that utilise that habitat, a likely significant effect will be inferred.
- Where doubt exists about the risk of a significant effect, use of the precautionary principle requires that this effect be considered appropriately within the Article 6 assessment process.

[5] Results

This section aims to provide a broad overview of key/important habitats and/or ecological features observed within the ADS and associated European Sites.

[5.1] Habitats

The following habitats were identified during the RRCS of the Lower Shannon ADS catchments.

Habitats recorded in the study area are listed in Table 5-1 below. These are listed in the order that they appear in 'A Guide to Habitats in Ireland' (Fossitt, 2000) rather than in order of abundance. Habitat mapping and photographs can be seen in Appendix A. In line with the Mayfly RRCS methodology, habitats deemed to have linkages to Annex I habitats during the site surveys were noted, although detailed vegetative surveys were not conducted.

Table 5-1. Habitats recorded during the rapid river corridor survey of the Lower Shannon ADS.

Habitat Name	Habitat Code (as per Fossitt, 2000)
Eroding/upland rivers	FW1
Depositing/lowland rivers	FW2
Drainage ditches	FW4
Reed and large sedge swamps	FS1
Estuaries	MW4
Tidal rivers	CW2
Lower salt marsh	CM1
Upper salt marsh	CM2
Sea walls, piers and jetties	CC1
Sand shores	LS2
Mud shores	LS4
Hedgerows	WL1
Treelines	WL2
Scrub	WS1
Dry meadows and grassy verges	GS2
Wet grassland	GS4
(Mixed) broadleaved woodland	WD1
Mixed broadleaved/conifer woodland	WD2
Conifer plantation	WD4
Improved agricultural grassland	GA1
Stone walls and other stonework	BL1
Earth banks	BL2
Buildings and artificial surfaces	BL3

Detailed descriptions of the habitats listed in Table 5-1 are available in the sections hereunder.

[5.1.1] Eroding/Upland Rivers (FW1)

This habitat is represented by the upper reaches of watercourses throughout the Lower Shannon ADS catchments. Sediment composition of watercourses in these reaches were primarily comprised of bedrock, cobbles and gravels, with little evidence of fine silts or sediments. *Ranunculus* sect. *batrachium* and green filamentous algae were found in some of the streams during the rapid river corridor survey.

This habitat has linkages to the Annex I habitats Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260) and Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation (3270). A preliminary assessment of the habitat was undertaken in accordance with the Mayfly Methodology but was not deemed to be of Annex I quality.

[5.1.2] Depositing/Lowland Rivers (FW2)

This habitat is represented by the lower reaches of watercourses throughout the Lower Shannon ADS catchments. Sediment composition of watercourses in these reaches is primarily comprised of fine sediments, with some cobbles and gravels. Gravels are typically incorporated with fine sediments, which can make them unsuitable for salmonid spawning. *Ranunculus* sect. *batrachium*, green filamentous algae, and *Callitriche* sp. were found in some of the streams during the rapid river corridor survey.

This habitat has linkages to the Annex I habitats Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260) and Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation (3270). A preliminary habitat assessment was conducted using the Mayfly Methodology; however, the habitat was not considered to be of Annex I quality, as insufficient positive indicator species were noted at the time of survey.

[5.1.3] Drainage Ditches (FW4)

Drainage ditches were observed throughout the Lower Shannon ADS catchments, typically within agricultural lands, often connecting (directly or indirectly) to natural watercourses. Green filamentous algae and *Callitriche* sp. were found in some of the drains during the rapid river corridor survey.

[5.1.4] Reeds and Large Sedge Swamps (FS1)

This habitat was observed in various locations throughout the study area, primarily along riverbanks. Species encountered included reeds (*Phragmites* spp.), sedges, reed canary grass (*Phalaris arundinacea*), and bulrush (*Scirpoides holoschoenus*).

This habitat has linkages to the Annex I habitat *Transition mires and quaking bogs* (7140) and *Calcareous fens with Cladium mariscus and species of the Caricion davallianae* (7210). The habitats found during surveys were determined to not be of Annex I quality, as insufficient positive indicator species and characteristic vegetation structure were noted at the time of survey.

[5.1.5] Estuaries (MW4)

Estuarine habitats encompass the entirety of the lower reaches of the River Shannon. Specifically, the Shannon Embankment North, Shannon Embankment South, Deel, Maigue Outfall, and Fergus catchments overlap with or lie adjacent to estuarine habitat.

These areas are designated as Annex I habitat *Estuaries* (1130), which is a qualifying interest in the NPWS-designated Lower River Shannon SAC. A preliminary assessment of the habitat was undertaken in accordance with the Mayfly Methodology and, accordingly, the habitat will be included for further assessment in Section 7 of this report.

[5.1.6] Tidal Rivers (CW2)

This habitat type is typified by the lower reaches of the numerous rivers within the Lower Shannon ADS catchments.

[5.1.7] Lower Salt Marsh (CM1)

Lower salt marsh habitats were observed within the estuarine portion of the River Shannon, to which the Shannon Embankment North, Shannon Embankment South, Deel, Maigue Outfall, and Fergus catchments lie adjacent. Typical vegetative species observed included cord-grass species (*Spartina spp.*), black saltwort (*Glaux maritima*), and sea aster (*Tripolium pannonicum*).

This habitat is linked to the Annex I habitat Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) (1330) which is a qualifying interest in the NPWS-designated Lower River Shannon SAC. A preliminary assessment of the habitat was undertaken in accordance with the Mayfly Methodology and, accordingly, the habitat will be included for further assessment in Section 7 of this report.

[5.1.8] Upper Salt Marsh (CM2)

Upper salt marsh habitats were observed throughout the estuarine portion of the River Shannon, to which the Shannon Embankment North, Shannon Embankment South, Deel, Maigue Outfall, and Fergus catchments lie adjacent. Typical vegetative species observed included rush species (*Juncus spp.*), sea aster, ribwort plantain (*Plantago lanceolata*), and common reed.

This habitat is linked to the Annex I habitat Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) (1330) which is a qualifying interest in the NPWS-designated Lower River Shannon SAC. A preliminary assessment of the habitat was undertaken in accordance with the Mayfly Methodology, accordingly, the habitat will be included for further assessment in Section 7 of this report.

[5.1.9] Sea Walls, Piers and Jetties (CC1)

This habitat is present in one area of the Lower River Shannon Estuary as a reinforced rock armour embankment. This habitat has linkages to the Annex I habitat *Reef* (1170). The habitats found during surveys were determined to not be of Annex I quality, as insufficient characteristic species and typical reef structures were noted at the time of survey.

[5.1.10] Sand Shores (LS2)

This habitat is present in the Lower River Shannon Estuary as exposed to sheltered shores of coarse-, medium-, or fine-grained sand. This habitat has linkages to the Annex I habitat *Embryonic shifting dunes* (2110) and *Shifting dunes along the shoreline with Ammophila arenaria* (2120). The habitats found during surveys were determined to not be of Annex I quality, as insufficient positive indicator species and characteristic dune structures were noted at the time of survey.

[5.1.11] Mud Shores (LS4)

This habitat is present in the Lower River Shannon Estuary, with sea aster and cord-grass species present. This habitat has linkages to the Annex I habitat *Mudflats and sandflats not covered by seawater at low tide* (1140). The habitats found during surveys were determined to not be of Annex I quality, as insufficient characteristic features and typical sediment composition were noted at the time of survey.

[5.1.12] Hedgerows (WL1)

This habitat is characterised by linear shrubs bordering agricultural lands. Floral species observed included bramble (*Rubus fruticosus*), hawthorn (*Crataegus monogyna*), and bindweed (*Calystegia sepium*). This habitat has linkages to the Annex I habitat *Hedgerows* (not specifically listed as Annex I but often linked to *Old deciduous woodlands* (91A0) and *Traditional orchards*). The habitats found during surveys were determined to not be of Annex I quality, as insufficient positive indicator species, structural diversity, and characteristic features were noted at the time of survey.

[5.1.13] Treelines (WL2)

Linear habitats comprising tall trees bordering fielded areas and watercourses were observed throughout the Lower Shannon ADS catchment, typically near agricultural lands. Species observed include ash (*Fraxinus excelsior*), oak (*Quercus* spp.), hawthorn, blackthorn (*Prunus spinosa*), beech (*Fagus sylvatica*), birch (*Betula pendula*), hazel (*Corylus avellana*), sycamore (*Acer pseudoplatanus*), willows (*Salix* sp.), poplar (*Populus* sp.), alder, horse chestnut (*Aesculus hippocastanum*), holly (*Ilex* sp.), and conifers.

This habitat has linkages to the Annex I habitat *Old sessile oak woods with Ilex and Blechnum in the British Isles* (91A0) and *Alluvial forests with Alnus glutinosa and Fraxinus excelsior* (91E0). The habitats found during surveys were determined to not be of Annex I quality, as insufficient positive indicator species, structural complexity, and characteristic assemblages were noted at the time of survey.

[5.1.14] Scrub (WS1)

Patches of scrubby vegetation were observed throughout the proposed works area, being widespread in fields and along riverbanks. Floral species observed included gorse (*Ulex europaeus*), bramble, bindweed, ragwort, willow, common hogweed *(Heracleum sphondylium)*, nettle (*Urtica dioica*), broadleaved dock (*Rumex obtusifolius*), bracken (*Pteridium* sp.*),* Japanese knotweed (*Reynoutria japonica*), giant hogweed (*Heracleum mantegazzianum*), thistle (*Cirsium* sp.), ivy (*Hedera hibernica*), butterbur (*Petasites hybridus*), cow parsley (*Anthriscus sylvestris*), canary grass (*Phalaris canariensis*), meadowgrass (*Poa* sp.), rye grass (*Lolium sp.*), Yorkshire fog (*Holcus lanatus*), willowherb, sedges, hawthorn, birch, ash, oak, and alder.

This habitat has linkages to the Annex I habitat *Temperate Atlantic wet heaths with Erica ciliaris and Erica tetralix* (4010) and *European dry heaths* (4030). The habitats found during surveys were determined to not be of Annex I quality, as insufficient positive indicator species, structural features, and characteristic vegetation composition were noted at the time of survey.

[5.1.15] Dry Meadows and Grassy Verges (GS2)

Dry meadows and grassy verges were observed in abundance throughout the Lower Shannon ADS. Species observed included Yorkshire fog, smooth meadowgrass *(Poa pratensis*), common hogweed, giant hogweed, ragwort, nettle, bramble, thistle, butterbur, gorse, broadleaved dock, rye grass, willowherb, false oat-grass (*Arrhenatherum elatius*), dandelion (*Taraxacum officinale* agg.), and clovers (*Trifolium* spp.).

This habitat has linkages to the Annex I habitat *Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia)* (6210). The habitats found during surveys were determined to not be of Annex I quality, as insufficient positive indicator species and characteristic vegetation structure were noted at the time of survey.

[5.1.16] Wet Grassland (GS4)

Examples of wet grassland habitat were frequently observed throughout the Lower Shannon ADS catchment. Typically, this habitat was observed near agricultural fields. Typical floral species observed included rushes (*Juncus spp*.), sedges (*Carex hirta* and *C. ovalis*), Yorkshire fog, creeping bent (*Agrostis stolonifera*), and marsh foxtail (*Alopecurus geniculatus*).

This habitat is linked to the Annex I grassland habitat Molinia meadows (6410). The habitats found during surveys were determined to not be of Annex 1 quality, as insufficient positive indicator species were noted at the time of survey and the habitat quality was degraded.

[5.1.17] (Mixed) Broadleaved Woodland (WD1)

This habitat type was observed sporadically within the Lower Shannon ADS catchment area. Species observed included ash, horse chestnut, holly, sycamore, bramble, hazel, beech, birch, cypress, alder, and willows. This habitat has linkages to the Annex I habitat *Old sessile oak woods with Ilex and Blechnum in the British Isles* (91A0). The habitats found during surveys were determined to not be of Annex I quality, as insufficient positive indicator species, structural diversity, and characteristic assemblages were noted at the time of survey.

[5.1.18] Mixed Broadleaved/Conifer Woodland (WD2)

This habitat type was observed sporadically within the Lower Shannon ADS catchment area. Species observed included conifers, beech, hazel, ash, and hawthorn. This habitat has linkages to the Annex I habitat *Old sessile oak woods with Ilex and Blechnum in the British Isles* (91A0) and *Bog woodland* (91D0). The habitats found during surveys were determined to not be of Annex I quality, as insufficient positive indicator species, structural complexity, and characteristic assemblages were noted at the time of survey.

[5.1.19] Conifer Plantation (WD4)

This habitat type was observed sporadically within the Lower Shannon ADS catchment area. Species observed included Sitka spruce (*Picea sitchensis*) and lodgepole pine (*Pinus contorta*). This habitat has linkages to the Annex I habitat *Bog woodland* (91D0) in some transitional contexts. The habitats found during surveys were determined to not be of Annex I quality, as insufficient positive indicator species, natural structure, and characteristic features were noted at the time of survey.

[5.1.20] Improved Agricultural Grassland (GA1)

This habitat type is ubiquitous throughout the Lower Shannon ADS catchment and was the most abundant habitat type observed in the surrounding lands. This habitat has linkages to the Annex I habitat *Semi-natural grasslands* (such as *Molinia meadows* 6410), although improved agricultural grassland typically does not meet Annex I criteria. The habitats found during surveys were determined to not be of Annex I quality, as insufficient positive indicator species and characteristic vegetation structure were noted at the time of survey.

[5.1.21] Stone walls and other stonework (BL1)

This habitat was present sporadically throughout the Lower Shannon ADS catchment area along riverbanks. This habitat has linkages to the Annex I habitat *Reefs* (1170) in some coastal or freshwater contexts where stone structures support characteristic communities. The habitats found during surveys were determined to not be of Annex I quality, as insufficient characteristic species and typical reef-associated vegetation were noted at the time of survey.

[5.1.22] Earth banks (BL2)

This habitat was present sporadically throughout the Lower Shannon ADS catchment area along riverbanks and serving as embankments at tidal reaches of river. This habitat has linkages to the Annex I habitat *Fossil shingle beaches* (1230) and *Semi-natural dry grasslands and scrubland on calcareous substrates* (6210) where earth banks support characteristic vegetation. The habitats found during surveys were determined to not be of Annex I quality, as insufficient positive indicator species and typical structural features were noted at the time of survey.

[5.1.23] Buildings & Artificial surfaces (BL3)

All roads, buildings, footpaths etc. observed within the Lower Shannon ADS catchment area fall into this category.

