Castleconnell Flood Relief Scheme

Final Report

AA Screening

July 2024

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Contract

This report relates to the Castleconnell Flood Relief Scheme commissioned by Limerick City and County Council, on behalf of the Office of Public Works. Hannah Mulcahy of JBA Consulting/JB Barry carried out this work.

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Purpose

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Abbreviations

AA	Appropriate Assessment
CFRAM	Catchment Flood Risk Assessment and Management
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report

EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FRS	Flood Relief Scheme
GIS	Geographic Information System
NHA	Natural Heritage Area
NPWS	National Parks and Wildlife Service
OPW	Office of Public Works
pNHA	Proposed Natural Heritage Area
QI	Qualifying Interest
RBMP	River Basin Management Plan
SAC	Special Areas of Conservation
SPA	Special Protection Areas
UWWTP	Urban Wastewater Treatment Plant
WFD	Water Framework Directive
WWTP	Wastewater Treatment Plant
ZoI	Zone of Influence

1 Introduction

1.1 Background

JBA Consulting Engineers and Scientists Ltd (hereafter JBA) has been appointed by Limerick City and County Council, to undertake Environmental Consultancy services in relation to the Castleconnell Flood Relief Scheme (FRS) at Castleconnell, Co. Limerick. This includes providing information for the competent authority to assist them to undertake an Appropriate Assessment Screening due to the proximity of Natura 2000 sites to the proposed Scheme.

The proposed development which will be submitted under Part 8 of the Planning and Development Act (2000) as amended, consists of development of a flood relief scheme to minimise the risks currently posed to people, the community, social amenity, environment and landscape.

This Appropriate Assessment Screening report provides the results of the assessment conducted for the proposed development, 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).

Screening for Appropriate Assessment is intended to be an initial examination which must be carried out the competent authority (e.g. the Planning Authority; An Bord Pleanála). This screening assesses the potential for likely significant effects; shows that impacts have been considered in the project development and design to follow avoidance of impact where possible, and mitigation where not possible. This report will also determine the need for further assessment (e.g. an NIS). The AA is carried out by the competent authority, and is supported by the AA Screening report and/or the NIS.

1.2 Legislative Context

The Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora) aims to maintain or restore the favourable conservation status of habitats and species of community interest across Europe.

The requirements of Articles 6(3) and 6(4) of the Habitats Directive have been transposed into Irish legislation by means inter alia the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 / 2011).

Under the Directive a network of sites of nature conservation importance have been identified by each Member State as containing specified habitats or species requiring to be maintained or returned to favourable conservation status. In Ireland the network consists of Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), and also candidate sites, which form the Natura 2000 network.

Article 6(3) of the Habitats Directive requires that, in relation to European designated sites (i.e. SACs and SPAs that form the Natura 2000 network), "*any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to* ***appropriate assessment*** *of its implications for the site in view of the site's conservation objectives*".

A competent authority can only grant consent to a plan or project after having determined that it will not adversely affect the integrity of any European site, in light of its conservation objectives and best scientific evidence, either alone or in combination with other plans or projects.

Under article 6(4) of the Directive, if adverse impacts are likely, and in the absence of alternative options, a plan or project must nevertheless proceed for imperative

reasons of overriding public interest (IROPI), including social or economic reasons, a Member State is required to take all compensatory measures necessary to ensure the overall integrity of the Natura 2000 site.

1.3 Appropriate Assessment Process

Guidance on the Appropriate Assessment (AA) process was produced by the European Commission in 2002 and updated in 2021). This guidance which was subsequently developed into guidance specifically for Ireland by the Department of Environment, Heritage and Local Government (DEHLG, 2010) and the Office of Planning Regulator (OPR, 2021). These documents identify a staged approach to conducting an AA, as shown in Figure 1-1. Clarifications on the details of the process, as determined through updates to guidance and case-law, are provided through the documents outlined in Section 1.4.1.

Figure 1-1: The Appropriate Assessment Process

1.3.1 Stage 1 - Screening for AA

The initial, screening stage of the Appropriate Assessment is to determine:

- whether the proposed plan or project is directly connected with or necessary for the management of the European designated site for nature conservation
- if it is likely to have a significant effect on the European designated site, either individually or in combination with other plans or projects

For those sites where a likely significant effect is identified, either alone or in combination with other plans or projects, further assessment is necessary to determine if the proposals will have a adverse effect on the integrity of a European designated site, in view of the site's conservation objectives (i.e., the process proceeds to Stage 2).

1.3.2 Stage 2 - AA

This stage requires a more in-depth evaluation of the plan or project, and the potential direct and indirect adverse impacts of them on the integrity and interest features of the European designated site(s), alone and in-combination with other plans and projects, taking into account the site's structure, function and conservation objectives. Where required, mitigation or avoidance measures will be suggested.

The competent authority can only agree to the plan or project after having ascertained that it will not adversely affect the integrity of any European site, in light of its conservation objectives and best scientific evidence, either alone or in combination with other plans or projects, after mitigation measures have been applied, and the mitigation measures are certain and capable of being successfully implemented. If this cannot be determined, then alternative solutions will need to be considered (i.e., the process proceeds to Stage 3).

1.3.3 Stage 3 - Alternative Solutions

Where adverse impacts on the integrity of European sites are identified, after mitigation measures have been applied, or the mitigation measures are not certain / capable of being successfully implemented, alternative ways of achieving the objectives of the plan or project that avoid adverse impacts need to be considered. If none can be found, the process proceeds to Stage 4.

1.3.4 Stage 4 - IROPI

Where adverse impacts of a plan or project on the integrity of European sites are identified and no alternative solutions exist, the plan will only be allowed to progress if imperative reasons of overriding public interest (IROPI) can be demonstrated. In this case compensatory measures will be required. Where the site concerned hosts a priority natural habitat type and/or a priority species, the only considerations which may be raised are those relating to human health or public safety.

The process only proceeds through each of the four stages for certain plans or projects. For example, for a plan or project, not connected with management of a site, but where no likely significant impacts are identified, the process stops at stage 1. Throughout the process, the precautionary principle must be applied, so that any uncertainties do not result in adverse impacts on a site.

1.3.5 Recent judgements of the Court of Justice of the European Union (CJEU) and how they are used in this assessment

The CJEU issued a ruling on the consideration of avoidance and reduction measures as a result of the case known as People over Wind, Peter Sweetman v Coillte Teoranta (Case C-323/17). This judgement stated that measures intended to reduce or avoid effects on a European site should only be considered within the framework of an AA, and it is not permissible to take into account such measures at the screening stage. In practice, this means that any activities that are not integral to the project (i.e. the project could conceivably take place without them) and have the effect of avoiding or reducing an impact on a European site, cannot be considered at the screening stage.

The CJEU ruling in the case of Grace & Sweetman [2018] (C-164/17) clarified the difference between avoidance and reduction (mitigation) measures and compensation. Measures intended to compensate for the negative effects of a project cannot be taken into account in the assessment of the implications of a project, and instead are considered under Article 6(4). This means that any project where an effect on the integrity of a European site remains and can only be offset by compensation, would need to proceed under Article 6(4), demonstrating "imperative reasons of overriding public interest".

The judgements referred to as the Dutch Nitrogen cases [2018] (C-293/17 and C-294/17) have important implications for projects that could potentially impact on sites that are exceeding critical thresholds for input of damaging ammonia (but could also reasonably apply where other nutrients are impacting European sites). The judgements state that the use of thresholds to exclude project impacts is acceptable in principle, and that strategic plans can be used as mitigation but only with consideration of the certainty (or otherwise) of the outcomes of those strategic plans. It clarifies that where the status of a habitat type is already unfavourable the possibility of authorising activities which increase the problem is necessarily limited.

The CJEU ruling in the case of Holohan v An Bord Pleanála (C-461/17) also clarified the importance in AA of taking into account habitat types and species outside the boundary of the European site, where implications of the impacts on those habitat and species may impact the conservation objectives of the European site. In this assessment functionally linked and supporting habitat for species outside of European

site boundaries are assessed where they could potentially impact the conservation objectives of any screened in European sites.

The CJEU ruling in response to questions referred by the Irish High Court in the Eco Advocacy case (C-721/21) indicated that an applicant for permission in its AA screening report/and a decision maker in undertaking its AA screening can take into account "standard features", i.e. all the constituent elements of that project inherent in it/elements that are incorporated into a projects design not with the aim of reducing its negative effects (even where these have the effect of reducing harmful effects on a European site).

1.4 Methodology

1.4.1 Guidance documents

This Natura Impact Statement has been prepared having regard to the Birds and Habitats Directives, the European Communities (Birds and Natural Habitats) Regulations 2011-15 as amended and relevant jurisprudence of the EU and Irish courts. The following documents have also been used to provide guidance for the assessment:

- DEHLG (2009 rev 2010) Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities. Department of the Environment, Heritage and Local Government (DEHLG, 2009).
- Office of the Planning Regulator (2021) OPR Practice Note PN01 - Appropriate Assessment Screening for Development Management (OPR 2021).
- European Communities (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 (European Commission 2019).
- 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 2021)
- EC (2022) Guidance document on assessment of plans and projects in relation to Natura 2000 sites. (European Commission. Directorate General for Environment. 2022)
- EC (2002) Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC, Office for Official Publications of the European Communities, Luxembourg. European Commission (European Commission et al. 2002).
- EC (2013) Interpretation manual of European Union habitats. Version EUR 28. (EC 2013).
- EC (2007) Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC – Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence, opinion of the commission. European Commission Management (European Commission, 2007).
- CIEEM (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland - Terrestrial, Freshwater and Coastal, Second Ed. (Chartered Institute of Ecology and Environmental), updated 2022.