[5.1.24] Fisheries Habitat Potential

Salmon (*Salmo salar*), brook lamprey (*Lampetra planeri*), river lamprey (*Lampetra fluviatilis*), and sea lamprey (*Petromyzon marinus*) are designated QIs for the Lower River Shannon SAC. According to current NPWS records, all four species are known to occur within the study area. Figures 5-3 to 5-6 provide an overview of the most recent NBDC records relating to the distribution of salmon and lampreys throughout the Lower Shannon ADS catchments. Preliminary evidence from site surveys conducted along primary watercourses and their tributaries indicates the presence of good-quality adult, spawning, and nursery habitat for these species. Notable features included clean gravel beds with good flow, deep glides, diverse in-channel habitat, and well-structured banks offering adequate cover.

[5.2] Fauna

The walkover survey focused on, but was not limited to, the species highlighted within the survey methodology, including otter and kingfisher. The Ecologists were mindful of other fauna that may have been present on site and recorded any sightings or potential evidence of species presence.

Evidence and data pertaining to the presence and distribution of several key ecological receptors was collected throughout the Lower Shannon ADS catchment. The sections hereunder provide an overview of information on specific ecological receptors within the study area.

[5.2.1] Otter (*Lutra lutra*)

Evidence of otter was observed at several locations throughout the Lower Shannon ADS catchments. Although the primary land use within the Lower Shannon ADS catchments is agricultural, there is evidence to suggest that otters are present throughout the length of the system. Figure 5-1 provides an overview of the locations of otter evidence in the form of sightings or signs from records from the NPWS and the National Otter Survey of Ireland 2010-11. Figure 5-2 provides photographic evidence of the presence of otter collected during site assessments along the Lower Shannon ADS catchments.

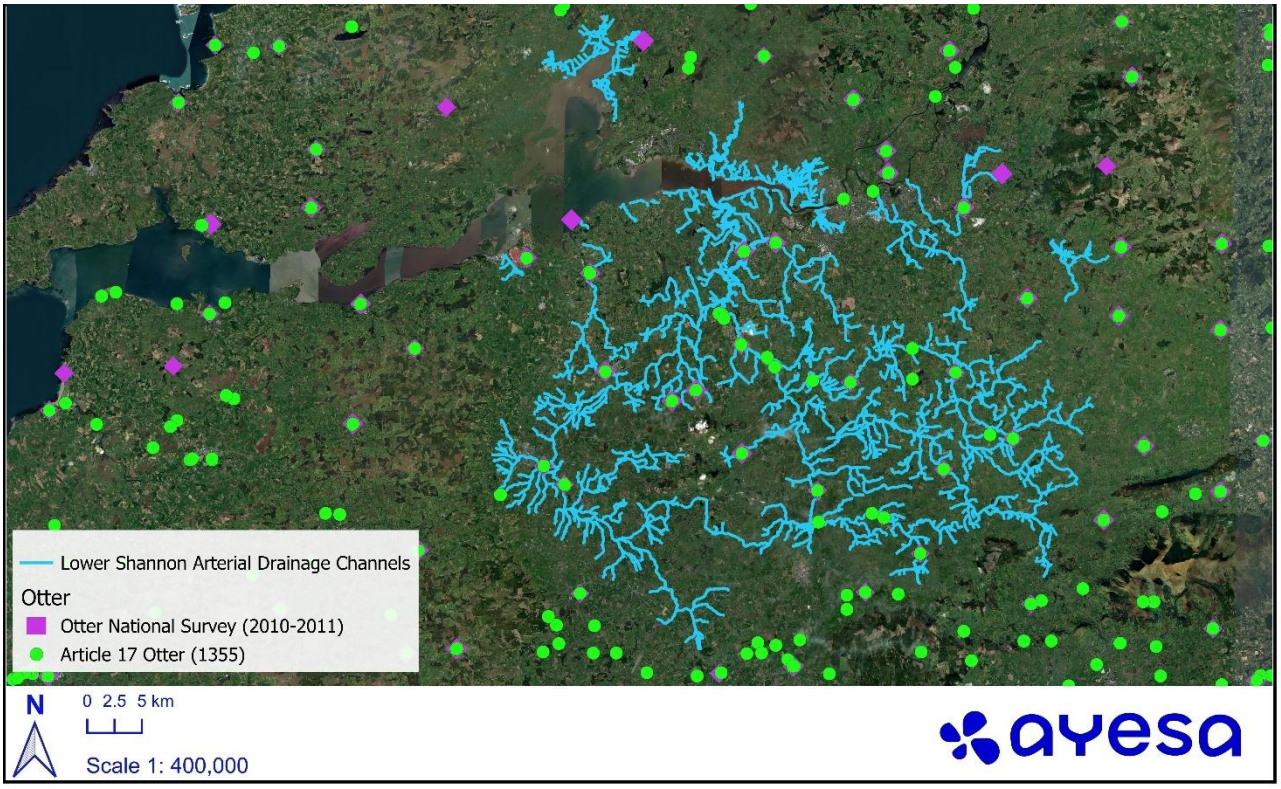

Figure 5-1. Distribution and extent of otter signs and/or sightings within the Lower Shannon ADS catchment.

Figure 5-2. Examples of evidence of otter presence at sites within the Lower Shannon ADS catchment.

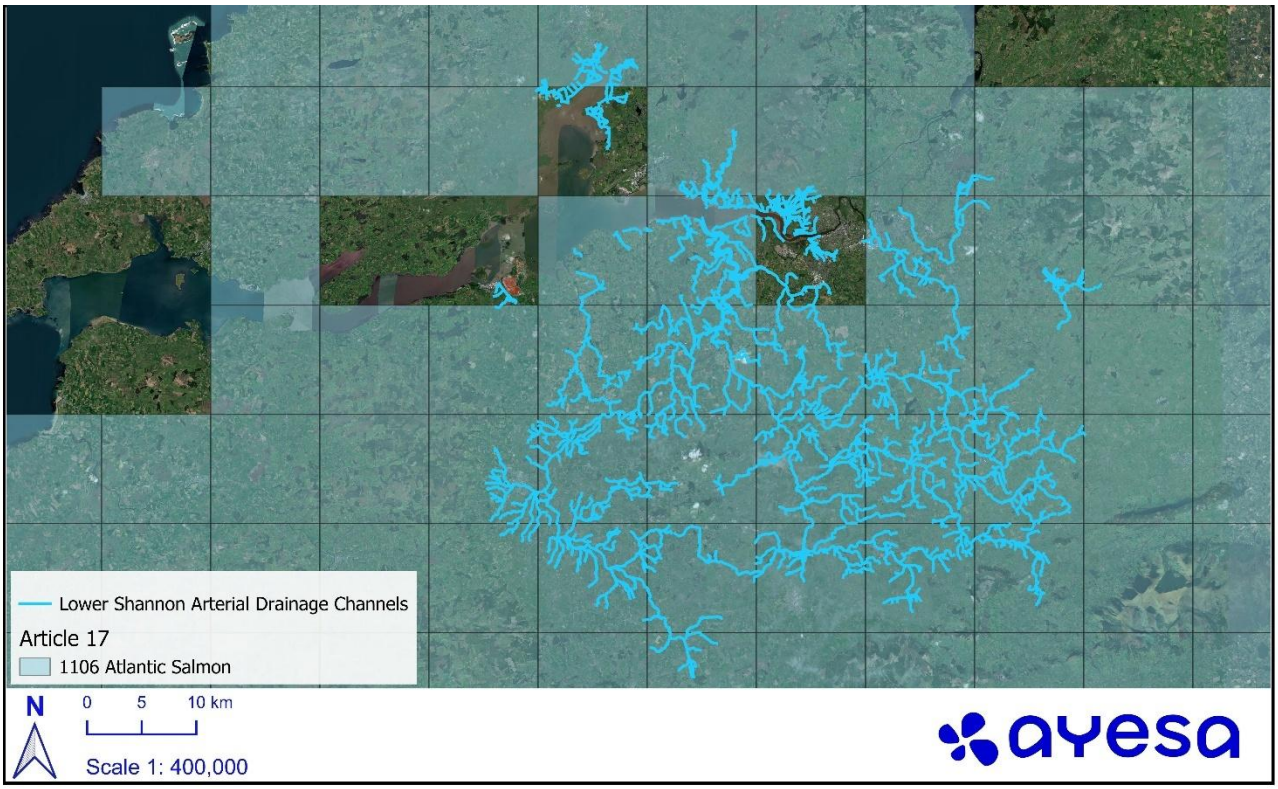

Figure 5-3. Distribution of salmon throughout the Lower Shannon ADS catchments (NPWS Article 17 data).

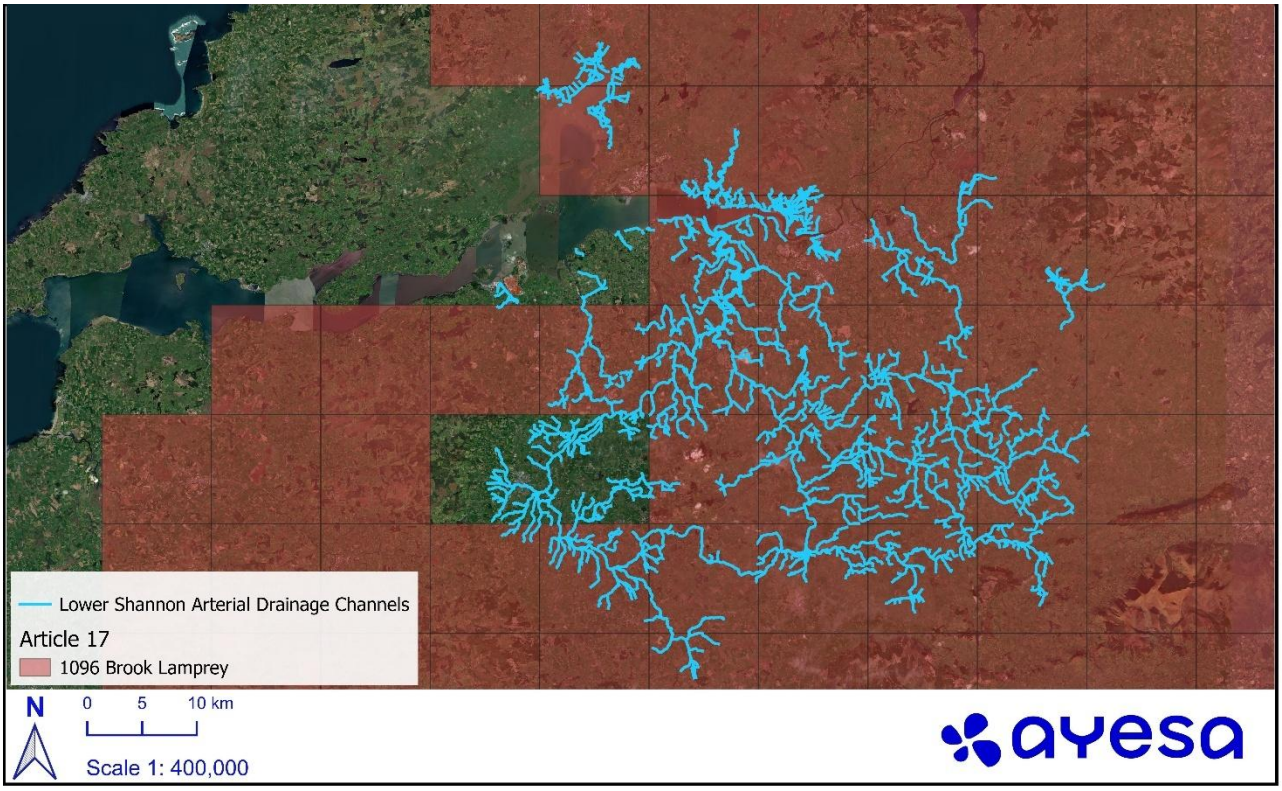

Figure 5-4. Distribution of brook lamprey throughout the Lower Shannon ADS catchments (NPWS Article 17 data).

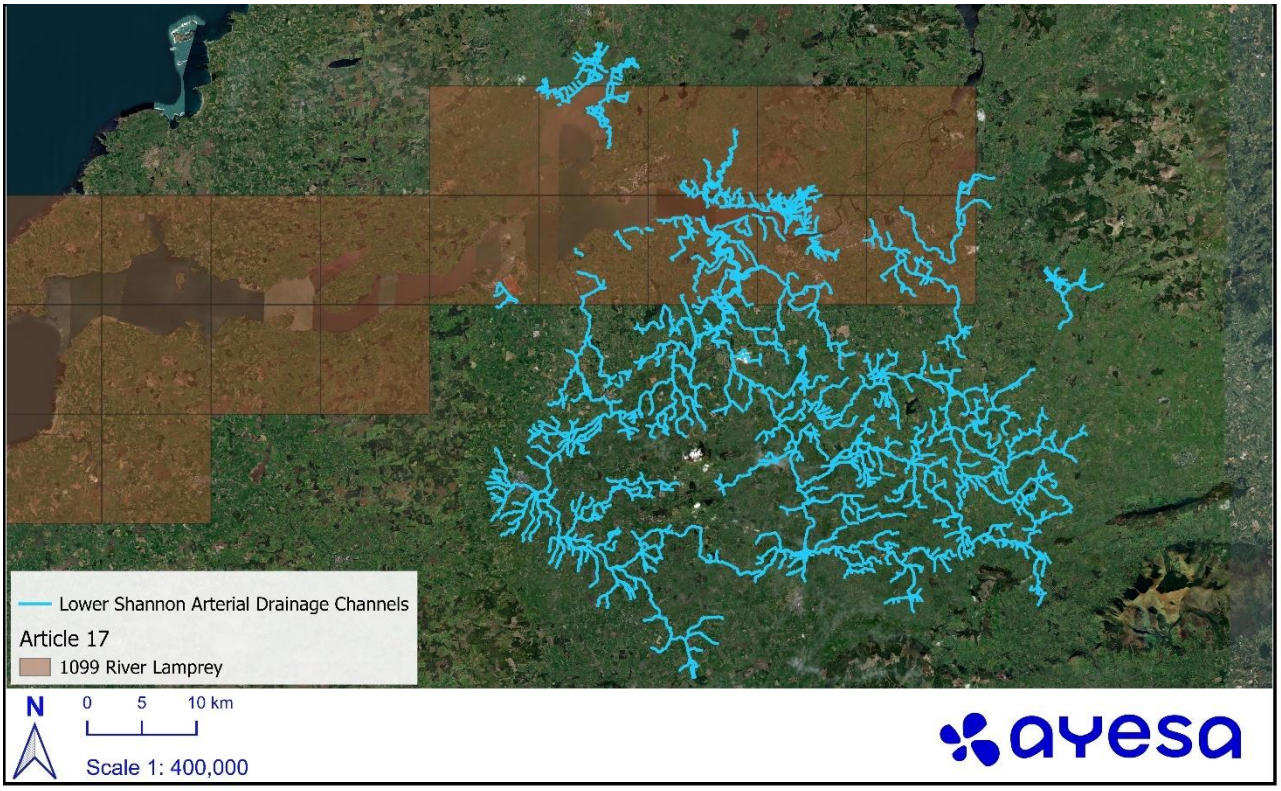

Figure 5-5. Distribution of river lamprey throughout the Lower Shannon ADS catchments (NPWS Article 17 data).

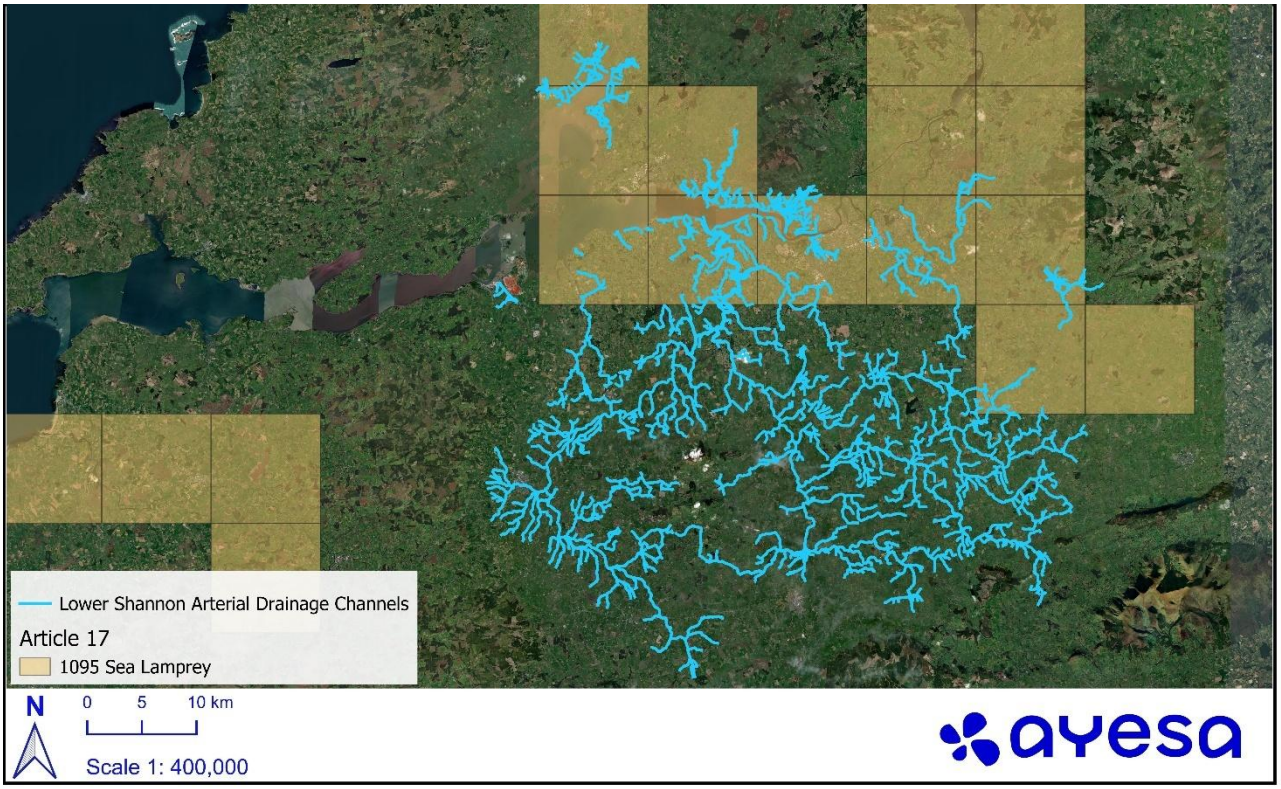

Figure 5-6. Distribution of sea lamprey throughout the Lower Shannon ADS catchments (NPWS Article 17 data).

[5.2.2] Kingfisher (*Alcedo atthis*)

Kingfishers are highly protected under the Wildlife Acts (1976, as amended), under Annex I of the EU Birds Directive, and under The Birds of Conservation Concern Ireland they are Amber Listed. Kingfishers are widespread residents throughout Ireland. They are a sedentary species rarely moving from their territories, breeding in burrows dug into vertical muddy banks along streams and rivers (Birdwatch Ireland).

There was no direct Kingfisher evidence or live sighting recorded during the RRCS. Kingfisher sightings have been recorded on the OPW dataset on the Mulkear Ballymackeogh, Shannon Embankments North and Shannon Embankments South ADS. Moderate-good habitat with good perches was observed within the Scheme area, as well as suitable nesting habitat along tidal (CW2) riverbank.

[5.2.3] White-Clawed Crayfish (*Austropotamobius pallipes*)

White-clawed crayfish are afforded strict protection under the Wildlife Acts (1976, as amended) and are listed under Annex II and Annex V of the EU Habitats Directive. They are also included on the Irish Red List of freshwater species as Vulnerable. White-clawed crayfish are native and widespread in suitable freshwater habitats across Ireland, typically favouring clean, well-oxygenated calcareous rivers and lakes with good instream structure, shelter, and suitable substrate such as cobbles, gravels, and boulders.

No direct evidence or live sightings of white-clawed crayfish were recorded during the RRCS survey. However, good to excellent potential habitat was noted within the Scheme area. This included well-structured instream environments with good flow, abundant shelter, suitable adult and juvenile habitat, and high-quality bank vegetation. The presence of cobbles, gravels, and boulders further indicates potentially suitable substrate for burrowing and shelter.

[5.3] Alien Invasive Species (AIS)

Invasive alien plant species (IAPS) were recorded within the Lower Shannon ADS catchment during walkover surveys, occurring in varying densities across the surveyed sections. Notably, large and dense stands of Japanese knotweed (*Reynoutria japonica*) were identified, representing a significant concern for both ecological integrity and bank stability. Himalayan balsam (*Impatiens glandulifera*) was present in small, scattered patches along drains, while giant hogweed (*Heracleum mantegazzianum*) was noted in isolated, mature stands. Other species recorded included winter heliotrope (*Petasites fragrans*) along the riverbank, and montbretia (*Crocosmia* × *crocosmiflora*) observed in a farmyard setting.

It should be noted that the entirety of the Scheme area was not surveyed, and as such, the presence and extent of all IAPS cannot be comprehensively confirmed based on field surveys alone. To supplement field data, OPW IAPS records were reviewed as part of the desktop study. These records indicate that the Lower Shannon ADS catchment has previously supported Himalayan balsam and Japanese knotweed populations, with additional records of species such as montbretia, white butterbur (*Petasites albus*), cord-grass (*Spartina anglica*), least duckweed (*Lemna minuta*), nuttall's pondweed (*Elodea nuttallii*), cherry laurel (*Prunus laurocerasus*), and giant rhubarb (*Gunnera tinctoria*) in the broader regional context.

[6] Source – Pathway – Receptor Model

[6.1] Sources of Likely Significant Effects

Table 6-1 provides details of the potential sources of significant effects. These sources are based on a reasonable worst-case scenario.

Table 6-1. Potential Sources of Impacts.

Activity	Potential Significant Effect
Disturbance of Species and Habitats	
Vehicle movement along ADS channels and during works operations	Habitat disturbance; compaction of vegetation/soil; species disturbance from adjacent habitats through: • Noise • Vibration • Human presence / visual disturbance
Channel maintenance – silt and vegetation removal	Removal of / disturbance to Annex I habitat; removal of habitat for species; loss of habitat connectivity; direct mortality/displacement of species; reduction of food resource availability.
Release of Suspended Solids	
Silt and vegetation management	Release of solids downstream, potentially impacting aquatic-dependent and riparian species/vegetation.
Release of Nutrients / Changes in Nutrient Levels	

Silt and vegetation maintenance	Release of silt material; re-suspension of deposited nutrients.
Vegetation cutting	Release of decaying cut material into embankment and channel.
Changes in Water Level	
Silt and vegetation management	Removal of blockages lowering upstream surface water level; removal of blockages altering upstream groundwater levels.

[6.1.1] Additional Considerations

The following activities were considered as potential sources of significant effects but were determined to **not present any potential risk**:

- Creation of site compounds and haul roads: Site compounds are not required for drainage maintenance works and the establishment of new haul roads are not assessed in this report. Haul roads may be in place already and regularly utilised. In areas with soft ground, machinery will either operate on tracks or utilise temporary matting to create an access corridor. Any matting used will be fully removed after the works are completed, allowing vegetation to naturally regenerate. Equipment and vehicles will be restricted to a single designated access route to minimise ground disturbance. New haul roads in or adjacent to designated sites would be subject to a separate AA if necessary.
- Light pollution: Working hours and safe working practice means that maintenance activities are only conducted in the daytime, thus eliminating the potential for light pollution.
- Excavation beyond design level: This is not permitted as part of maintenance activities. Any alteration to the base level and maximum capacity of a channel would be subject to a separate AA where it had the potential to impact on designated sites.
- Hydrocarbon and chemical spillage: All machinery is routinely serviced and maintained to reduce the risk of hydrocarbon leaks, and vehicles checked daily by operators before they start work. All operators are trained to prioritise the protection of water quality. Hydraulic excavators and other equipment will operate using long-life engine oil and biodegradable hydraulic oil. Refuelling and lubrication activities will take place at least 50 m from watercourses. Spill kits will be available in all maintenance machinery. Plant nappies will be used on pumps and compressors as required There will be no flow path from vehicles parked overnight. No machinery will track through the channel.
- Exhaust emissions and air quality: The number of emissions to the air from ADS maintenance activities is determined to be negligible because of the small maintenance crews and the low number of vehicles necessary for the works.
- Migration of fish: The proposed works will not result in channel obstruction and only very short-term disturbance which may interrupt migration pathway and activities. Consultation with Inland Fisheries Ireland (IFI) ensures that instream works are conducted during the most appropriate season. Therefore, obstruction to fish migration due to the proposed ADS maintenance works will not occur.
- Disturbance to birds in supporting habitats: The minimal number of machines and small size of maintenance crew are similar to those associated with typical agricultural activities. Maintenance activities occur less frequently than agricultural activities and are cyclical in nature, so any disturbance that would occur would not be new or novel, with birds being used to the disturbance level. Where there is potential for cumulative effects from agricultural

activities and ADS works in combination, the abundance of suitable foraging habitat in the wider area for birds outside of the European Site for which they are designated will prevent significant effects to their conservation objectives. Any/all potential disturbance effects that may occur within the boundaries of European Sites are considered (as described above), but those relating to birds outside of a designated European Site are excluded. Where possible, vegetation removal activities during the ADS maintenance works will be undertaken outside of the breeding bird season (March to August, inclusive). All nesting birds are protected from disturbance by the Wildlife Act 2000 (as amended), which is incorporated into the OPW Environmental Management Plan and, as such, all ADS maintenance activities will comply with this legislation.

[6.2] Pathways

The potential pathways for impacts are assessed as follows:

- Surface water and groundwater: Effects can be carried downstream in the normal flow of water. Upstream effects may also be transmitted where the level of the water is altered. In rare circumstances, the maintenance works may alter the condition of the groundwater, which can be transmitted down gradient where connected to surface water.
- Air: Noise, vibration, and dust effects can be transmitted as a direct result of maintenance works, including vehicle movement and vegetation management.
- Land: Direct result of maintenance works, including vehicle movement as well as storage areas and vegetation management.

[6.2.1] Land and Air Pathways

As mentioned in Section 4.5.1, the relevant ZoI for land and air pathways encompasses a radius of up to 1 km from the scheme works. The 1 km ZoI accounts for indirect effects for noise and visual disturbance through air pathways as well as direct impacts from physical disturbance to habitats through land pathways.

There are eight European Sites located within this distance:

- Lower River Shannon SAC (overlaps with proposed works)
- River Shannon and River Fergus Estuaries SPA (overlaps with proposed works)
- Newhall and Edenvale Complex SAC (ca. 600 m from proposed works)
- Barrigone SAC (ca. 900 m from proposed works)
- Tory Hill SAC (overlaps with proposed works)
- Glen Bog SAC (overlaps with proposed works)
- Askeaton Fen Complex SAC (overlaps with proposed works)
- Curraghchase Woods SAC (overlaps with proposed works)

Given the nature of their QIs/SCIs, all of these sites except Barrigone SAC will be assessed further below. Barrigone SAC is excluded due to the fact that it is not designated for any QIs that could be impacted via land or air pathways at a distance of ca. 900 m.

[6.2.2] Surface Water and Groundwater Pathways

There is no published evidence on how quickly suspended solids released during maintenance activities remain at levels that would significantly affect wildlife. Nevertheless, based on the experience and professional opinion of Ayesa ecologists, effects rarely persist more than 2 km downstream due to the small-scale nature of the works. However, a precautionary distance of 5 km is used herein for screening of sites for surface water impacts where the site has not been designated for FPM; where it has been designated for FPM, the screening distance is extended to 35 km or if the works are being carried out within an FPM sub-catchment. Accordingly, the following European Sites have direct downstream/overlapping surface water connectivity with the proposed works and have QIs/SCIs that may be affected via hydrological pathways, and therefore will be considered in this assessment:

- Lower River Shannon SAC (overlaps with proposed works)
- River Shannon and River Fergus Estuaries SPA (overlaps with proposed works)
- Tory Hill SAC (overlaps with proposed works)
- Glen Bog SAC (overlaps with proposed works)
- Askeaton Fen Complex SAC (overlaps with proposed works)
- Curraghchase Woods SAC (overlaps with proposed works)

It is unlikely that any clearance will result in changes in water levels more than 1 km upstream. However, a precautionary distance of 3 km is used herein for potentially sensitive sites. Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA falls within this distance, being located ca. 2.6 km (hydrological distance) upstream; as does Slievefelim to Silvermines Mountains SPA, which is located ca. 1.5 km. As these sites are solely designated for hen harrier (*Circus cyaneus*), a bird of high conservation concern but one that is not dependent on aquatic ecosystems, there exists no potential for effects to them.

[6.3] Receptors

The connectivity and/or proximity of the proposed ADS maintenance works to European Sites identified within the ZoI is assessed below. Habitats and species associated with European Sites identified as at risk of potential significant effects from the proposed ADS maintenance works are listed in the sections hereunder. Additionally, any sensitive/protected species/habitats within the immediate vicinity of the proposed works have been considered.