- EC (2007/2012) Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC – Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence, opinion of the commission. European Commission Management (European Commission, 2007/12).
- NPWS, 2019a. The Status of EU Protected Habitats and Species in Ireland. Volume 1: Summary Overview. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill.
- NPWS, 2019b. The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitats Assessments. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill
- NPWS, 2019c. The Status of EU Protected Habitats and Species in Ireland. Volume 3: Species Assessments. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill

1.4.2 Desktop Study

A desktop study was conducted of available published and unpublished information, along with a review of data available on the National Parks and Wildlife Service (NPWS) and National Biodiversity Data Centre (NBDC) web-based databases, in order to identify key habitats and species (including legally protected and species of conservation concern) that may be present within ecologically relevant distances from the project as explained below. A baseline habitat assessment was performed using satellite imagery of the site. The data sources below (accessed June 2022) were consulted for the desktop study:

- Aerial photography available from www.osi.ie and Esri World Imagery.
- NPWS website (www.npws.ie) where Natura 2000 site synopses, data forms and conservation objectives were obtained along with Annex I habitat distribution data and status reports. A sensitive da
- River Basin Management Plans (www.wfdireland.ie)
- NBDC species data within a custom polygon covering the study area with an additional 5km buffer
- NBDC Biodiversity Maps (maps.biodiversityireland.ie)
- Catchments (www.catchments.ie)
- Environmental Protection Agency Maps (https://gis.epa.ie/EPAMaps)
- Geological Survey Ireland (GSI) website (www.gsi.ie)
- GSI - Groundwater data viewer (https://dcenr.maps.arcgis.com)
- Planning Applications (myplan.ie)

1.4.3 Ecological Site Surveys

Various ecological site surveys from 2019 to 2024 were performed by JBA Ecologists Jean Hamilton, Joe Freijser, Hannah Mulcahy, Colm O'Leary, Anne Mullen, Damien McAndrew, Johanna Healy and William Mulville; JBA Arboriculturist Stephen Tester and sub-consultants Dr Joanne Denyer (Denyer Ecology) and Dr William O'Connor (Ecofact). Table 1-1 contains further details on survey dates and type of survey undertaken. This AA Screening will summarise the survey findings but are detailed in the Stage 2 Appropriate Assessment.

The ecological walkover survey recorded habitats and protected species, following the methods outlined in the documents below:

- Heritage Council (2011). Best Practice Guidance for Habitat Survey and Mapping (Smith et al. 2011).
- Fossitt, J. (2000). A Guide to Habitats in Ireland. The Heritage Council, Kilkenny (Fossitt 2000a).
- Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes (NRA, 2009b).

Aerial photographs and site maps assisted the survey. Habitats have been named and described following Fossitt (2000). Nomenclature for higher plants principally follows that given in The New Flora of the British Isles 4th Edition (Clive Stace 2019). Identification of Irish plants generally follows that given in Webb's An Irish Flora (Parnell and Curtis, 2012).

Table 1-1 Ecological surveys undertaken in the study area

Survey type	Date	Location of survey	Assessed in NIS or EIAR
Habitat surveys – survey data and subconsultant report included in Appendix B of NIS			
In-river habitats	1 August 2019	River Shannon and islands.	NIS & EIAR
Habitats and invasive species	13 August 2019	Entire scheme	NIS & EIAR
Ecological walkover on Northern section of scheme	25 June 2021	Additional area added to FRS option –At Rivergrove and Grange House	NIS & EIAR
Ecological walkover	19 July 2022	Additional habitat mapping to update information in 2022. Entire scheme	NIS & EIAR
Annex I habitats (surveyed by Sub-consultant Denyer Ecology)	21 May 2022	Annex habitats entire scheme	NIS
Alluvial Woodland extent check	20th July 2022	Annex habitats entire scheme	NIS
Alluvial woodland mapping extent in winter	10 February 2023	Woodland around Cloon Stream	NIS
Bird surveys – survey data included in Appendix C of NIS			
Wintering birds	14 November 2019 17 December 2019 15 January 2020 13 February 2020 11 March 2020	Vantage point at Ferry Playground & Mall Road	QI birds assessed in NIS All other birds assessed in EIAR
Wintering Birds 2024 update surveys	16 Jan 2024 23 Feb 2024	Vantage point at Ferry Playground & Mall Road	QI birds assessed in NIS All other birds assessed in EIAR
Breeding bird survey	28 July 2022	Entire scheme	EIAR

Survey type	Date	Location of survey	Assessed in NIS or EIAR
Heronry nest check at Mahers pub - Drone	8 September 2022	Heronry in 2 trees behind Mahers pub	EIAR
Breeding Bird survey	4th May 2023	Entire scheme	EIAR
Breeding Bird survey	1st June 2023	Entire scheme	EIAR
Mammal surveys - survey data included in Appendix D of NIS			
Winter mammals – set up Trail Camera x 2 on Cloon Stream for Otter	26 January 2023	Cloon Stream	NIS & EIAR
Trail Camera for Otter on Cloon Stream x 2 cams	19th May 2023	Cloon Stream	NIS & EIAR
Trail Camera for Otter on Cloon Stream x 2 cams	1st June 2023	Cloon Stream	NIS & EIAR
Winter mammals – set up Trail Camera x 2 on Cloon Stream for Otter	26 January 2023	Cloon Stream	NIS & EIAR
Bat surveys– survey data included in Appendix E of NIS			
Bat activity	19 September 2019 20 May 2020 20 July 2020	Entire scheme	Impact assessment in EIAR
Bat static detectors	19th September – 29th September 2019 20th May – 25th May 2020 19th July – 27th July 2020 12th August- 19th August 2020	Static detectors set up at Island House, Mahers Pub & Coolbane woods	Impact assessment in EIAR
Bat activity and emergence – Beech trees at Grange House	8 September 2022	Additional area added to FRS option at Grange House	EIAR
Aquatic surveys – survey data and sub-consultant report included in Appendix F of NIS			
Fisheries / aquatic survey (surveyed by Sub-consultant Ecofact)	August 2021	6 survey locations within River Shannon & Cloon Stream	QI species included in NIS Non-QI species in EIAR
eDNA in Cedarwood Stream	13th September 2023	Cedarwood stream	NIS & EIAR
Tree survey – Sub-consultant report included in Appendix H of NIS			
Tree surveys (surveyed by Arborist)	19 & 20 October 2022	Entire scheme	EIAR

1.5 Screening Method

This screening assessment uses the source-pathway-receptor model as outlined in guidance (OPR 2021). Using the source-pathway-receptor model allows for the potential significant effects to be eliminated if no viable source, pathway, or receptor is present.

An examination of the construction methods or project description allows sources of impact to be determined. This also allows a zone of influence for the project to be generated based on the size, scale and nature of the works involved. The pathways for impact are also analysed to see if a functional pathway for impact is present. This report analyses three pathways: surface water, groundwater and land. Using information gathered from desk sources (e.g. mapped qualifying interests from the Conservation Objectives for the site) and from field surveys, receptors within the zone of influence are identified. In some cases, sensitive receptors may also play a role in determining the zone of influence. If any of the three parts to the model are not present (source-pathway-receptor) the potential for a likely significant effect from the project on the Natura 2000 network can be discounted.

1.5.1 Zone of Influence

An examination of the construction methods or project description allows sources of impact to be determined. This also allows a zone of influence for the project to be generated based on the size, scale and nature of the works involved. Using the source-pathway-receptor model the pathways for impact are also analysed to see if a functional pathway for impact is present. This report analyses three pathways: surface water, groundwater, and land.

As the works are confined to Castleconnell Village and will largely use existing infrastructure the project will primarily directly affect the site only. However, as the scale of proposed works are considered of 'Project' status, Natura 2000 sites within a 10km range of the proposed development were examined in relation to surface water and groundwater / ground-to-surface water pathways (i.e., local surface water sub-catchments and groundwater bodies / aquifers), with an extended 15km range for those with a downstream hydrological connection.

In respect to the ZoI for air pollution (emissions and dust), Natura 2000 sites within a 500m buffer zone of the development were considered as per the Institute of Air Quality Management (IAQM) Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2014), including ex-situ foraging habitats utilised by QI species associated with local Natura 2000 sites.