[6.3.1] Special Protection Areas (SPAs)

River Shannon and River Fergus Estuaries SPA (004077)

The site synopsis and conservation objectives for the site are available at http://www.npws.ie/protected-sites/spa/004077. Some of the proposed ADS maintenance works will occur within the boundaries of the River Shannon and River Fergus Estuaries SPA. This SPA is of high conservation value for the following SCIs:

- Cormorant (*Phalacrocorax carbo*) [A017]
- Whooper Swan (*Cygnus cygnus*) [A038]
- Light-bellied Brent Goose (*Branta bernicla hrota*) [A046]
- Shelduck (*Tadorna tadorna*) [A048]

- Wigeon (*Anas penelope*) [A050]
- Teal (*Anas crecca*) [A052]
- Pintail (*Anas acuta*) [A054]
- Shoveler (*Anas clypeata*) [A056]
- Scaup (*Aythya marila*) [A062]
- Ringed Plover (*Charadrius hiaticula*) [A137]
- Golden Plover (*Pluvialis apricaria*) [A140]
- Grey Plover (*Pluvialis squatarola*) [A141]
- Lapwing (*Vanellus vanellus*) [A142]
- Knot (*Calidris canutus*) [A143
- Dunlin (*Calidris alpina*) [A149]
- Black-tailed Godwit (*Limosa limosa*) [A156]
- Bar-tailed Godwit (*Limosa lapponica*) [A157]
- Curlew (*Numenius arquata*) [A160]
- Redshank (*Tringa totanus*) [A162]
- Greenshank (*Tringa nebularia*) [A164]
- Black-headed Gull (*Chroicocephalus ridibundus*) [A179]
- Wetland and Waterbirds [A999]

[6.3.2] Special Areas of Conservation (SACs)

Lower River Shannon SAC (002165)

The site synopsis and conservation objectives for the site are available at http://www.npws.ie/protected-sites/sac/002165. Some of the proposed ADS maintenance works will occur within the boundaries of the Lower River Shannon SAC. This SAC is of high conservation value for the following QIs:

- Sandbanks which are slightly covered by sea water all the time [1110]
- Estuaries [1130]
- Mudflats and sandflats not covered by seawater at low tide [1140]
- Coastal lagoons [1150]
- Large shallow inlets and bays [1160]
- Reefs [1170]
- Perennial vegetation of stony banks [1220]
- Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]
- Salicornia and other annuals colonising mud and sand [1310]
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]
- Mediterranean salt meadows (*Juncetalia maritimi*) [1410]

- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]
- *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [6410]
- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]
- *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029]
- *Petromyzon marinus* (Sea Lamprey) [1095]
- *Lampetra planeri* (Brook Lamprey) [1096]
- *Lampetra fluviatilis* (River Lamprey) [1099]
- *Salmo salar* (Salmon) [1106]
- *Tursiops truncatus* (Common Bottlenose Dolphin) [1349]
- *Lutra lutra* (Otter) [1355]

Newhall and Edenvale Complex SAC (002091)

The site synopsis and conservation objectives for the site are available at http://www.npws.ie/protected-sites/sac/002165. Some of the proposed ADS maintenance works will occur within the boundaries of the Newhall and Edenvale Complex SAC. This SAC is of high conservation value for the following QIs:

- Caves not open to the public [8310]
- *Rhinolophus hipposideros* (Lesser Horseshoe Bat) [1303]

Tory Hill SAC (000439)

The site synopsis and conservation objectives for the site are available at http://www.npws.ie/protected-sites/sac/000439. Some of the proposed ADS maintenance works will occur within the boundaries of Tory Hill SAC. This SAC is of high conservation value for the following QIs:

- Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210]
- Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* [7210]
- Alkaline fens [7230]

Glen Bog SAC (001430)

The site synopsis and conservation objectives for the site are available at http://www.npws.ie/protected-sites/sac/001430. Some of the proposed ADS maintenance works will occur within the boundaries of Glen Bog SAC. This SAC is of high conservation value for the following QIs:

- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]

Askeaton Fen Complex SAC (002279)

The site synopsis and conservation objectives for the site are available at http://www.npws.ie/protected-sites/sac/001430. Some of the proposed ADS maintenance works will occur within the boundaries of Askeaton Fen Complex SAC. This SAC is of high conservation value for the following QIs:

- Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* [7210]
- Alkaline fens [7230]

Curraghchase Woods SAC (000174)

The site synopsis and conservation objectives for the site are available at http://www.npws.ie/protected-sites/sac/001430. Some of the proposed ADS maintenance works will occur within the boundaries of Curraghchase Woods SAC. This SAC is of high conservation value for the following QIs:

- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]
- *Taxus baccata* woods of the British Isles [91J0]
- *Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016]
- *Rhinolophus hipposideros* (Lesser Horseshoe Bat) [1303]

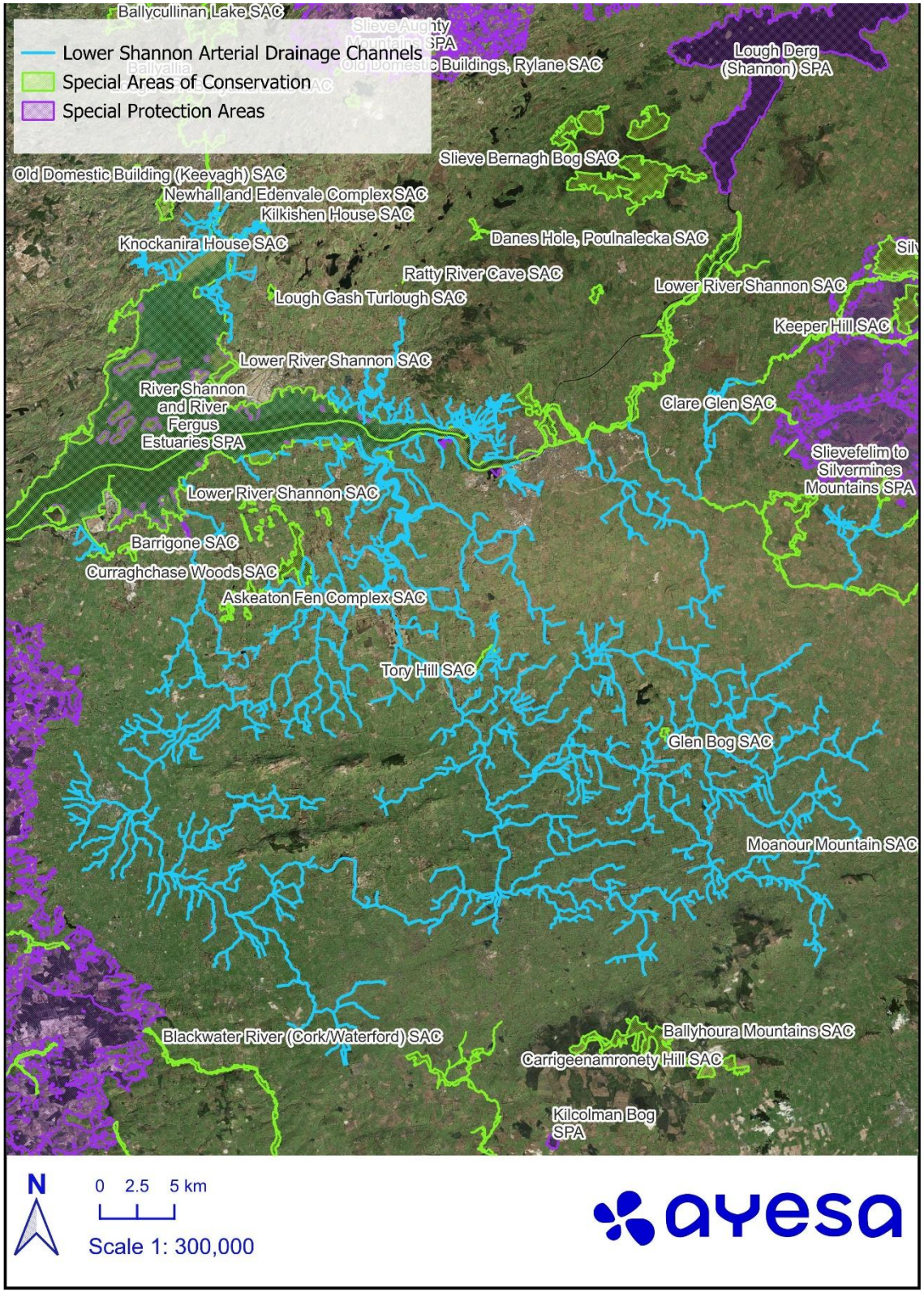

Figure 6-1. European sites in relation to the Lower Shannon ADS.

[7] Assessment of Likely Effects

In assessing the likelihood of the occurrence of significant effects, the logic is as follows:

- The conditions necessary for a significant effect are considered, and
- The likelihood of that effect is assessed, considering the process/emission magnitude, duration, timing, and frequency, as well as the connectivity with the proposed project site and the sensitivity of the QI/SCI to the process/emission in question.

The following table (Table 7-1) identifies whether there is likelihood of significant effects to European Sites via the designated pathways (i.e., surface water and groundwater, air, and/or land pathways) stemming from ADS maintenance activities.

Table 7-1. Likelihood of significant effects to QIs/SCIs designated for European Sites.

Designated SCI	Desktop Study Comments	Assessment
River Shannon and River Fergus Estuaries SPA (004077)		
Cormorant (*Phalacrocorax carbo*) [A017] **Whooper Swan (*Cygnus cygnus*) [A038]** **Light-bellied Brent Goose (*Branta bernicla hrota*) [A046]** **Shelduck (*Tadorna tadorna*) [A048]** **Wigeon (*Anas penelope*) [A050]** **Teal (*Anas crecca*) [A052]** **Pintail (*Anas acuta*) [A054]** **Shoveler (*Anas clypeata*) [A056]** **Scaup (*Aythya marila*) [A062]** **Ringed Plover (*Charadrius hiaticula*) [A137]** **Golden Plover (*Pluvialis apricaria*) [A140]** **Grey Plover (*Pluvialis squatarola*) [A141]** **Lapwing (*Vanellus vanellus*) [A142]** **Knot (*Calidris canutus*) [A143]** **Dunlin (*Calidris alpina*) [A149]**	The conservation objectives of SCIs for which the River Shannon and River Fergus Estuaries SPA is designated are related to the population trends and distribution of waterbird species, and the wetland habitat that supports them. Specifically, the conservation objectives aim to: • Maintain a favourable conservation status of the supporting habitat, achieved when, 1) The natural range and total coverage area is stable or increasing 2) The specific structure and functions for long-term habitat maintenance remain to exist. • Maintain the favourable conservation status of species, achieved when, 1) The population dynamics are stable or increasing, 2) The natural range of the species is stable or increasing, 3) Sufficient supporting habitat exists to maintain positive population trends long-term. • Maintain the favourable conservation condition of the wetland habitat in River Shannon and River Fergus Estuaries SPA as a resource for the regularly occurring waterbirds that utilise it. Some of the proposed ADS works will occur adjacent to the River Shannon Estuary, within watercourses that connect to the estuary, and within the River Shannon and River Fergus Estuaries SPA. The proposed maintenance works can result in minor sediment disturbance and/or sediment influx into the watercourse(s) and within the estuary. However, given the naturally high and fluctuating sediment concentrations within estuaries, and the associated dilution factor, any sedimentation stemming from the proposed works will not have a significant effect on this habitat nor on the birds utilising it. Consequently, it is determined that significant effects through surface and groundwater pathways are unlikely. Noise emissions from machinery and equipment can have significant effects on bird species. Similarly, vibration and dust emissions can have significant effects on aquatic biota (displacement, alteration of microhabitats, etc). No piling,	**Significant effects via surface & groundwater pathways – Unlikely** **Significant effects via air pathways – Likely**

Black-tailed Godwit (*Limosa limosa*) [A156] **Bar-tailed Godwit (*Limosa lapponica*) [A157]** **Curlew (*Numenius arquata*) [A160]** **Redshank (*Tringa totanus*) [A162]** **Greenshank (*Tringa nebularia*) [A164]** **Black-headed Gull (*Chroicocephalus ridibundus*) [A179]** **Wetland and Waterbirds [A999]**	demolition, or other similar works are proposed within the ADS maintenance works area. Nevertheless, the proposed ADS works will result in the production of noise, vibration, and dust effects. Consequently, it is determined that significant effects to wading birds through air pathways are likely. The ADS works will occur within the boundaries of River Shannon and River Fergus Estuaries SPA, wherein there is potential for loss of habitat, prey items, and connectivity between habitats for bird species. Consequently, it is determined that significant effects to the conservation objectives of bird species through land pathways are likely.	**Significant effects via land pathways – Likely**
Designated QI	**Desktop Study Comment**	**Assessment**
Lower River Shannon SAC (002165)		
Sandbanks which are slightly covered by sea water all the time	This habitat type is primarily located in the middle of the mouth of the River Shannon Estuary and encompasses a total area of ca. 1,353 ha. The conservation objectives include: • The stable occurrence and distribution of sandbanks. • The stable or increasing size of total area of sandbanks. • The maintenance of the distribution of sediment based invertebrate communities (e.g., polychaetes community, *Nephtys cirrose* community).	**Significant effects via surface & groundwater pathways – Unlikely**
	Estuarine habitats, in which sandbank habitats occur, encompass the entirety of the lower reaches of the River Shannon. The proposed ADS maintenance works along the various Lower Shannon catchments may result in adverse effects through surface water pathways, such as increased sedimentation and/or contaminants, which may result in altered water quality leading to significant negative effects to benthic invertebrate communities. However, sandbank habitats are located in the middle of the Shannon Estuary, and so a significant dilution effect is afforded to any potential water quality alterations. Consequently, it is determined that significant effects to the conservation objectives of sandbanks which are slightly covered by sea water all the time through surface and groundwater pathways are unlikely.	**Significant effects via air pathways – Unlikely**
	Due to the nature of this habitat, noise/vibration/dust effects are not a cause for concern. Some of the ADS maintenance works will occur adjacent to the Shannon Estuary. However, sandbank habitats are in the middle of the estuary, i.e. not adjacent to the proposed works. Therefore, there is no potential for significant effects from land activities to result in habitat loss or loss of connectivity between habitats. It is therefore determined that significant effects to the conservation objectives of sandbanks which are slightly covered by sea water all the time through land pathways are unlikely.	**Significant effects via land pathways – Unlikely**