Furthermore, a 300m disturbance buffer from boundaries of the proposed development has been incorporated into the ZoI in order to account for QI species potentially foraging within ex-situ habitats. Some wintering bird species (that are QIs of Natura 2000 sites along the Ireland's lakes and rivers and estuaries) are known to travel considerable distances on a daily basis for foraging and roosting, with flocks occasionally utilising outlier sites, outside of that of their typical roosting /foraging areas. These flight distances can be beyond what is normally considered the ZoI for a project. For this reason, any SPAs connected to River Shannon has been included within the ZoI of the proposed development.

This means the final 'Zone of Influence' can be a complex shape not easily defined by a simple distance figure, but in this way the assessment includes all relevant sites whilst avoiding unnecessary inclusion of other sites.

1.5.2 Likely Significant Effect Test

The test for AA screening is whether the project could have a 'Likely Significant Effect' (LSE) on any Natura 2000 site. A likely significant effect is defined as any effect that

could undermine the conservation objectives of a Natura 2000 site, either alone or in combination with other plans or projects. There must be a causal connection between the project and the qualifying interest of the site which could result in possible significant effects on the site. The LSE test is a lower threshold for the screening assessment than 'adverse effect on site integrity' considered at Appropriate Assessment stage (Stage 2) as screening is intended to be a preliminary examination for potential effects.

The Zone of Influence was used to identify Natura 2000 sites that could be impacted by the project. For each of these sites, the Qualifying Interest features and their associated conservation objectives were identified, and the possibility of LSE was determined by a combination of location, ecological and hydrological connectivity, sensitivity of receptor and magnitude of the source of impact.

1.5.3 In-Combination Screening

The possibility of in-combination effects are considered only at a high level. Where there is no effect at all via a pathway, there is no possibility of in-combination effects. Where an LSE is identified, the in-combination assessment is carried forwards to a Stage 2 Appropriate Assessment.

1.5.4 Consultation

Consultation is ongoing with a number of key stakeholders in relation to Natura 2000 sites which includes, but is not limited to the following:

- Limerick City and County Council.
- National Parks and Wildlife Services

A meeting with National Parks and Wildlife Services' Ecologist Jervis Goode took place on the 20th July 2022, where the project's ecological sensitivities and survey efforts were discussed at length, as well as the proposed FRS design. Following the meeting additional baseline and updated surveys were conducted as requested to ensure full coverage of sensitive ecological features, including QI species, within the ZoI of the proposed development. Consultation took place with NPWS regarding the extent of the Annex I Alluvial Forest [91E0] within the River Shannon.

Later consultation with Jervis Goode, NPWS Ecologist, also took place at the public participation day on the 6th September 2023, on findings of surveys and the proposed Scheme, particularly interactions with the Lower River Shannon SAC.

The NPWS grassland specialist was consulted in relation to the latest definition of Annex I habitat Hydrophilous tall herb fen in Ireland. A national survey is currently being undertaken of this habitat and it is likely that the definition and positive indicator species list will be updated in the future.

The observations and recommendations obtained as a result of the above consultations are included and addressed in this report.

1.6 Competent Persons

The assessment has been carried out by Anne Mullen BSc MSc MCIEEM and Hannah Mulcahy BSc (Hons), MSc. Both are ecologists with JBA and have undertaken numerous Appropriate Assessment Screening and NIS assessments. The assessment has been reviewed by ecology Technical Director Rachael Brady BSc MSc PGCert CEcol MCIEEM with extensive experience in undertaking assessments under the Habitats Directive.

1.7 Limitations and Constraints

The screening assessment is subject to some limitations. These would not affect the conclusion, but the following points are recorded in order to ensure the basis of the assessment is clear:

- Information on the works and conditions on site are based on current knowledge at the time of writing. Changes to the site since this report was drafted cannot be accounted for. However, significant changes to the site are unlikely in the time between the submission of the report and likely determination date (2024).
- This assessment is based on the methodology for proposed works as described in this report. Where changes to methodology occur, an ecologist will need to be consulted to determine if the changes are likely to alter the ecological impacts and would therefore need reassessment.
- The AA Screening addresses issues around Natura 2000 sites and does not exempt works from responsibilities related to habitats and species covered under separate national legislation.

2 Project Description

2.1 The 'Project'

The proposed flood relief scheme in Castleconnell meets the criteria of a 'Project' as defined in the Habitats Directive and is not directly connected with or necessary to the management of any Natura 2000 site. Therefore, the project is subject to the requirements of the Appropriate Assessment process.

A number of options were assessed during the design process, and a preferred option emerged. The nature of site and the designation of the site played a large role in the multi-criteria analysis, and the emergence of the preferred option.

2.2 Project location

The River Shannon is the main river in Ireland, with an estimated catchment area of 15,700 km2. The river begins at Shannon Pot in the Cuilcagh Mountains in County Cavan. The river flows to the south and discharges into the Shannon Estuary. Castleconnell village drains approximately 10,824 km2 of the Shannon catchment and associated flood flow.

Parteen Weir and Lough Derg, which is approximately 6.5 km upstream of Castleconnell village, have a significant impact on the flood flows at Castleconnell.

There is a southerly topographical decline, with road levels adjacent to Rivergrove B&B on the Lacka Road falling to 22.7mOD on Chapel Hill in front of the public carpark.

Castleconnell is served by the M7 motorway, R445 regional road, and the Limerick-Ballybrophy railway line. The study area is outlined in red in Figure 2-1.

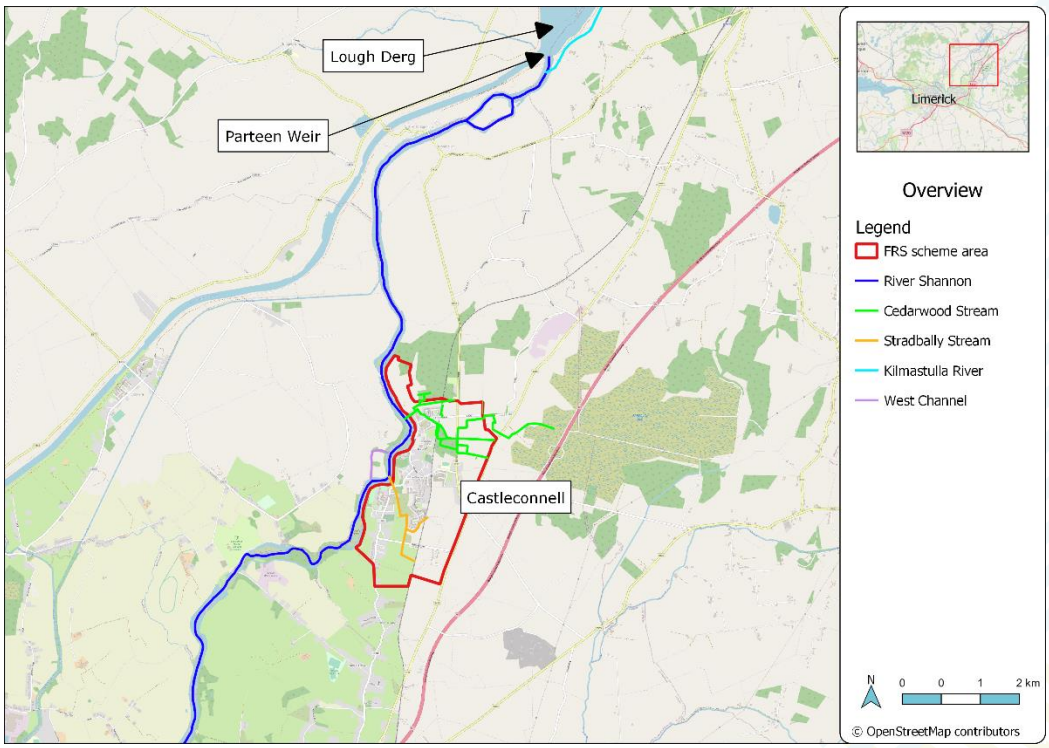

Figure 2-1: Castleconnell FRS Catchment Overview

2.3 Description of Proposed Development

The proposed development comprises a Flood Relief Scheme with various measures including flood walls, embankments, road raising, demountable flood barriers, and associated works and infrastructural changes. From north to south, the scheme is generally composed of:

- Flood walls and associated interventions between Rivergrove B&B and Mall House.
- Replacement of the existing wall along Mall Road with a new flood wall, set back from the existing wall and the river by c. 1m.
- Road raising at the entrance to Island House and Scanlon Park junction.
- Continuation of the new setback flood wall along Mall Road between the entrance to Island House and Maher's Pub.
- A flood wall running along the back of Maher's Pub and Meadowbrook Estate, merging into a new earth embankment towards Stormont House.
- A new flood wall and road raising along the entrance to Island House.
- Road raising and a demountable flood barrier at the entrance to Coolbane Woods; and
- An embankment running from the entrance to Coolbane Woods, running south and tying in with higher ground.

The location and further description of each element of the FRS is shown on Figure 2-2.

2.3.1 Detailed description

The proposed development comprises the following:

Rivergrove B&B and Grange House

Replacement of the existing wall to the west of Rivergrove B&B with a new flood wall. The new flood wall extends across the existing entrance and a new entrance will be provided at higher ground further to the east. Provision of a new low-level plinth inside the existing front boundary wall to the north of the B&B will avoid the need to replace the existing high stone wall. A short length of glass panels will be provided within the flood wall to maintain some of the view of the river from the conservatory.