Estuaries	This habitat encompasses the mouth of the River Shannon and is adjacent to and overlaps with some of the works. The conservation objectives include: • The stable or increasing size of total area of estuarine habitat. • The maintenance (density and distribution) of sediment based invertebrate communities (e.g., polychaetes community, *Nephtys cirrose* community).	**Significant effects via surface & groundwater pathways – Unlikely**
	Estuarine habitats encompass the entirety of the lower reaches of the River Shannon. The proposed maintenance works could result in minor sediment disturbance and/or sediment influx into the watercourse(s) and within the estuary, potentially resulting in altered water quality and loss of benthic invertebrate communities within this habitat. However, given the naturally high and fluctuating sediment concentrations within estuaries, and the associated dilution factor, any sedimentation stemming from the proposed works will not have a significant effect on this habitat. Consequently, it is determined that potential significant effects to the conservation objectives of estuaries through surface and groundwater pathways are unlikely.	**Significant effects via air pathways – Unlikely**
	Due to the nature of this habitat, noise/vibration/dust effects are not a cause for concern. The ADS maintenance works will occur throughout the River Shannon Estuary. However, works in these areas will only involve grass mowing and therefore will not lead to any significant effects. It is therefore determined that significant effects to the conservation objectives of estuaries through land pathways are unlikely.	**Significant effects via land pathways – Unlikely**
Mudflats and sandflats not covered by seawater at low tide	A considerable proportion of the Lower Shannon Estuary consists of mudflats and sandflats exposed at low tide. The conservation objectives include: • The stable or increasing size of total area of estuarine habitat. • The maintenance of the extent of *Zostera* dominated community. • Natural maintenance (density and distribution) of sediment based invertebrate communities (e.g., polychaetes community, *Nephtys cirrose* community).	**Significant effects via surface water & groundwater pathways – Unlikely**
	This habitat occurs throughout the Shannon Estuary. The proposed maintenance works could result in minor sediment disturbance and/or sediment influx into the watercourse(s) and within the estuary within which this habitat occurs. However, given the naturally high and fluctuating sediment concentrations within estuaries, and the associated dilution factor, as well as the fact that mudflats are dependent on silt/clay from influent rivers, any sedimentation stemming from the proposed works will not have a significant effect on this habitat. Consequently, it is determined that potential significant effects to the conservation objectives of estuaries through surface and groundwater pathways are unlikely.	**Significant effects via air pathways – Unlikely**
	Due to the nature of this habitat, noise/vibration/dust effects are not a cause for concern. The ADS maintenance works will occur throughout the River Shannon estuary. However, works in estuarine areas will only involve grass mowing and therefore will not lead to any significant effects. It is therefore determined that significant effects to mudflats and sandflats not covered by seawater at low tide through land pathways are unlikely.	**Significant effects via land pathways – Unlikely**

Coastal lagoons	This habitat is known to occur in isolated patches along the coastline of the River Shannon Estuary. The conservation objectives (NPWS, 2011) of this habitat includes: • Maintain a stable or increasing total area of the habitat. • No decline in habitat distribution or occurrence. • Maintenance of the salinity regime & hydrological regime. • Maintenance of appropriate hydrological connections between lagoons and sea. • Maintenance of water quality (chlorophyll-*a*, Molybdate Reactive Phosphorous (MRP) & Dissolved Inorganic Nitrogen). • Ensure that the maximum depth of lagoons is colonised by macrophytes. • Maintenance of the number & extent of typical plant species, the number of listed lagoon specialist animal species, and ensure the absence / minimal number of negative indicator species. Coastal lagoons are currently known to exist within four isolated pockets in the Lower River Shannon SAC, with the closest one of these located ca. 2.5 km from the nearest ADS works (i.e. the Shannon Embankments South catchment). Consequently, when the dilution factor of the intervening estuarine waters is considered, it is determined that significant effects to coastal lagoon habitats through surface & groundwater pathways are unlikely. Due to the nature of this habitat, noise/vibration/dust effects are not a cause for concern. Some of the ADS maintenance works will occur within and adjacent to the River Shannon Estuary. However, no lagoon habitats are located adjacent to the works. Therefore, there is no potential for significant effects from land activities to result in habitat loss or loss of connectivity between habitats. It is therefore determined that significant effects to lagoons through land pathways are unlikely.	**Significant effects via surface & groundwater pathways – Unlikely** **Significant effects via air pathways – Unlikely** **Significant effects via land pathways – Unlikely**
Large shallow inlets and bays	This habitat encompasses the entirety of the lower reaches of the River Shannon Estuary, encompassing an area of ca. 35,000 ha. Shallow inlets and bays are key habitats for benthic invertebrate communities which in turn support fish and bird populations utilising estuarine habitats. The conservation objectives include: • Maintain a stable or increasing total area of the habitat. • Conserve the community distribution types within these habitats, namely: Intertidal sand with *Scolelepis squamata* and *Pontocrates spp*. community; Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex; Subtidal sand to mixed sediment with *Nucula nucleus* community complex; Subtidal sand to mixed sediment with *Nephtys spp*. community complex; Fucoid-dominated intertidal reef community complex; Mixed subtidal reef community complex; Faunal turf-dominated subtidal reef community; Anemone-dominated subtidal reef community; and Laminaria-dominated community complex. Some of the ADS maintenance works will occur within and adjacent to the River Shannon Estuary, as well as within watercourses that connect to the estuary, i.e. where this habitat occurs. Thus, there is direct hydrological connectivity between large shallow inlets and bay habitats and the proposed works. That being said, this habitat	**Significant effects via surface & groundwater pathways – Unlikely** **Significant effects via air pathways – Unlikely** **Significant effects via land pathways – Unlikely**

	occurs ca. 30 km from the nearest proposed works. Given the naturally high and fluctuating sediment concentrations within estuaries, and the associated dilution factor, any sedimentation stemming from the proposed works will not have a significant effect on this habitat. Consequently, it is determined that significant effects to the conservation objectives of large shallow inlets and bays through surface & groundwater pathways are unlikely. Due to the nature of this habitat, noise/vibration/dust effects are not a cause for concern. Some of the ADS maintenance works will occur within and adjacent to the River Shannon Estuary, but not adjacent to this habitat. It is therefore determined that significant effects to the conservation objectives of estuaries through land pathways are unlikely.	
Reefs	Reefs predominantly occur throughout the River Shannon Estuary, encompassing an area of ca. 21,400 ha. The intertidal reefs within the Shannon Estuary are exposed or moderately exposed to wave action and subject to moderate tidal streams. The conservation objectives include: • Maintain a stable or increasing total area of the habitat. • No decline in habitat distribution or occurrence. • Conserve the community distribution types within these habitats, namely Fucoid-dominated intertidal reef community complex; Mixed subtidal reef community complex; Faunal turf-dominated subtidal reef community; Anemone-dominated subtidal reef community; and Laminaria-dominated community complex.	**Significant effects via surface & groundwater pathways – Unlikely**
	The River Shannon estuary comprises reefs. There is therefore direct hydrological connectivity between reef habitats and the Lower Shannon ADS catchments. However, given the naturally high and fluctuating sediment concentrations within estuaries, and the associated dilution factor, any sedimentation stemming from the proposed works will not have a significant effect on this habitat. Consequently, it is determined that significant effects to the conservation objectives of reefs through surface water pathways are unlikely.	**Significant effects via air pathways – Unlikely**
	Reef habitats are key supporting habitats for benthic invertebrate and fish communities which in turn are imperative to ecological functioning (e.g., nutrient cycling, oxygenation of sediment via turbations, forage sources, etc). Although the ADS works will occur proximal to shallow inlet and bay habitats, no piling or underwater noise emissions are planned during the proposed maintenance works. Additionally, any effects from dust emissions from the proposed ADS works will be dissipated quickly because of the dilution effect afforded by the River Shannon Estuary. Consequently, it is determined that significant effects to the conservation objectives of reefs through air pathways are unlikely. The ADS works will not incur any intrusion or loss to reef habitats, nor will the ADS works result in subsequent indirect effects to communities associated with reef habitats. Consequently, it is determined that significant effects to the conservation objectives of reefs through land pathways are unlikely.	**Significant effects via land pathways – Unlikely**

	These habitats are only known to occur on hills and/or cliffs in the western portion of the River Shannon Estuary. Floral species associated with these habitats are typically terrestrial in nature. The conservation objectives include: • Maintain a stable or increasing total area of the habitat. • No decline in habitat distribution or occurrence. • Maintain and/or restore the physical structure (sediment supply & zonation)	**Significant effects via surface & groundwater pathways – Unlikely**
	• Maintain vegetation composition (typical species & sub-communities, plant health, minimisation of the occurrence of negative indicator species).	**Significant effects via air pathways – Unlikely**
Perennial vegetation of stony banks [1220] **Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]**	Perennial vegetation of stony banks and vegetated sea cliffs consist of terrestrial floral species and are currently known to exist in isolated pockets on hills and cliffs near in the western portion of the River Shannon Estuary. Thus, these habitats are isolated from the proposed works with the intervening waters between them being estuarine/open, such that any potential water quality effects would be imperceptible in the habitats. It is therefore determined that significant effects to the conservation objectives of perennial vegetation of stony banks and vegetated sea cliffs through surface & groundwater pathways are unlikely. Due to the nature of these habitats, noise/vibration/dust effects are not a cause for concern.	
	The ADS maintenance works will not incur any intrusion or loss of habitats, nor will the ADS works result in subsequent direct or indirect effects to plant communities associated with these habitats. It is therefore determined that significant effects to the conservation objectives of perennial vegetation of stony banks and vegetated sea cliffs through land pathways are unlikely.	**Significant effects via land pathways – Unlikely**
	This habitat type occurs in sheltered bays and inlets throughout the River Shannon Estuary, with the nearest location being ca. 1.7 km from the nearest ADS maintenance works (i.e. the Shannon Embankments South catchment). The conservation objectives include, • Maintain a stable or increasing total area of the habitat. • No decline or change in habitat distribution • Maintain and / or restore the physical structure (sediment supply, creeks & pans, flooding and regime) of the habitat. • Maintain vegetation height, zonation and cover	**Significant effects via surface & groundwater pathways – Unlikely**
***Salicornia* and other annuals colonising mud and sand [1310]**	• Maintain the composition of typical species and sub-communities (i.e., species-poor communities) Although this habitat is located ca. 1.7 km from the proposed works via land pathway, the hydrological distance between them is ca. 5.5 km, with this particular habitat being upstream of the proposed works in the Shannon Embankments South catchment. Therefore, considering the naturally high and fluctuating sediment concentrations within estuaries, and the associated dilution factor, as well as the habitat's location upstream, any sedimentation stemming from the proposed works will not have a significant effect on this habitat. It is therefore determined that significant effects to the conservation objectives of *Salicornia* and other annuals	**Significant effects via air pathways – Unlikely**

	colonising mud and sand through surface water and groundwater pathways are unlikely. Due to the nature of this habitat, noise/vibration/dust effects are not a cause for concern. The ADS maintenance works will occur ca. 1.7 from mud and sandflat areas supporting *Salicornia* and other annuals, wherein the proposed ADS works will not encroach into nor disrupt the occurrence or distribution of *Salicornia* colonising mud and sand. It is therefore determined that significant effects to the conservation objectives of *Salicornia* and other annuals colonising mud and sand through land pathways are unlikely.	**Significant effects via land pathways – Unlikely**
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) **Mediterranean salt meadows (*Juncetalia maritimi*)**	Mediterranean salt meadows encompass an area of ca. 22.3 ha within the SAC. but occur in small, isolated pockets, primarily near the River Fergus Estuary. Conversely, Atlantic salt meadows are more widespread, encompassing an area of ca. 119.3 ha. The conservation objectives include: • Maintain a stable or increasing total area of the habitat. • No decline or change in habitat distribution or occurrence. • Maintain and/or restore the physical structure (sediment supply, creeks & pans, flooding and regime) of the habitat. • Maintain vegetation height, zonation and cover. • Maintain the representative range of sub-communities with typical saltmarsh species.	**Significant effects via surface & groundwater pathways – Unlikely**
	The proposed ADS maintenance works may result in significant effects through surface water pathways, such as increased sedimentation and/or contaminants, potentially resulting in altered water quality, nutrient loading, and alteration of key ecological processes. However, salt meadows can tolerate high concentrations of suspended solids and so any effects from the ADS works attributable to sedimentation will be imperceptible in this habitat. Consequently, it is determined that significant effects to the conservation objectives of Atlantic salt meadows through surface and groundwater pathways are unlikely.	**Significant effects via air pathways – Unlikely**
	Due to the nature of this habitat, noise/vibration/dust effects are not a cause for concern. Some of the ADS maintenance works will occur within and adjacent to the River Shannon Estuary where these habitats occur. However, the works will not overlap or encroach into salt meadow habitats, nor will the works result in disruptions to habitat connectivity. It is therefore determined that significant effects to the conservation objectives to salt meadows through land pathways are unlikely.	**Significant effects via land pathways – Unlikely**
Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation	According to the conservation objectives document, this habitat is confined to sites directly adjacent to the west of Limerick City. However, this mapping is not comprehensive nor up-to-date, and so the occurrence of this type of floating vegetation elsewhere in the Lower Shannon catchments cannot be ruled out. The conservation objectives include: • Maintain a stable or increasing total area of the habitat. • No decline or change in habitat distribution or occurrence. • Maintain the hydrological regime of the watercourses (river flow, tidal influence, freshwater seepages).	**Significant effects via surface & groundwater pathways – Likely**