Replacement of the existing wall to the west of Grange House with a new flood wall that will continue along the southern side of the driveway until it ties in with high ground. Glass panels will be provided in sections, as agreed with the homeowner, to maintain views of the river from key areas of the house. The open section of the Cedarwood Stream adjacent to the Mill Building will remain open, and a new culvert of approximately 40m will be provided from the downstream point of this open section to the Shannon. This includes removal of the open feature in the garden, which will be replaced by the culvert. A new pumped foul connection will be provided to the public foul sewer to replace the existing free outfall from the house to the Cedarwood Stream open feature.

Mall House

Replacement of the wall to the north, west and south of Mall House with a new flood wall. Where the northern face of the house is constructed against the boundary wall, a new plinth wall will be constructed immediately north, in the property of Dunkineely House. Protection is not required to the front of Mall House because the Mall Road is protected.

Provision of a demountable flood barrier to the entrance on Dunkineely House (immediately to the south of Mall House).

Mall Road

Replacement of the existing wall to the west of the Mall Road with a new flood wall which will be set back by c. 1m and constructed outside the SAC and the area of alluvial woodland.

Provision of demountable barrier in the main fisherman access point through the Mall wall.

Island House entrance

Road raising at the entrance to Island House, to the '504 event' 1% AEP flood level (23.70m). Provision for a flood gate on top of this to defend up to the 'Baseline design event (limitations in operational conditions).' Raising of c. 50m length of the driveway to Island House (on the eastern side of the causeway) by c. 200mm to allow for safe evacuation at the onset of a flood event. Raising of Scanlon park junction by c. 100mm.

Mall Road (Cont.) & Maher's Pub & Meadowbrook Estate

Replacement of the existing wall between Island House and Maher's pub with a new flood wall, which will be set back by c. 1m for the majority of its length. C. 55m immediately south of the entrance to Island House will be replaced along its existing alignment due to space constraints.

Provision of a new flood wall alongside Maher's Pub car park. It is proposed to set back the wall along the rear (western) boundary by c. 6m to remain outside of the RPZ of the Cedar tree (where herons nest). This flood wall extends along the northern boundary of nr. 7 Meadowbrook Estate, terminating at the front boundary of nr. 6 Meadowbrook Estate. A section of the existing boundary wall at ethe end of the cul-de-sac will be removed, and a gate will be provided through the wall to provide emergency access to Stormont House and for maintenance of the embankment in the Stormont House grounds only. There will be no access for members of the public through the gate.

Meadowbrook Estate & Stormont House

Provision of an embankment along the rear of Meadowbrook Estate, from nr. 7 Meadowbrook Estate and north of Stormont House.

A low-level flood wall along the west of Stormont House, inside the existing castellated wall.

Raising ground levels along the Stormont House entrance road.

A short length of low-level flood wall to tie in with rock at the Castle to the east of the entrance to Stormont House.

Coolbane Woods (entrance)

Road raising to the '504 event' 1% AEP level at the Coolbane Woods junction adjacent to the castle. Provision of a demountable flood barrier to the west of the junction, to defend up to the 'Baseline Design Event (limitations in operational conditions)'.

Coolbane Woods (woodland)

Proposed embankment along the southern boundary of the Coolbane Woods entrance road and along the rear of house no.'s 1-4, to tie into higher ground to the south.

Cedarwood Stream

Silt and vegetation removal, replacement of small culvert.

Figure 2-2: Overview of FRS proposal

2.4 Construction Activities

A Draft Buildability Report has been prepared for the proposed FRS which outlines the construction methodology and phasing. This is summarised below and includes information which is relevant to the NIS. The Draft Buildability Report will remain a live document until after the planning application stage, when the finalised detailed design of the scheme is complete.

It is expected that the construction phase will take place over 12 to 18 months.

2.4.1 Construction Compounds

Several compound areas will be established during the construction phase, for use in different geographical areas of the scheme. Establishment of these areas will include the following:

- Site offices.
- Site facilities (canteen, toilets, drying rooms, etc.).
- Secure compound for the storage of all on-site machinery and materials.
- Temporary car parking facilities.
- Temporary fencing.
- Site Security to restrict unauthorized entry.
- Bunded storage of fuels and refuelling area. Bunds shall be 110% capacity of the largest vessel contained within the bunded area.
- A separate container will be located in the Contractors compound to store absorbents used to contain spillages of hazardous materials. The container will be clearly labelled, and the contents of the container will be disposed of by a licenced waste contractor at a licenced site. Records will be maintained of material taken off site for disposal.
- A maintenance programme for the bunded areas will be managed by the site environmental manager. The removal of rainwater from the bunded areas will be their responsibility. Records will be maintained of materials taken off site for disposal.
- The site environmental manger will be responsible for maintaining all training records.
- The contents of any tank will be clearly marked on the tank, and a notice displayed requiring that valves and trigger guns be locked when not in use.
- Drainage collection system for washing area to prevent run-off into surface water system; and
- All refuelling of vehicles will be carried out at the fuel stores within the main site compound and only ADR trained personnel will be permitted to operate fuel bowsers.

2.4.2 Operation

A Maintenance Plan will be put in place whereby Limerick City & County Council will inspect and install the demountable barriers and flood gates once per year to examine them for any defects and to ensure that staff are trained in and familiar in their

installation. Annual inspection and installation of demountable barriers and flood gates, and inspection non-return valves and drainage outfall

Annual inspection of Cedarwood Stream and removal of vegetation for improved conveyance if required.

Annual inspections of the embankments will be needed, together with investigations of its performance after each flood event. Monitoring of seepage will be recommended. Inspection of entire scheme following a flood event. Cutting of grass on embankments twice per year.

Responsibility for erection of the demountable flood barriers and flood gates ahead of a flood event will remain with Limerick City & County Council. For this reason, they have all been proposed at publicly accessible locations.

3 Existing Environment

3.1 Overview

This section summarises the baseline information on Annex habitats and species, and pathways within the project footprint. This is based on a review of the information listed in Section 1.4.2 and data collected during ecological surveys of the study area.

Details of ecological surveys undertaken within the study area are available in Section 1.4.3.

3.2 Annex Habitats

Habitats associated with the Lower River Shannon SAC and Qualifying Interests are assessed only. All other habitats are assessed in the Biodiversity Chapter of the EIAR that accompanies this report.

The table below also contains a heading section for Annex I habitats (associated with Natura 2000 sites) which are linked with specific Fossitt habitats via floral assemblage / quality and/or utilisation by QI faunal species identified from desktop data and/or field survey observations.

The detail on the habitat and species is presented in Appendix C the accompanying NIS, but results of Annex I habitats at the site are presented below.

Table 3-1 Habitat types recorded in the study area linked to Annex habitats and Species

Fossitt Habitat & Code	Linked Annex Habitat & Species
Wet willow-alder-ash woodland WN6	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)91E0
Riparian woodland WN5	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)91E0
(Mixed) broadleaved woodland WD1	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)91E0
Upland/eroding rivers FW1 – Cedarwood Stream	Pathway to SAC
Lowland/depositing rivers FW2 – River Shannon & Cloon Stream	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] Sea Lamprey *Petromyzon marinus* [1095] Brook Lamprey *Lampetra planeri* [1096] River Lamprey *Lampetra fluviatilis* () [1099] Salmon *Salmo salar* [1106] Lutra lutra (Otter) [1355] Cormorant *Phalacrocorax carbo* [A017] Black-headed Gull *Chroicocephalus ridibundus* [A179]
Drainage ditches FW4	Pathway to SAC

3.2.1 Annex I Habitats

Surveys to assess areas of potential Annex I habitats and to map their extent were undertaken by Dr Joanne Denyer (Denyer Ecology) and JBA Ecologist Hannah Mulcahy in May 2022. Details of Annex I habitat surveys and methodology is found in Appendix B of the accompanying NIS.

Two habitats listed under Annex I of the E.U. Habitats Directive have been recorded within the study area. These include:

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

Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430). This is not a QI of the Lower River Shannon SAC and will be assessed in the EIAR for this project.

Follow-up surveys to finalise the extents of these habitats and conduct ecological walkovers of the priority Annex I Alluvial woodlands in particular, were conducted by JBA Ecologists Hannah Mulcahy, Anne Mullen and NPWS Ecologist Jervis Goode on 19 July 2022. All areas of alluvial woodland, particularly the woodland area behind Maher's pub along the Cloon Stream, and the woodland beside the Mall road was visited again by JBA ecologists on the 10 February 2023 to survey extent and composition of the habitat while vegetation had died back in winter. It was checked again in summer 2023 when visiting the scheme to place trail cameras, and again in winter 2024 during wintering bird surveys. JBA ecologists are satisfied the condition and extent of this habitat is the same as the initial survey of this habitat since May 2022.

The Annex I habitat Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] is also a Qualifying Interest of the Lower River Shannon. Aquatic surveys found this to not be present in the study area in Castleconnell.

The results of the surveys are described in the sections below.