	• Maintain substratum composition - dominated by the particle size ranges, appropriate to the habitat sub-type (frequently sands, gravels and cobbles) • Maintain water quality to prevent changes in species composition. • Maintain vegetation composition – habitats should include typical species in good condition It is possible that this habitat occurs in the catchments within which the proposed ADS maintenance works will take place. Alterations in water quality and/or direct/indirect effects from surface water & groundwater transport may have significant effects to floating vegetation habitats. Consequently, it is determined that significant effects to this QI through surface & groundwater pathways are likely. Due to the nature of this habitat, noise/vibration/dust effects are not a cause for concern. The ADS maintenance works will occur in multiple Lower Shannon catchments. Potential effects from land include habitat loss, bank erosion, and loss of connectivity between habitats. It is therefore determined that significant effects to this QI through land pathways are likely.	**Significant effects via air pathways – Unlikely** **Significant effects via land pathways – Likely**
***Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)**	This habitat is a terrestrial grassland and is only known to occur in small, isolated patches within the SAC due to loss from land-use change. However, NPWS (Article 17) data reveal records of this habitat immediately adjacent to a proposed ADS maintenance works site in the northwest of the Maigue catchment, as well as ca. 400 m from proposed works at the eastern end of the Shannon Embankments North catchment. The conservation objectives include: • Maintain a stable or increasing total area of the habitat. • No decline or change in habitat distribution or occurrence. • Maintain the vegetation structure components – broadleaf herb:grass ratio, sward height, presence of notable species. • Maintain the health of the habitat through the lack of percentage cover of negative indicator species (<20%), negative indicator bog moss species (<25%), and lack of woody species cover (<5%). • Maintain the physical structure of the habitat by ensuring <10% bare ground is present. Although *Molinia* meadows are known to occur adjacent to the proposed works, there are no hydrological connections into the habitat itself. It is therefore determined that significant effects to *Molinia* meadows through surface and groundwater pathways are unlikely. Due to the nature of this habitat, noise/vibration/dust effects are not a cause for concern. As some of the proposed ADS works will occur immediately adjacent to *Molinia* meadows, there exists the potential for physical disturbance to this habitat. It is therefore determined that significant effects to the conservation objectives of Molinia meadows through land pathways are likely.	**Significant effects via surface & groundwater pathways – Unlikely** **Significant effects via air pathways – Unlikely** **Significant effects via land pathways – Likely**

Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)	According to the conservation objectives document, alluvial woodlands are located in several areas of the Lower River Shannon, some of which are proximal to the Lower Shannon ADS maintenance works. NPWS Article 17 data further reveal this habitat occurring adjacent to an ADS drain within the Maigue catchment and a stream within the Mulkear Ballymackeogh catchment. The conservation objectives include: • Maintain a stable or increasing total area of the habitat. • No decline in habitat distribution. • Maintenance of woodland size (i.e., larger than 3 ha [min]). • Maintain diversity of the structure of woodlands (cover & height, community diversity & extent, natural regeneration, and density of dead / fallen timber). • Maintain the hydrological regime (flooding depth / height of water table).	**Significant effects via surface & groundwater pathways – Likely**
	This habitat is known to occur within the Scheme area. Arterial drainage maintenance works, including de-silting and vegetation clearance, can mobilise fine sediments into adjacent watercourses. These materials may then be transported downstream, altering the hydrological regime that supports alluvial forest habitats. Excessive sedimentation can smother floodplain soils, impairing natural regeneration processes by limiting seed germination and seedling establishment. Moreover, changes in flooding patterns due to altered channel morphology or flow dynamics may reduce the frequency or extent of inundation, impacting the maintenance of appropriate water tables essential for this habitat's persistence. Over time, such impacts could reduce the extent and condition of the habitat, hinder natural regeneration, and jeopardise targets related to vegetation structure, species composition, and hydrological regime. Consequently, it is determined that significant effects to this QI through surface & groundwater pathways are likely. Due to the nature of this habitat, noise/vibration/dust effects are not a cause for concern.	**Significant effects via air pathways – Unlikely**
	Direct physical disturbance from machinery operating near the alluvial forest habitat can lead to soil compaction, root damage, and physical removal of vegetation along access routes or work areas. These impacts may disrupt the delicate structure of the woodland floor, inhibit natural regeneration, and reduce ground flora diversity. Land-based access may also introduce or spread non-native invasive plant species, such as Himalayan balsam or giant hogweed, which can rapidly colonise disturbed areas and outcompete native species, contrary to conservation objectives. Furthermore, activities that reduce dead wood volumes, damage veteran trees, or fragment existing woodland patches may undermine key structural targets, including canopy layering, dead wood presence, and habitat continuity. If unmitigated, these pressures could significantly degrade woodland composition and function, threatening the long-term viability of the Annex I habitat within the SAC. It is therefore determined that significant effects to this QI through land pathways are likely.	**Significant effects via land pathways – Likely**

Freshwater Pearl Mussel (*Margaritifera margaritifera*)	According to the conservation objectives document, freshwater pearl mussel (FPM) is known to occur in the River Cloon, located west of the River Fergus. Moreover, NPWS Article 17 data show that FPM is absent from any of the Lower Shannon ADS catchments and from any downstream waterbodies. The conservation objectives include: • Maintain the distribution of populations. • Restore the size of the number of adults. • Maintenance of population structure – recruitment (restore at least 20% of juveniles), no more than 5% decline in number of adults. • Restore and maintain habitat extent. • Restore and maintain water quality to "good" levels. • Restore and maintain substratum quality (filamentous algae (absent or trace, < 5%, and macrophytes (absent or trace, < 5%)), substratum quality to include very little fine sediments, oxygen availability, and flow variability to appropriate hydrological regimes. As none of the works occur within or upstream of any waterbodies containing FPM, significant effects to this QI through surface and groundwater pathways are unlikely. As none of the works occur within or upstream of any waterbodies containing FPM, significant effects to this QI through air pathways are unlikely. As none of the works occur within or upstream of any waterbodies containing FPM, significant effects to this QI through surface and groundwater pathways are unlikely.	**Significant effects via surface & groundwater pathways – Unlikely** **Significant effects via air pathways – Unlikely** **Significant effects via land pathways – Unlikely**
Sea Lamprey (*Petromyzon marinus*) **Brook Lamprey (*Lampetra planeri*)** **River Lamprey (*Lampetra fluviatilis*)**	According to NPWS, records, sea lamprey, brook lamprey and river lamprey are known to occur within the Scheme areas (See Figures 5-4 to 5-6). The conservation objectives for these species include: • Allow/maintain > 75% of main river stem accessible from estuary for anadromy. • Maintenance of population structure of juveniles (at least three age/ size groups). • Maintain density of juveniles. • No decline in extent and distribution of spawning beds. • Maintenance of > 50% of available juvenile habitat. Instream and bankside work (e.g., vegetation/silt removal, bank vegetation clearance, etc) will inevitably result in sediment disturbance and/or sediment influx into the watercourse(s). Consequently, there exists the potential for effects to water quality, abundance of food resources for juvenile lamprey, and to water flow and/or accessibility to specific river stretches. It is therefore determined that significant effects to lamprey species through surface and groundwater pathways are likely. Noise emissions from machinery and equipment are unlikely to have significant effects on aquatic biota. No piling, demolition or other similar works are proposed within the ADS maintenance works. It is therefore determined that significant effects to the conservation objectives of lamprey species through air pathways are unlikely. Although the proposed ADS works will occur throughout the Lower River Shannon system, they will not occur proximal to key lamprey	**Significant effects via surface & groundwater pathways – Likely** **Significant effects via air pathways – Unlikely** **Significant effects via land pathways – Unlikely**

	spawning or nursery habitats, as any/all habitats supporting protected species will be avoided, according to the OPW environmental management plan. It is therefore determined that significant effects to the conservation objectives of lamprey species through land pathways are unlikely.	
Salmon (*Salmo salar*)	According to NPWS records, Atlantic salmon are known to occur throughout the Lower Shannon ADS catchments (see Figure 5-3). The conservation objectives include: • No significant decline in % of accessible river extent for anadromy (maintain 88-100%). • Conservation of the number of spawning adults (as dictated by NASCO). • Maintain density of fry & juveniles. • No significant decline in the abundance of out-migrating smolt. • No significant decline in abundance and distribution of redds. • Maintenance water quality along main river stem and key tributaries.	**Significant effects via surface & groundwater pathways – Likely**
	Instream and bankside work (e.g., in-stream vegetation/silt removal, bank vegetation clearance, etc) will inevitably result in sediment disturbance and/or sediment influx into the watercourse(s). Consequently, there exists the potential for effects to water quality, and to water flow and/or accessibility to specific river stretches. It is therefore determined that significant effects to salmon through surface and groundwater pathways are likely.	**Significant effects via air pathways – Unlikely**
	Noise emissions from machinery and equipment are unlikely to have significant effects on aquatic biota. No piling, demolition or other similar works are proposed within the ADS maintenance works. Consequently, it is determined that significant effects to salmon through air pathways are unlikely.	
	Although the proposed ADS works will occur throughout the Lower River Shannon system, the works will not occur proximal to key salmon spawning or nursery habitats, as any/all habitats supporting protected species will be avoided, according to the OPW environmental management plan. It is therefore determined that significant effects to salmon through land pathways are unlikely.	**Significant effects via land pathways – Unlikely**
Bottlenose Dolphin (*Tursiops truncatus*)	Bottlenose dolphins are known to occur extensively throughout the Lower River Shannon Estuary. The conservation objectives for this species include: • Maintain access to suitable habitat, with no restrictions to sites by artificial barriers. • Ensure that critical use areas, representing habitat used preferentially by bottlenose dolphin are maintained.	**Significant effects via surface & groundwater pathways – Unlikely**

	• Ensure that anthropogenic activities should occur at levels that do not adversely affect the bottlenose dolphin population at the site Instream and bankside works (e.g., vegetation/ silt removal, bank vegetation clearance, etc) will inevitably result in sediment disturbance and/or sediment influx into the watercourse(s), affecting water quality and potentially having downstream effects on prey communities. However, Bottlenose dolphins are known to utilise a very large area for foraging and travel, utilising almost the entirety of the Lower River Shannon Estuary. The estuary will offer a significant dilution effect to any/all sediment run-off and/or water quality alterations, whilst critical use areas are located > 3 km from the nearest ADS works. Consequently, it is determined that significant effects to the bottlenose dolphin through surface and groundwater pathways are unlikely.	**Significant effects via air pathways – Unlikely**
	Noise and vibration emissions from machinery and equipment are unlikely to have significant effects to bottlenose dolphins due to the scale of the works in relation to the extent of the estuarine/marine habitat used by this species. Consequently, it is determined that significant effects to the bottlenose dolphin through air pathways are unlikely. Although the proposed ADS works will occur within the estuarine portion of the River Feale, there will be no significant loss to bottlenose dolphin habitat considering the large range this species inhabits. It is therefore determined that significant effects to the bottlenose dolphin through land pathways are unlikely.	**Significant effects via land pathways – Unlikely**
Otter (*Lutra lutra*)	Otters are abundant within the Lower River Shannon SAC (see Figure 5-1). The conservation objectives for this species include: • No significant decline in distribution. • No significant decline in terrestrial habitat (ca. 193 ha.), marine habitat (ca. 812 ha.) or extent of freshwater habitat (ca. 104 km) utilised by otter. • No significant decline / change in abundance of couches or holts. • No significant decline in the abundance of fish biomass along watercourses. • No significant increase in the number of barriers to connectivity. The proposed ADS works will occur throughout catchments feeding into the Lower River Shannon. In-stream and bankside works (e.g., vegetation/silt removal, bank vegetation clearance, etc) will inevitably result in sediment disturbance and/or sediment influx into the watercourse(s). Consequently, there exists the potential for effects to water quality, abundance of food resources (amphibians, fish, crustaceans, etc) for otter, and to water flow and/or accessibility to specific river stretches. Thus, it is determined that significant effects to otter through surface and groundwater pathways are likely.	**Significant effects via surface & groundwater pathways – Likely**
	Noise and vibration emissions from machinery and equipment are likely to have significant effects, as otters are sensitive to elevated noise emissions. Additionally, increased human presence in certain areas may disturb otter, potentially displacing them from holts or couches. Consequently, it is determined that significant effects to the conservation objectives of otter through air pathways are likely.	**Significant effects via air pathways – Likely**
	The ADS maintenance works will occur proximal to aquatic habitats used by otters. Land-based work activities may impede upon access to terrestrial habitats used by otters, as well as terrestrial foraging grounds. Consequently, it is determined that significant effects to otters through land pathways are likely.	**Significant effects via land pathways – Likely**

Designated QI	Desktop Study Comment	Assessment
Newhall and Edenvale Complex SAC (002091)		
Caves not open to the public	Caves not open to the public (8310) is integrally linked to lesser horseshoe bat (*Rhinolophus hipposideros*) (1303) as part of the habitat for the species; therefore, a separate conservation objective has not been set for the habitat in Newhall and Edenvale Complex SAC.	**N/A**
***Rhinolophus hipposideros* (Lesser Horseshoe Bat)**	The conservation objectives for this species include the following: • Population per roost: Minimum numbers for each roost. • Condition of roosts: No decline. • Extent of potential foraging habitat: No significant decline within 2.5 km of qualifying roosts. • Presence of linear features: No significant loss within 2.5 km of qualifying roosts. • Light pollution: No significant increase in artificial light intensity adjacent to named roosts or along commuting routes within 2.5 km of those roosts. There is no hydrological connectivity between the proposed works and the SAC. Thus, it is determined that significant effects to the lesser horseshoe bat through surface and groundwater pathways are unlikely. Noise and vibration emissions from machinery and equipment will not affect any of the conservation objectives stipulated for this QI. Works will be carried out during the day and so there is no potential for significant effects attributable to artificial light pollution. Thus, it is determined that significant effects to the lesser horseshoe bat through air pathways are unlikely. The ADS maintenance works will occur proximal to aquatic and terrestrial habitats potentially used by lesser horseshoe bats. If drainage works require vegetation clearance along watercourses, this could result in the removal or fragmentation of wooded habitats or scrub that are used by bats for foraging. Moreover, removal of riparian vegetation such as hedgerows and treelines during arterial drainage can fragment commuting routes and create open corridors, effectively isolating lesser horseshoe bat roosts from their foraging grounds. Consequently, it is determined that significant effects to the lesser horseshoe bat through land pathways are likely.	**Significant effects via surface & groundwater pathways – Unlikely** **Significant effects via air pathways – Unlikely** **Significant effects via land pathways – Likely**
Designated QI	**Desktop Study Comment**	**Assessment**
Tory Hill SAC (000439)		
Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites)	This habitat is located ca. 170 m west of the nearest proposed works within the SAC. The conservation objectives for semi-natural grassland aim to: • Maintain a stable or increasing habitat area and distribution, subject to natural processes. • Support a diverse plant community with at least seven positive indicator species (including two high-quality species).	**Significant effects via surface & groundwater pathways – Unlikely**

	• Limit cover of negative indicators (<20%), non-native species (<1%), woody species and bracken (<5%), and litter (<25%). • Maintain a vegetation structure with 40–90% broadleaf herb content and sward height between 5–40 cm across at least 30% of the area. • Protect the physical condition of the habitat by ensuring bare soil does not exceed 10% and that signs of serious disturbance remain limited (<20 m²). Semi-natural dry grasslands on calcareous substrates are sensitive to sediment runoff, particularly due to their reliance on thin, well-drained soils that support a diverse range of specialist flora. Sediment deposition can smother low-growing vegetation, alter soil structure, and create conditions that favour the spread of negative indicator species or woody encroachment. Such changes may compromise the conservation objectives for the habitat, including the maintenance of vegetation composition, structure, and physical condition. Where works occur upslope or adjacent to areas supporting this habitat, effective sediment control measures are essential to avoid adverse effects. However, this habitat is not located adjacent to or downstream of any streams designated for ADS maintenance works. Therefore, significant effects to this QI via surface and groundwater pathways are unlikely. This habitat is not particularly sensitive to noise or vibration, and any emissions generated during proposed works (e.g. dust or mechanical noise) are expected to be highly localised, short-term, and limited in intensity. Given the likely distance from active work areas and the absence of sustained, high-intensity emissions, no significant effects via airborne pathways are foreseen. This habitat is located ca. 170 m from the nearest proposed works. Given this separation, and assuming standard site management measures are in place, there is no reasonable risk of physical disturbance, trampling, or habitat degradation arising from land-based pathways.	**Significant effects via air pathways – Unlikely** **Significant effects via land pathways – Unlikely**
Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* [7210]	This habitat is located immediately adjacent to some of the proposed works and is hydrologically connected. The conservation objectives for calcareous fens aim to: • Maintain a stable or increasing habitat area and distribution, subject to natural processes. • Support active peat formation through appropriate water table levels maintained near the surface for most of the year. • Maintain natural hydrological regimes, including high groundwater levels and near-natural surface drainage. • Ensure water quality remains suitable, with appropriate pH and low nutrient levels, particularly phosphorus.	**Significant effects via surface & groundwater pathways – Likely**

	• Maintain a diverse vegetation community with adequate cover of typical species (e.g. *Cladium mariscus*, brown mosses), while limiting cover of native negative indicators and scrub (<10%), non-native species (<1%), and disturbed bare ground (<10%; <1% if tufa present). • Protect rare or locally distinctive species by avoiding decline in their distribution or populations. Calcareous fens with *Cladium mariscus* are highly sensitive to changes in hydrology and water quality, as their ecological integrity relies on stable groundwater levels and low-nutrient, base-enriched water inputs. Sediment runoff can result in the infilling of fen hollows, smothering of peat-forming vegetation, and disruption of water chemistry. Given the hydrological connectivity of the fen to nearby surface waters and its proximity to the proposed ADS maintenance works, there is potential for adverse effects via sediment-laden runoff or changes in drainage patterns. These could compromise the habitat's conservation objectives, including peat formation, typical vegetation composition, and hydrological function. Thus, it is determined that significant effects to this QI via surface water and groundwater pathways are likely. While fen habitats are not especially sensitive to airborne emissions, such as noise, vibration, or dust, localised impacts may arise if works are conducted immediately adjacent to the habitat. In this case, emissions from machinery during ADS maintenance are expected to be short-term, of low intensity, and spatially limited. Given the wet and partially enclosed nature of the fen, and assuming a reasonable buffer from active works, significant effects via airborne pathways are not anticipated. Given the fen's immediate adjacency to proposed work areas, there is potential for direct land-based impacts such as physical disturbance, trampling, or compaction, all of which could damage sensitive peat-forming vegetation and disturb surface hydrology. Uncontrolled machinery movement or foot traffic through the fen could also facilitate invasive species spread or bare ground development. It is therefore determined that significant effects to this habitat via land pathways are likely.	**Significant effects via air pathways – Unlikely** **Significant effects via land pathways – Likely**
Alkaline fens	This habitat is located near the proposed works area and is hydrologically connected. The conservation objectives for alkaline fens aim to: • Maintain a stable or increasing habitat area and distribution, subject to natural processes. • Support active peat formation by ensuring water tables remain at or just above the soil surface for most of the year. • Maintain or restore natural hydrological regimes, including high groundwater levels and near-natural surface drainage, avoiding artificial drawdown.	**Significant effects via surface & groundwater pathways – Likely**

	• Ensure water quality remains suitable, particularly with low nutrient levels (especially phosphorus and nitrogen) and calcium-rich, base-enriched groundwater. • Maintain a diverse range of vegetation communities, with adequate cover of typical species including brown mosses (e.g. *Campylium stellatum*, *Calliergonella cuspidata*) and vascular plants (e.g. *Juncus subnodulosus*, *Cirsium dissectum*, *Epipactis palustris*). • Limit the cover of native negative indicators (e.g. *Urtica dioica*, *Pteridium aquilinum*), native scrub and trees (<10%), soft rush and common reed (<10%), non-native species (<1%), and litter (<25%). • Avoid excessive disturbance such as bare ground from poaching or machinery (<10%) and maintain tufa formations with minimal vegetation disturbance (<1%). • Protect rare or locally distinctive species by avoiding any decline in their distribution or population size.	**Significant effects via air pathways – Unlikely**
	Alkaline fens are highly sensitive to changes in hydrology and water quality, as their ecological integrity relies on stable groundwater levels and low-nutrient, base-enriched water inputs. Sediment runoff can result in the infilling of fen hollows, smothering of peat-forming vegetation, and disruption of water chemistry. Given the hydrological connectivity of the fen to nearby surface waters and its proximity to the proposed ADS maintenance works, there is potential for adverse effects via sediment-laden runoff or changes in drainage patterns. These could compromise the habitat's conservation objectives, including peat formation, typical vegetation composition, and hydrological function. Thus, it is determined that significant effects to this QI via surface water and groundwater pathways are likely. While fen habitats are not especially sensitive to airborne emissions such as noise, vibration, or dust, localised impacts may arise if works are conducted immediately adjacent to the habitat. In this case, emissions from machinery during ADS maintenance are expected to be short-term, of low intensity, and spatially limited. Given the wet and partially enclosed nature of the fen, and assuming a reasonable buffer from active works, significant effects via airborne pathways are not anticipated. Given the fen's immediate adjacency to proposed work areas, there is potential for direct land-based impacts such as physical disturbance, trampling, or compaction, all of which could damage sensitive peat-forming vegetation and disturb surface hydrology. Uncontrolled machinery movement or foot traffic through the fen could also facilitate invasive species spread or bare ground development. It is therefore determined that significant effects to this habitat via land pathways are likely.	**Significant effects via land pathways – Likely**

Designated QI	**Desktop Study Comment**	**Assessment**
Glen Bog SAC (001430)		
Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion*	According to the conservation objectives document and NPWS Article 17 data, alluvial woodland comprises a large section of this SAC, which overlaps the Lower Shannon ADS maintenance works, specifically within the Maigue catchment.	**Significant effects via surface & groundwater pathways – Likely**

***incanae, albae*)**	***Salicion***	The conservation objectives include: • Maintain or increase total habitat area (≥9.07 ha). • No decline in habitat distribution or woodland size (≥3 ha). • Maintain diverse woodland structure (canopy cover & height, community diversity, natural regeneration, and deadwood density). • Ensure appropriate hydrological regime (suitable water table/flooding). • Retain mature/veteran trees and locally distinctive features (e.g. ancient woodland indicators, red data species). • Maintain native tree cover (≥95%) and presence of typical species (e.g. alder, willow, oak, ash, birch). • Prevent or control negative indicator species, especially non-native invasives. This habitat is known to occur within the Scheme area. Arterial drainage maintenance works, including de-silting and vegetation clearance, can mobilise fine sediments into adjacent watercourses. These materials may alter the hydrological regime that supports alluvial forest habitats. Excessive sedimentation can smother floodplain soils, impairing natural regeneration processes by limiting seed germination and seedling establishment. Moreover, changes in flooding patterns due to altered channel morphology or flow dynamics may reduce the frequency or extent of inundation, impacting the maintenance of appropriate water tables essential for this habitat's persistence. Over time, such impacts could reduce the extent and condition of the habitat, hinder natural regeneration, and jeopardise targets related to vegetation structure, species composition, and hydrological regime. Consequently, it is determined that significant effects to this QI through surface & groundwater pathways are likely. Due to the nature of this habitat, noise/vibration/dust effects are not a cause for concern. Direct physical disturbance from machinery operating near the alluvial forest habitat can lead to soil compaction, root damage, and physical removal of vegetation along access routes or work areas. These impacts may disrupt the delicate structure of the woodland floor, inhibit natural regeneration, and reduce ground flora diversity. Land-based access may also introduce or spread non-native invasive plant species, such as Himalayan balsam or giant hogweed, which can rapidly colonise disturbed areas and outcompete native species, contrary to conservation objectives. Furthermore, activities that reduce dead wood volumes, damage veteran trees, or fragment existing woodland patches may undermine key structural targets, including canopy layering, dead wood presence, and habitat continuity. If unmitigated, these pressures could significantly degrade woodland composition and function, threatening the long-term viability of the Annex I habitat within the SAC. It is therefore determined that significant effects to this QI through land pathways are likely.	**Significant effects via air pathways – Unlikely** **Significant effects via land pathways – Likely**

Designated QI	Desktop Study Comment	Assessment
Askeaton Fen Complex SAC (002279)		
Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* [7210]	The SAC is located immediately adjacent to some of the proposed works and is hydrologically connected. The conservation objectives for calcareous fens aim to: • Maintain a stable or increasing habitat area and distribution, subject to natural processes. • Support active peat formation through appropriate water table levels maintained near the surface for most of the year. • Maintain natural hydrological regimes, including high groundwater levels and near-natural surface drainage. • Ensure water quality remains suitable, with appropriate pH and low nutrient levels, particularly phosphorus. • Maintain a diverse vegetation community with adequate cover of typical species (e.g. *Cladium mariscus*, brown mosses), while limiting cover of native negative indicators and scrub (<10%), non-native species (<1%), and disturbed bare ground (<10%; <1% if tufa present). • Protect rare or locally distinctive species by avoiding decline in their distribution or populations. Calcareous fens with *Cladium mariscus* are highly sensitive to changes in hydrology and water quality, as their ecological integrity relies on stable groundwater levels and low-nutrient, base-enriched water inputs. Sediment runoff can result in the infilling of fen hollows, smothering of peat-forming vegetation, and disruption of water chemistry. Given the hydrological connectivity of the fen to nearby surface waters and its proximity to the proposed ADS maintenance works, there is potential for adverse effects via sediment-laden runoff or changes in drainage patterns. These could compromise the habitat's conservation objectives, including peat formation, typical vegetation composition, and hydrological function. Thus, it is determined that significant effects to this QI via surface water and groundwater pathways are likely. While fen habitats are not especially sensitive to airborne emissions, such as noise, vibration, or dust, localised impacts may arise if works are conducted immediately adjacent to the habitat. In this case, emissions from machinery during ADS maintenance are expected to be short-term, of low intensity, and spatially limited. Given the wet and partially enclosed nature of the fen, and assuming a reasonable buffer from active works, significant effects via airborne pathways are not anticipated. Given the SAC's immediate adjacency to proposed work areas, there is potential for direct land-based impacts such as physical disturbance, trampling, or compaction, all of which could damage sensitive peat-forming vegetation and disturb surface hydrology. Uncontrolled machinery movement or foot traffic through the fen could also facilitate invasive species spread or bare ground development. It is therefore determined that significant effects to this habitat via land pathways are likely.	**Significant effects via surface & groundwater pathways – Likely** **Significant effects via air pathways – Unlikely** **Significant effects via land pathways – Likely**

Alkaline fens	The SAC is located near the proposed works area and is hydrologically connected. The conservation objectives for alkaline fens aim to: • Maintain a stable or increasing habitat area and distribution, subject to natural processes. • Support active peat formation by ensuring water tables remain at or just above the soil surface for most of the year. • Maintain or restore natural hydrological regimes, including high groundwater levels and near-natural surface drainage, avoiding artificial drawdown. • Ensure water quality remains suitable, particularly with low nutrient levels (especially phosphorus and nitrogen) and calcium-rich, base-enriched groundwater. • Maintain a diverse range of vegetation communities, with adequate cover of typical species including brown mosses (e.g. *Campylium stellatum*, *Calliergonella cuspidata*) and vascular plants (e.g. *Juncus subnodulosus*, *Cirsium dissectum*, *Epipactis palustris*). • Limit the cover of native negative indicators (e.g. *Urtica dioica*, *Pteridium aquilinum*), native scrub and trees (<10%), soft rush and common reed (<10%), non-native species (<1%), and litter (<25%). • Avoid excessive disturbance such as bare ground from poaching or machinery (<10%) and maintain tufa formations with minimal vegetation disturbance (<1%). • Protect rare or locally distinctive species by avoiding any decline in their distribution or population size. Alkaline fens are highly sensitive to changes in hydrology and water quality, as their ecological integrity relies on stable groundwater levels and low-nutrient, base-enriched water inputs. Sediment runoff can result in the infilling of fen hollows, smothering of peat-forming vegetation, and disruption of water chemistry. Given the hydrological connectivity of the fen to nearby surface waters and its proximity to the proposed ADS maintenance works, there is potential for adverse effects via sediment-laden runoff or changes in drainage patterns. These could compromise the habitat's conservation objectives, including peat formation, typical vegetation composition, and hydrological function. Thus, it is determined that significant effects to this QI via surface water and groundwater pathways are likely. While fen habitats are not especially sensitive to airborne emissions such as noise, vibration, or dust, localised impacts may arise if works are conducted immediately adjacent to the habitat. In this case, emissions from machinery during ADS maintenance are expected to be short-term, of low intensity, and spatially limited. Given the wet and partially enclosed nature of the fen, and assuming a reasonable buffer from active works, significant effects via airborne pathways are not anticipated. Given the fen's immediate adjacency to proposed work areas, there is potential for direct land-based impacts such as physical disturbance, trampling, or compaction, all of which could damage sensitive peat-forming vegetation and disturb surface hydrology. Uncontrolled machinery movement or foot traffic through the fen could also facilitate invasive species spread or bare ground development. It is therefore determined that significant effects to this habitat via land pathways are likely.	**Significant effects via surface & groundwater pathways – Likely** **Significant effects via air pathways – Unlikely** **Significant effects via land pathways – Likely**