3.2.1.1 Alluvial Forests (91E0) [WN5 - Riparian woodland / WN6 Wet willow-alder-ash woodland]

Three areas of Annex I alluvial woodland were recorded within the study area, corresponding to Fossitt habitats riparian woodland and wet willow-alder-ash woodland. One area of woodland has been described as 'Affinity to Alluvial Forests'. From north to south in relation to the woodlands mapped in methodology is found in Appendix B of the accompanying NIS, the Annex I alluvial woodlands are further described in this section. These woodlands are listed as:

- Alluvial Woodland 2 – located next to the Mall Road
- Alluvial Woodland 4- On Cloon Island, between Island House and Stormont House next to Cloon Stream.
- Alluvial Woodland 3- Emerging alluvial forests at Coolbane Woods.
- Affinity to Alluvial Woodland 1- located next to the Mall Road and Cloon Stream (between Island House and Maher's Pub).
- Instream river islands –surveyed in 2019 during initial scoping surveys. Habitat description and ground flora indicated this is Alluvial Forests 91E0.

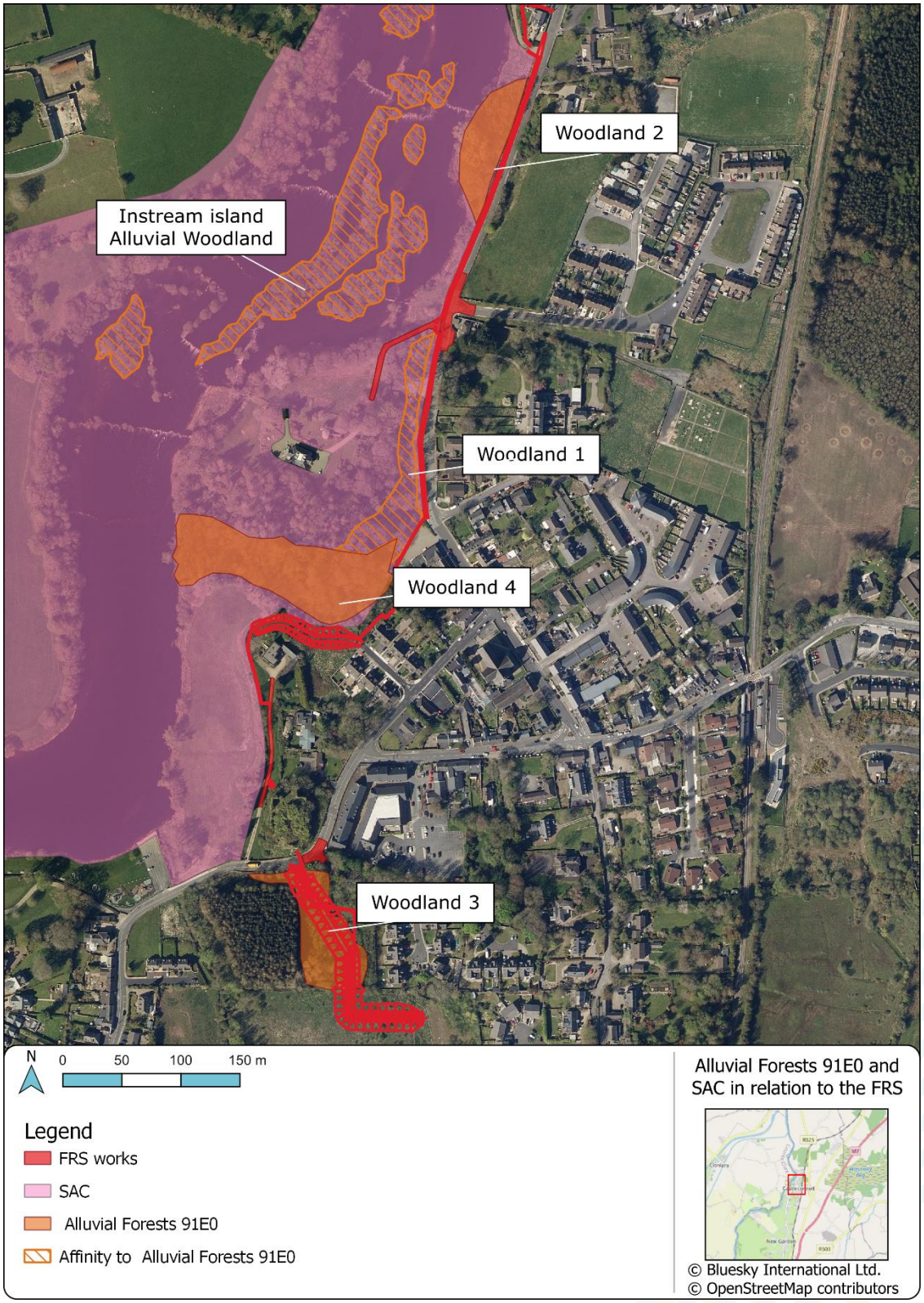

Figure 3-1 Alluvial Forest 91E0 mapped in the scheme area (woodland numbers correspond to survey report by Denyer Ecology, 2022).

Alluvial woodland 2 – Mall Road

This corresponds to riparian woodland and is a small area of woodland within the flood zone of the River Shannon. The canopy is dominated by Alder and the non-native willow species White Willow. Ash and Rusty Willow *Salix cinerea* subsp. *Oleifolia* are occasional and the hybrid *Salix x reichardtii* (Goat Willow *S. caprea* x Rusty Willow) was recorded. The ground flora is dominated by diverse wetland vegetation. In addition to the positive indicator species, the following are frequent: Hemlock Water-dropwort *Oenanthe crocata*, Great Willowherb *Epilobium hirsutum*, Water Horsetail *Equisetum fluviatile*. Giant Hogweed is occasional.

The area of this woodland is approximately 0.3 hectares in size.

Figure 3-2 Alluvial woodland 2 recorded in Castleconnell FRS study area beside Mall Road, corresponding to riparian woodland

Alluvial woodland 4 – Cloon Island/ Stormont House

The second area of alluvial woodland corresponds to wet willow-alder-ash woodland and is adjacent to the River Shannon and there is a river channel to the south which discharges into the River Shannon. This area was viewed from the south of this channel and partially accessed from the northern side. It was not possible to access the whole area due to the deep river channel and scrub. Whilst non-native tree species are present (e.g., Sycamore and conifers), Alder and Ash are also locally frequent, and the ground flora is dominated by wet woodland. The woodland grades into affinity alluvial woodland (WD1 Mixed broadleaved woodland) to the east and contains some areas of non-alluvial woodland.

The area of this woodland is approximately 0.9 hectares in size.

Figure 3-3 Alluvial woodland 4 recorded around the Cloon Stream at Island House & Stormont House; corresponding to wet willow-alder-ash woodland

Alluvial woodland 3- Coolbane Woods

The southernmost area of alluvial woodland recorded also corresponds to wet willow-alder-ash woodland and occurs adjacent to a conifer plantation. This area is not adjacent to the river/ side channels (as for the other wet woodland areas) but has a typical wet woodland ground flora and is likely to be within the winter flood zone. The canopy is dominated by young Rusty Willow with Downy Birch *Betula pubescens*. The ground flora is dominated by 91E0 positive indicator species in most areas, but Pendulous Sedge is also locally frequent. (Denyer Ecology 2022). The area of this woodland is approximately 0.4 hectares in size.

Figure 3-4 Alluvial woodland 3 at Coolbane Woods; corresponding to wet willow-alder-ash woodland

Affinity to Alluvial woodland 1 [WD1 – Mixed broadleaved woodland]

An area of planted woodland in the grounds of a house was identified as having an affinity to alluvial woodland. There is at least one stream channel within the woodland which discharges to the River Shannon. The canopy is dominated by non-native tree species Sycamore and Beech, which are not typical of 91E0. However, in some areas the ground flora has affinity to 91E0 alluvial woodland due to the proximity to the stream and probably winter flooding. Non-native species in the ground flora include locally abundant Ground-elder *Aegopodium podagraria*, occasional Giant Hogweed, Snowberry and Winter Heliotrope *Petasites pyrenaicus*. (Denyer Ecology 2022).

The area of this woodland is approximately 0.4 hectares in size.

Figure 3-5 Affinity to alluvial woodland recorded in Castleconnell FRS study area between Island House entrance and Maher's Pub along the Cloon Stream, mixed broadleaved woodland with areas of indicator ground flora

3.2.1.2 Alluvial Forests 91E0 on Islands – Riparian woodland WN5

Several stands of riparian woodland occur across on in-stream islands in the River Shannon which corresponds to the priority Annex I habitat alluvial woodlands [91E0].

The canopies of these woodlands are often dominated by tree species such as Alder, willow species such as Grey Willow *Salix cinerea* and Crack-willow *Salix x fragilis*, Sycamore and Ash. The ground flora is dominated by Ivy and Nettle; other species include Dock *Rumex* spp., Wood Avens, Yellow Iris, Brome, Cock's-foot and Broad-leaved Helleborine *Epipactis helleborine*.

The woodlands on the Islands were not included in the Annex I habitat survey carried out by Denyer Ecology, as they are not directly affected by the proposed scheme. These islands were surveyed by JBA in 2019. However, the islands and other wooded areas on the banks of the River Shannon at Castleconnell can be considered Annex I Alluvial Woodland 91E0 (Figure 3-6).

Figure 3-6 Example of riparian woodlands recorded on islands within the River Shannon

3.2.1.3 Floating River vegetation [3260]

The Annex I habitat Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation' habitat is designated (QI) within the Lower River Shannon SAC.

During the aquatic survey *Ranunculus*, *Potamogeton* spp. And *Fontinalis antipyretica* were identified. While the species which make up this habitat were noted separately throughout the survey, due to high levels of siltation, filamentous algae, and these areas being very localized with high proportion of *Potamogeton* spp., these areas are not considered to represent this Annex I habitat. Additionally, this habitat occurs in nutrient poor fast flowing waters, however the background unsatisfactory water quality, channel modifications, and the severe river regulation has made conditions generally unsustainable for this Annex I habitat (Ecofact, 2021).

The protected habitat 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation 'was not recorded on the River Shannon at Castleconnell during the aquatic habitat survey, however this habitat is known to be present just outside the survey boundary, approximately 20m upstream the outfall Conway's Canal, as previously recorded by AECOM ecologists in 2019 (AECOM, 2019). During the survey *Ranunculus*, *Potamogeton* spp. And *Fontinalis antipyretica* were regularly recorded. While *these* species are components of the Annex II 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation' habitat, high levels of siltation, filamentous algae and these areas being very localized with high proportion of *Potamogeton* spp. Means that these areas are not considered to represent this Annex I habitat. Water flowing through the canal is not hydrologically connected to water flowing past Castleconnell.

Full descriptions of encountered habitats and floral assemblages are described in the aquatic baseline report in Appendix F of the accompanying NIS.

3.3 Surface Waterbodies within the Scheme Study Area

There are many waterbodies present in the FRS scheme area including the River Shannon (Figure 3-7), as well as three streams. Descriptions of these waterbodies are included as they connect with the Lower River Shannon SAC and contain QI species.

Figure 3-7 Surface waterbodies recorded within the Castleconnell FRS study area

3.3.1 Cedarwood stream (Upland/eroding rivers FW1)

The Cedarwood Stream is located at the northern boundary of the study area. It was culverted for most of its reach, and where visible surveyors noted the substrate

consisted of sand and pebbles and stream banks were steep (Figure 3-8). No aquatic vegetation was observed in-stream. This river drains into the SAC.

Figure 3-8 Cedarwood stream is culverted many times, with last culvert at Grange House near where it joins with River Shannon

3.3.2 River Shannon – Lowland/depositing rivers FW2

The River Shannon flows along the western boundary of the study area. The flow in the River Shannon is controlled by a Parteen regulating weir through which flow of water that travels through a headrace towards the Ardnacrusha Hydroelectric station. The river is therefore not under a natural hydrological regime. There are also several fisheries modifications in the Shannon at Castleconnell such as weirs, which have changed the river levels in areas resulting in some deeper areas and an increasingly confined channel.

Annex I habitat 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]' was not recorded at any of the in-stream fisheries survey sites (Ecofact, 2020). It is likely that the background unsatisfactory water quality, channel modifications, and the severe river regulation has made conditions generally unsustainable for this annex habitat.

Annex I habitats Alluvial Forests [91E0] are present on the island and edges of the River Shannon in Castleconnell (Figure 3-9).

Figure 3-9 River Shannon next to proposed scheme

3.3.3 Cloon Stream – Lowland/depositing rivers FW2

The Cloon stream is a side tributary of the River Shannon, which forms Cloon Island (Figure 3-10). This stream is within the Lower River Shannon SAC. There is a causeway at the entrance to Island house which bridges the Cloon Stream. The bed of the Cloon stream is devoid of aquatic vegetation, however the surrounding habitat is composed of wet willow-alder-ash woodland and mixed broadleaved woodland around Island House on Cloon Island. The woodlands around the Cloon Stream have been classified as Annex I Alluvial Forests 91E0 and affinity to 91E0 and are located within the SAC (Figure 3-11).

Additionally, River / Brook Lamprey and Sea Lamprey were recorded in the stream during the fisheries surveys. No salmon were recorded in the stream.

Figure 3-10 Cloon Stream – View from causeway at Island House

Figure 3-11 View of Cloon Stream from Maher's Pub Car Park in Winter in normal water conditions (above) and in flood (below)

3.3.4 Stradbally stream Lowland/depositing rivers FW2

The Stradbally stream lies just outside the main study area to the south and flows into the River Shannon (and SAC) next to the Ferry Playground A larger drainage ditch that discharges storm water from the Supervalu car park connects with the Stradbally stream through the Scheme area. Smaller Drainage ditches from the conifer plantation connects with this stream also.

3.3.5 Drainage Ditches

Drainage ditches occur within the Flood Cell F3. One ditch drains through a culverted section from the Supervalu car park, under the entrance road to Coolbane Woods housing estate, and through the Conifer plantation into the Stradbally Stream. Other small drainage ditches are located throughout the Conifer Plantation.

A large drainage ditch bordering the south of the woodland flows into the Stradbally stream, however in 2023 this has recently been excavated (Figure 3-12).

Figure 3-12: Drainage ditches in proximity to Coolbane woods

3.4 Protected Fauna (Annex Species)/ QI Features

3.4.1 Desktop survey data

A search was made in National Biodiversity Data Centre (NBDC) records for protected species within 5km of the scheme (full details in Appendix A of the accompanying NIS).

The following species of Qualifying Interest for Screened-in Natura 2000 sites have been recorded in the NBDC database within 5km of the study area:

- European Otter *Lutra lutra*
- Black-headed Gull *Chroicocephalus ridibundus*
- Curlew *Numenius arquata*
- Golden Plover *Pluvialis apricaria*
- Cormorant *Phalacrocorax carbo*
- Lapwing *Vanellus vanellus*
- Whooper Swan *Cygnus cygnus*
- Sea Lamprey *Petromyzon marinus*, a QI species of the Lower River Shannon SAC, has been historically recorded in the stretches of the River Shannon within the study area (records obtained from a sensitive data request from NPWS). These records date as recently as 1995.

These desktop results have been incorporated into the surveys for this Scheme, as detailed in the sections below.

3.4.2 Bird surveys

Wintering bird surveys, breeding bird surveys and checks for active heron nests were conducted from 2019 to 2023. The surveys conducted are included in the table below.

Details of bird surveys and methodology is found in Appendix C of the accompanying NIS

Qualifying Interest bird records

Cormorant and Black headed Gull are Qualifying Interest features of the River Shannon and River Fergus Estuaries SPA and Lough Derg (Shannon) SPA. Both species were recorded as present in the River Shannon at Castleconnell during the surveys.

Cormorant

Cormorant were recorded both in the winter and summer months; no signs of breeding and no roost sites were recorded. Cormorant forage on the main channel of the River Shannon, and rest on exposed areas in the watercourse and along the banks.

A maximum count of eight birds was recorded during the winter bird surveys. Long term trends on a national scale indicate an increasing population, with I-WeBS counts on the Shannon with highs of 66 individuals, and highs of 328 on the Shannon and Fergus estuary (Kennedy et al. 2022).

Black-headed gull

Black-headed gull, a QI of the SPA, were observed to congregate and feed around the Ferry Playground on the amenity grassland, and also in the River Shannon in this area. Black headed gull was observed flying overhead, feeding and resting around the River Shannon. Based on bird surveys and best scientific judgement it is considered that these birds could be part of the populations of wintering waterbirds which are Qis of the River Shannon and River Fergus SPA and / or Lough Derg (Shannon) SPA.

A maximum count of 39 birds in a single flock flying over was recorded during the winter bird surveys. I-WeBS counts on the Shannon have highs of 225 individuals, and highs of 1484 on the Shannon and Fergus estuary (I-WeBS 2022).

Wintering Black-Headed Gulls were not recorded roosting along the zone of works for the scheme. In winter the birds are likely to be foraging on land. The area covered by the scheme does not present suitable foraging or roosting habitat. Gulls also habituate to the presence of people and machinery and may show fewer signs of disturbance.

The field between Stormont house and the River Shannon may present suitable foraging habitat for the birds. This was confirmed during the 2024 wintering bird surveys, where in flood conditions, Mallard and Greylag geese were roosting and foraging in this meadow.

Black-headed gull was recorded foraging along the main channel of the River Shannon. There is no suitable nesting habitat along the area of works, and no signs of nesting were recorded.

3.4.3 Otter

Otter *Lutra lutra* is a Qualifying interest of the Lower River Shannon SAC. Details of Mammal surveys and methodology is found in Appendix D of the accompanying NIS.

A potential otter holt was observed on the right bank of the river in 2019 and otter have been observed feeding in the Shannon during the wintering bird surveys on 13 February 2020. Otter spraints have been recorded along the River Shannon in many locations. Therefore, Otter is present in the main River Shannon, however no holts, couches or resting places have been found within the construction area of the Scheme.