Designated QI	Desktop Study Comment	Assessment
Curraghchase Woods SAC (000174)		
Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)	According to the conservation objectives document and NPWS Article 17 data, alluvial woodland comprises a small section of this SAC at its northern end, which does not overlap or have a downstream connection with the Lower Shannon ADS maintenance works. The conservation objectives include: • Maintain or increase total habitat area (≥3.46 ha). • No decline in habitat distribution or woodland size (≥3 ha; ≥25 ha where feasible). • Maintain diverse woodland structure (canopy cover and height, community diversity, natural regeneration, deadwood). • Ensure appropriate hydrological regime (e.g. high water table or periodic flooding where relevant). • Retain mature and veteran trees and features of local distinctiveness (e.g. ancient woodland indicators, rare species). • Maintain native tree cover (≥95%) and presence of typical species (e.g. alder, willow, oak, ash, birch). • Prevent or control negative indicator species, particularly non-native invasives (e.g. sycamore, beech, rhododendron). This habitat is known to occur within the SAC but lies approximately 1.6 km upstream of the proposed works. Arterial drainage maintenance activities, including de-silting and vegetation clearance, have the potential to mobilise fine sediments into adjacent watercourses. However, due to the upstream position of the habitat relative to the proposed works, it is hydrologically disconnected from potential downstream effects such as sediment deposition or altered flow dynamics. As such, there is no realistic surface or groundwater pathway through which the proposed works could influence the hydrological regime, floodplain conditions, or natural regeneration processes that support the alluvial forest habitat. Therefore, significant effects on this QI can be ruled out. Due to the nature of this habitat, noise/vibration/dust effects are not a cause for concern. The alluvial forest habitat lies approximately 1.4 km from the nearest proposed works. While direct physical disturbance from machinery can negatively impact woodland habitats through soil compaction, root damage, or vegetation clearance, the separation distance between the works and the habitat excludes the potential for such direct impacts. There is no requirement for access through or adjacent to the habitat, and no land-based pathway exists through which the proposed activities could result in soil disturbance, introduction of invasive species, or degradation of woodland structure. Therefore, significant effects to this QI via land pathways can be ruled out.	**Significant effects via surface & groundwater pathways – Unlikely** **Significant effects via air pathways – Unlikely** **Significant effects via land pathways – Unlikely**

***Taxus baccata* woods of the British Isles [91J0]**	According to the conservation objectives document and NPWS Article 17 data, yew woodland occurs ca. 600 m north of the nearest proposed works and ca. 1 km (hydrological distance) upstream. The conservation objectives include: • Maintain or increase total habitat area (≥3.26 ha), subject to natural processes. • No decline in habitat distribution, subject to natural processes. • Maintain or increase overall woodland size. • Maintain diverse woodland structure with closed canopy, subcanopy, and ground layers. • Maintain diversity and extent of woodland community types. • Ensure natural regeneration with adequate seedling, sapling, and pole-age classes. • Maintain ≥30 m³/ha of fallen deadwood and ≥30 snags/ha, including large-diameter stems. • No decline in number of mature and veteran trees. • No decline in features indicating local distinctiveness (e.g. ancient woodland indicators, rare species). • Maintain ≥95% native tree cover. • Maintain presence of typical native species including yew and ash. • Prevent or control negative indicator species, especially non-native invasives like cherry laurel and beech. The yew woodland associated with this SAC lies approximately 0.6 km (hydrological distance) upstream of the nearest proposed works area. Arterial drainage maintenance activities such as vegetation clearance and silt removal have the potential to mobilise fine sediments or contaminants into adjacent watercourses. Although the woodland is located upstream of the works, natural hydrological processes such as backflows during high water events or altered drainage patterns could theoretically influence groundwater or floodplain inputs that support woodland hydrology. However, given the upstream position of the habitat, the direction of flow, and the separation distance of 1 km, the risk of significant effects via surface water or groundwater pathways is considered unlikely. Due to the nature of this habitat, noise/vibration/dust effects are not a cause for concern. The yew woodland is separated from the works by ca. 600 m of mixed terrain, which would significantly limit the likelihood of direct land-based impacts. The proposed works do not require access routes, machinery movement, or storage within or adjacent to the woodland area, thereby reducing the risk of soil compaction, vegetation clearance, or physical disturbance. Moreover, the introduction or spread of invasive non-native species such as cherry laurel or beech is unlikely due to the absence of direct connectivity and the relatively short-term nature of the works. As such, there is no evidence to suggest that the yew woodland would be affected via land-based pathways, and significant effects are not considered likely.	**Significant effects via surface & groundwater pathways – Unlikely** **Significant effects via air pathways – Unlikely** **Significant effects via land pathways – Unlikely**

***Vertigo moulinsiana* (Desmoulin's Whorl Snail) [1016]**	According to the conservation objectives document, this species is present within a large area at the southern end of the SAC. This area overlaps with and is adjacent to which some of the ADS maintenance works are proposed. The conservation objectives for this species include the following: • Distribution: No decline in the number of occupied 1 km grid squares, subject to natural processes. • Occurrence in suitable habitat: Present in at least 50% of samples from suitable habitat patches, subject to natural processes. • Habitat area: Area of suitable habitat stable or increasing, subject to natural processes; no less than 1.8 ha of at least sub-optimal habitat. • Habitat quality (overall suitability): No decline in the percentage of samples classified as suitable habitat; at least 80% of samples should be habitat class I or II. • Habitat quality (soil wetness): No decline in soil wetness; at least 80% of sample points should be classified in soil moisture classes 3–5. • Habitat quality (water levels): Maintain the hydrological regime at current levels, subject to natural processes. • Habitat quality (vegetation structure): No increase in grazing or mowing intensity; in some areas, current levels should be reduced to restore habitat quality. • Tree canopy extent: Tree canopy cover around the lake stable at current levels, subject to natural processes. Desmoulin's whorl snail depends on a stable hydrological regime, with saturated soils and high water levels supported by both surface water and groundwater inputs. ADS maintenance works, particularly channel clearance, can alter local hydrology by lowering water levels, reducing connectivity between surface and groundwater, or increasing drainage efficiency. These changes can lead to drying of wetland soils, altering the delicate moisture balance required for suitable habitat conditions. As groundwater contributes significantly to maintaining the saturated conditions and vegetation structure needed by the species, any reduction in groundwater levels or changes in flow could degrade habitat quality or reduce its extent. Given the proximity of known *Vertigo moulinsiana* habitat to the proposed works and the species' sensitivity to hydrological changes, significant effects via surface water and groundwater pathways cannot be ruled out. Potential impacts to Desmoulin's whorl snail via air pathways would generally relate to localised emissions of dust or exhaust from machinery during maintenance works. While such emissions may result in temporary declines in local air quality, the snail's low mobility and location within wetland vegetation offers some natural buffering from dust deposition. Furthermore, air-borne pollutants are unlikely to directly alter soil moisture or water levels, which are the key habitat attributes for this species. Given that the snail does not rely on clean air for respiration in the way that more exposed or aerial species might, and that emissions from ADS maintenance are likely to be low-level and short-term, significant effects via air pathways are unlikely. Impacts to Desmoulin's whorl snail via land pathways may occur where machinery or personnel physically enter or disturb suitable habitat areas during maintenance works. Trampling or compaction could damage vegetation, alter micro-topography, or reduce soil permeability, thereby affecting habitat structure and moisture retention. There may also be potential for incidental introduction of invasive species or increased grazing pressure if access is not	**Significant effects via surface & groundwater pathways – Likely** **Significant effects via air pathways – Unlikely** **Significant effects via land pathways – Unlikely**

	controlled, both of which could reduce habitat quality. However, the most suitable habitat areas for this species are often soft, marginal zones that may be avoided during access planning due to their impracticality for heavy equipment. Provided that works are kept to within existing access routes and unsuitable habitat types, and that protective measures are implemented to avoid habitat encroachment, significant effects via land pathways are unlikely.	
***Rhinolophus hipposideros* (Lesser Horseshoe Bat)**	Some of the proposed works will be carried out ca. 200 m from known roosts, as per the conservation objectives document. Moreover, the works will be carried out within potential foraging grounds and well within the foraging range of this species. The conservation objectives for this species include the following: • Population per roost: Minimum numbers for each roost. • Condition of roosts: No decline. • Extent of potential foraging habitat: No significant decline within 2.5 km of qualifying roosts. • Presence of linear features: No significant loss within 2.5 km of qualifying roosts. • Light pollution: No significant increase in artificial light intensity adjacent to named roosts or along commuting routes within 2.5 km of those roosts.	**Significant effects via surface & groundwater pathways – Unlikely**
	Lesser horseshoe bats roost in buildings, caves, and cellars, and forage within complex, enclosed habitats such as woodlands, hedgerows, and along riparian corridors. While this species is not directly dependent on surface water or groundwater for roosting or foraging, watercourses often function as important commuting routes. Maintenance works along channels could result in localised changes to water levels or bank conditions, which in turn could affect riparian vegetation structure. If this leads to the degradation or removal of linear features used for navigation, the bats' ability to commute efficiently between roosts and foraging sites could be affected. However, the bats themselves are not reliant on the hydrological regime for physiological functions or prey availability in the same way aquatic or wetland species are. Therefore, significant effects to lesser horseshoe bat via surface water or groundwater pathways are unlikely.	**Significant effects via air pathways – Unlikely**
	ADS maintenance works may involve the use of fuel-powered machinery, which can generate localised noise and airborne emissions. Lesser horseshoe bats are particularly sensitive to disturbance, especially near maternity and hibernation roosts. However, the nearest known roost is approximately 200 m from the proposed works area, placing it within the 500 m precautionary screening distance adopted for noise-related impacts, as outlined in Section 4.5.1. While the works will occur during daylight hours—when bats are not active—repeated or intense noise emissions could still result in temporary disturbance to roosting individuals. That being said, repeated or intense works do not occur during standard maintenance works. As such, significant effects to this species via air pathways can be ruled out at this stage. Lesser horseshoe bats are heavily reliant on continuous networks of linear landscape features, such as hedgerows, treelines, and river corridors, which provide sheltered foraging and commuting routes. Works within these habitats could result in the removal or fragmentation of key features, leading to increased exposure to predators and reduced foraging efficiency. As the proposed maintenance activities occur within known foraging grounds and well within the species' 2.5 km foraging range, and as linear features are a defined conservation objective for the species, any degradation or loss of such features may represent a risk. Therefore, significant effects to lesser horseshoe bat via land pathways cannot be ruled out.	**Significant effects via land pathways – Likely**

[7.1] Cumulative and In-Combination Significant Effects

It is a requirement of AA screening that the cumulative or in-combination effects of the proposed development together with other plans or projects are assessed. Cumulative significant effects can be defined as a project/plan/programme likely to have a significant effect thereon, either individually or in combination with other plans or projects.

The following sources were consulted in order to determine if there were any other plans or projects in the area which could result in cumulative significant effects:

- DHPLG EIA Portal: https://www.housing.gov.ie/planning/environmental-assessment/environmental-impact-assessment-eia/eia-portal
- Limerick City and County Council - Planning System: https://maps.limerick.ie/planningenquiry
- Clare County Council – Planning System: https://www.clarecoco.ie/services/planning/applications/view/

Table 7-2 provides a list of the plans/projects that may give rise to in-combination effects with the proposed ADS maintenance works area. Given the extent of the Lower Shannon ADS, and in order to streamline the assessment, only those planning permissions that are proximal to Annex I or similar qualifying habitats which may give rise to potential significant effects were considered for inclusion here. Specific consideration has been afforded to the Water framework Directive, 2019-2021 (EPA, 2021) and / or the National Biodiversity Action plan 2023-2030 (HLGH, 2024). Additionally, consideration has been given to those developments currently underway or that have approved permission and which may have in-combination effects.

All other committed/approved developments are for individual residential properties, all of which are not considered to be a risk of in-combination effects given that none will involve further modification of European Sites.

Additionally, there is potential for cumulative and in-combination effects to occur from agricultural practices. The lands surrounding the Lower Shannon ADS include consist mainly of Improved agricultural grassland (GA1). Agricultural practices have the potential to, in-combination with the ADS works, cause significant effects to ecological European Sites. Soil erosion, nutrient and pesticide runoff, and soil compaction as a result of common agricultural practices can disrupt water flow, increase flooding risks and harmful effects on the local ecosystem. However, the in-combination effects of agricultural practices in the surrounding areas cannot be fully quantified. Applying the precautionary principle, there is potential for significant effects; therefore, mitigation measures are required to address the cumulative impacts on water quality from both agriculture and ADM works; these will be provided at Stage 2 AA.

Table 7-2. Assessment of Approved Plans and In-Combination Effects

Plan/Project (Date)	Applicant [Address]	Overview	Potential significant effects from plan / project and In-combination effects
Planning Ref:306270 Granted 21/05/2021	Limerick City & County Council	Flood protection measures around King's Island.	The planning application is located near Limerick City Centre and is within close proximity to the proposed ADS works. There is potential for: • Sediment run-off • Noise and Vibration impacts • Contaminated surface water run-off / hydrocarbon spills Although these works are hydrologically connected to the proposed ADS works, JBA consulting have produced an NIS report for these works on behalf of Limerick City and County Council. This outlines measures that will be put in place to ensure that these works will not significantly impact surrounding environments independently and/or in combination with other projects in the area.
Planning Ref:312559 Granted 20/09/2022	Limerick City & County Council	Ground investigation works to inform the option selection and design of the proposed Limerick City and Environs Flood Relief Scheme.	The planning application is located near Limerick City Centre and is within close proximity to the proposed ADS works. There is potential for: • Sediment run-off • Noise and Vibration impacts • Contaminated surface water run-off / hydrocarbon spills

[8] Screening Statement

The Screening exercise was completed in compliance with the relevant EC and national legislation and associated guidance. Article 42(7) of the European Communities (Birds and Natural Habitats) Regulations 2011 states that: *"The public authority shall determine that an Appropriate Assessment of a plan or project is not required […] if it can be excluded on the basis of objective scientific information following screening under this Regulation, that the plan or project, individually or in combination with other plans or projects, will have a significant effect on a European site."*

There were seven (7) European sites identified within the ZoI, with several sites having direct connectivity with the proposed ADS maintenance works. All of these sites have been screened in and will be carried forward for AA. These sites are:

- River Shannon and River Fergus Estuaries SPA
- Lower River Shannon SAC
- Newhall and Edenvale Complex SAC
- Tory Hill SAC
- Glen Bog SAC
- Askeaton Fen Complex SAC
- Curraghchase Woods SAC

The potential significant effects from the proposed maintenance works, alone and in-combination with other developments, have been considered in the context of European Sites, the conservation objectives of their Qualifying Interests/Special Conservation Interest, the Water Framework Directive (v3), and the National Biodiversity Action Plan (v4).

From this screening exercise, it has been determined that, as a result of the proposed ADS maintenance works, impacts may occur on European Sites and/or on the conservation objectives of their QIs/SCIs through surface water & groundwater, air, and/or land pathways. Therefore, likely significant effects cannot be excluded.

The project is therefore screened in for further Appropriate Assessment. Consequently, the proposed maintenance works in the Lower Shannon ADS catchments will require an NIS report.

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