The Otter Survey of Ireland 2004/2005 indicated that Otters were present in 70.53% of sites in the Shannon River Basin District (which included some sites in the vicinity of Castleconnell), compared to 100% from the surveys in 1980/81 (Bailey & Rochford, 2006).

Survey of Cloon Stream – Trail camera surveys 2023

In 2019 & 2020, Otter spraint was recorded on the Island House causeway over the Cloon stream. As the proposed FRS will be located close to the Cloon Stream, further work to determine use of the stream by otters was carried out. This involved trail cameras set up along the stream in 6 locations in winter and spring.

Through January to August 2023, signs of otter were also searched for while the vegetation was low in the winter, such as prints, slides, couches, dens, and spraints. No signs of otter have been observed around the Cloon Stream downstream of the Island House causeway. Details of these surveys is located in Appendix D of the accompanying NIS.

Otter was not recorded from any of the 6 cameras.

This does not rule out the presence of otter on the Cloon Stream, however it is unlikely that otters are regularly using the Cloon Stream, and do not appear to be using this area as a resting site, despite the dense vegetation.

3.4.4 Aquatic Ecology Surveys

Baseline aquatic ecology surveys and a desktop assessment of aquatic ecology was carried out by Sub-consultants Ecofact in August 2021. Details of Fisheries surveys and methodology is found in Appendix F of the accompanying NIS.

A preliminary desktop study gathered information from available online databases/ published documents which informed the field survey effort. Field surveys included an aquatic habitat survey, aquatic macroinvertebrate survey, and electrofishing surveys of general fish stocks (including salmonids) and specific electrofishing efforts to assess juvenile Lamprey presence. Six survey sites were selected in the River Shannon between Doonass Bridge to the south of Castleconnell to an area known as 'Pa's Gap' to the north of Castleconnell. The following sections summarises the findings of the aquatic survey report.

Sea Lamprey *Petromyzon marinus*, River Lamprey, Brook Lamprey *Lampetra planeri*, River Lamprey *Lampetra fluviatilis*, and Salmon *Salmo salar* are all Annex II species, Qis of the Lower River Shannon SAC and are known to be present within the reach of the River Shannon at Castleconnell.

3.4.4.1 Aquatic Fauna

The survey reach was separated into six survey areas. One general fish survey, one kick sampling survey and three juvenile Lamprey surveys were conducted at each survey area. General fish surveys followed standard 5-minute electrical fishing techniques. Separate juvenile Lamprey surveys were carried out using specific electric fishing techniques at three 1 sq. m habitat patches where available. All fisheries surveys were conducted under authorisation from the Department of Environment, Climate and Communications under Section 14 of the Fisheries (Consolidation) Act (1959). A full description of the survey methods, the best practice guidance that was followed and results is found in Appendix F of the accompanying NIS.. A map of the survey areas with results is shown in Figure 3-13 overleaf.

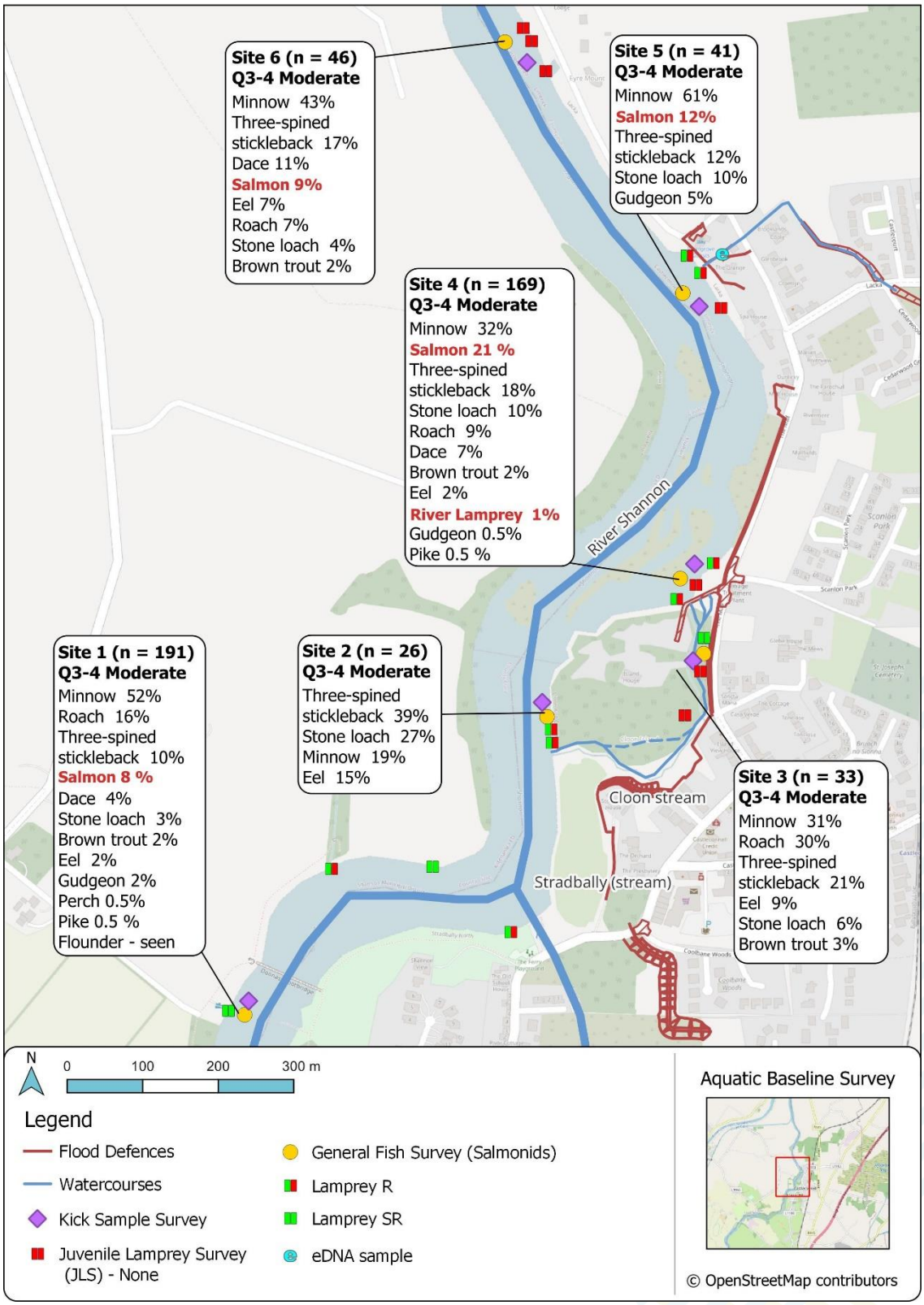

Figure 3-13: Map of aquatic fauna baseline surveys, with recorded Qis of the Lower River Shannon highlighted in yellow

A total of 13 species of fish were recorded within the survey reach of the River Shannon. These species included

- Atlantic Salmon *Salmo salar*
- Brown Trout *Salmo trutta subsp. Fario*
- Minnow *Phoxinus phoxinus*
- Dace *Leuciscus leuciscus*
- Stone Loach *Barbatula barbatula*
- Gudgeon *Gobio gobio*
- Eel *Anguilla anguilla*
- Flounder *Platichthys flesus*
- Perch *Perca fluviatilis*
- Pike *Esox esox*
- River / Brook Lamprey *Lampetra fluviatilis / planeri*
- Sea Lamprey *Petromyzon marinus*
- Three-spined Stickleback *Gasterosteus aculeatus*

Juvenile salmon numbers were generally low but locally abundant in suitable riffle habitats. Eels were present at most of the sites in low densities. All three of the Irish Lamprey species were recorded during the survey. However, numbers were considered to be very low, with juvenile Lampreys absent in many areas of suitable habitat. Lampreys on this channel are also affected by the extreme water regulation. Also, Lamprey migration and habitats are impacted by the numerous fisheries structures in the channel. All migratory fish are impacted by Parteen Regulating Weir – which blocks Lamprey migration.

Kick sampling surveys were conducted at each site area. Overall, the study reach was represented by a macroinvertebrate family richness of between 19 and 28. The Q ratings were stable across all sites at Q3-4, corresponding to WFD status 'Moderate'. There was a paucity of group A pollutant sensitive species in the study area and Group B species were not well represented, when compared to Group C pollutant tolerant species which were the most abundant and diverse. Group D and E very pollutant tolerant species were also not well represented, which reflects this 'Moderate' water quality rating.

No White clawed crayfish *Austropotamobius pallipes*, Swan mussel *Anodonta cygnea* or Duck mussel *Anodonta anatina* were recorded within the survey reach, even though they were recorded in the past as part of river monitoring surveys. It is possible that there has been an outbreak of Crayfish Plague Aphanomyces astaci in this section of the Lower Shannon within the last ten years, considering it has been recorded further upstream within the River Shannon. An outbreak of crayfish plague occurred in the River Maigue in 2017 (LCCC 2022).

The results of these surveys are broken down for each survey area in Table 3-2 overleaf.

Table 3-2: Results of aquatic baseline surveys at each site

Site	Location	Results of electrofishing and macroinvertebrate study – QI species
Site 1	Doonass bridge (River Shannon)	16 Juvenile Atlantic Salmon 35 juvenile Lamprey 2 Sea Lamprey
Site 2	Castlelough / Ferry playground (River Shannon)	No salmonids 11 juvenile Lamprey
Site 3	Cloon Stream	No salmon 4 juvenile Lamprey 1 juvenile Sea Lamprey
Site 4	In River Shannon at Elvers	169 individual fish recorded, comprising of 11 species. 35 Salmon 2 River Lamprey 16 juvenile Lamprey
Site 5	Main River Shannon beside River Grove house	Salmon 13 juvenile Lamprey
Site 6	Pa's Gap (main River Shannon)	Salmon No juvenile Lamprey recorded at Site 6.

3.4.4.2 Summary and Conclusions of Report from Ecofact based on Baseline Aquatic Ecology Survey

The aquatic ecology of the study area is strongly influenced by the water abstraction/regulation, fisheries modifications, and background water quality within this section of the River Shannon. Biological water quality at all sites was rated as being unsatisfactory and the overall evaluation was 'Q3 -Moderately Polluted'. Water quality in this stretch of the river is affected by agricultural runoff throughout the Shannon catchment. However, during the current survey many agricultural impacts were observed –there are also untreated domestic sewage inputs and untreated discharge from the ESB salmon hatchery at Parteen Regulating Weir. There are multiple wastewater discharges in the wider study area, many of which are non-compliant with ELVs based on most recent available documents. The water abstraction and regulation reduce the assimilation capacity of the river.

The fish community of the river is dominated by non-native cyprinid species, including Minnow, Dace, and Roach. Juvenile salmon numbers were generally low but locally abundant in suitable riffle habitats. Eels were present at most of the sites in low densities. All three of the Irish Lamprey species were recorded during the survey. However, numbers were considered to be very low with juvenile Lampreys absent in many areas of suitable habitat. Lampreys on this channel are also affected by the extreme water regulation. Lamprey migration and habitats are impacted by the numerous fisheries structures in the channel. All migratory fish are impacted by Parteen Regulating Weir – which blocks Lamprey migration. Salmon numbers above the Shannon dams are <5% of the Conservation Escapement Target. The overall hydromorphology has been affected by the operation of Parteen Regulation Weir which prevents sediments moving along the river also. This affects spawning and

nursey habitats for both salmonids and Lampreys. Although juvenile salmon numbers were locally abundant, trout numbers in the river were surprisingly low.

Aquatic macroinvertebrates recorded showed an overall Q Rating at each site as Q3-4, which corresponds to Water Framework Directive status 'Moderate'. Family richness ranged from between 19 and 29 overall. Water quality monitoring shows that overall ecological conditions in the study area are rated as Moderate.

Overall, the Lower River Shannon in the vicinity of proposed flood scheme is a river in ecological decline as a result of water quality pressures, instream modifications, and river regulation. This is affecting the aquatic conservation interests of the Lower River Shannon SAC. Juvenile Lamprey numbers in the channels near the proposed flood scheme features are very low. The habitats for salmon in the immediate area of the proposed flood scheme are suboptimal, with no salmon recorded in the side channel that runs to the east of Island House. Lampreys were also absent from this channel. There are no protected or notable aquatic macroinvertebrates in the study area. Annex I floating river vegetation is also absent. (Ecofact Environmental Consultants 2021)

3.4.5 eDNA Sample from Cedarwood stream

An eDNA survey was conducted on the Cedarwood Stream to determine presence of the three Lamprey species, Eel and/or Smooth Newt. The stream flows into the River Shannon from a culvert outfall at the northern extent of the proposed scheme near Grange House.

This stream is heavily modified with an existing culvert at its outfall, as well as a small weir and further culverts present upstream. Where the stream is not culverted in the last 100m before reaching the Shannon, it is confined by a two stone walls (Figure 3-14). An eDNA sample was taken from an open section of the stream between two culverts, the location of which is outlined in Figure 3-13 above.

Figure 3-14: Cedarwood Stream, location of eDNA sample.

3.4.6 Cedarwood culvert fish passability analysis

A general desktop passability assessment has been completed for the Cedarwood stream using available engineering information. This desktop assessment has been completed using best practice guidance from SNIFFER (2012) WFD111 (2a) Coarse resolution rapid assessment methodology to assess barriers to fish migration and criteria described in the OPW (2022)Design Guidance For Fish Passage On Small Barriers.

The existing double culvert and weir system present at the downstream extent of the Cedarwood stream consists of a cylindrical culvert at bed level which runs from the outfall at the Shannon for approximately 10m (culvert A) followed by open section with natural/rough substrate. This open section is confined by rock walls on both banks and there is a small weir with a drop height of approximately 0.4m from water level. Another cylindrical culvert (culvert B) is present for approximately 20m upstream of this open section. There is a small drop of approximately 0.05m at the downstream end of the 20m long culvert. There is no drop at the Shannon outfall, the culvert enters the main River Shannon at surface flow level, there may be a small lip at the base of the culvert under the water surface.

The stark difference in light levels present at outfalls and inflows of both culverts presents an obvious light barrier for fish, reducing potential use of the culverts.

The effective gradient across both culverts is approximately 6% This gradient is above the preferred minimum of 5% for juvenile salmonids and Lamprey passing through a culvert of 10m or higher. This means the velocity at which water passes through both culverts is likely to be slightly above the speed of the weakest swimming fish entering the stream, however a large proportion of fish may still be able to pass if the substrate conditions are optimal in both culverts.

There is a lack of a pool present under the 0.4m high weir. All fish species other than Eel require a pool to allow them to jump over drop features such as weirs. This weir poses a complete obstacle to Lamprey and would restrict movement to all but the strongest swimming salmonids. It is highly unlikely that there is viable population of salmonids or any population of Lamprey beyond this weir. There may be a small population of Eel within the stream. This result was confirmed in the eDNA where Eel was recorded as present in the stream.

3.5 Non-native Invasive Species

A full list of invasive species recorded in the last ten years within the site with an additional 5km buffer is in Appendix A.2 of the accompanying NIS. These were sourced from the National Biodiversity Data Centre's biodiversity maps and databases. The following species listed under the Third Schedule of Regulation S.I. 477/2011 have been recorded within the study area in the NBDC database: Greylag Goose *Anser anser* and Giant Hogweed *Heracleum mantegazzianum* and Zebra Mussel *Dreissena polymorpha*. Quagga mussel *Dreissena bugensis* may also be present in the reaches around Castleconnell.

ESB (2020) noted that habitat improvement and angling access works were completed throughout Castleconnell, including the spraying of Giant Hogweed which was undertaken by the Castleconnell Fishery Association (CFA) (ESB 2020). ESB also note that volunteers sprayed Himalayan Balsam *Impatiens glandulifera* later in the year, which was mainly done at the bottom of the fishery near beats 5 and 6 (ESB 2020).

3.5.1 3rd Schedule Invasive species recorded

Invasive species were initially recorded in 2019/2020 when surveys began. Third Schedule invasive species including Giant Hogweed (Figure 3-15), Himalayan Balsam and Zebra Mussel (Figure 3-16)were recorded during ecological site surveys at this time (Figure 3-17). Himalayan balsam was only noted in the hedges and ditches along Belmont Road which is no longer part of the scheme study area.

Giant Hogweed

There is informal Invasive species control by Castleconnell River Association who have been controlling Giant Hogweed around the river edges and riparian woodlands

informally over the last few years. Since initial surveys, there has been a notable decrease in the presence of Giant Hogweed, as observed by Ecologists during subsequent site visits, and clear signs that this plant is being controlled through removal of flowering spikes. Giant Hogweed is a negative indication species for Alluvial Forests and is present in this Annex I habitat adjacent to the scheme. Although being controlled over the past few years, it is still likely that GH seeds are present in the soil and therefore mitigation measures will be required to control the spread of this species during construction.

Figure 3-15 Giant Hogweed recorded in the riparian vegetation of the River Shannon

Zebra Mussel

Zebra Mussel *Dreissena polymorpha* was recorded at two places in River Shannon during the initial survey around the island, and later from most of the stretch of the River Shannon in low to common abundances during the aquatic survey from all sites from Rivergrove to Doonass (Ecofact, 2021). The freshwater invasive mussel improves water clarity and has resulted in a shifting of ecosystems here, resulting in increased light penetration in areas, meaning reduced green algae and therefore having consequences for naturally occurring wildlife, fish and aquatic species. No instream works are required for this scheme, and it is unlikely any of the proposed works for this scheme will result in the spread of this species.

Figure 3-16 Zebra Mussel shells found in the main River Shannon

3.5.2 Other invasive species

Other invasive species recorded during site surveys include Butterfly-bush *Buddleja davidii*, Montbretia *Crocosmia x crocosmiiflora* and Winter Heliotrope *Petasites pyrenaicus*.

It is possible for Mink *Mustela vison* to be present within the study area, but no definite sightings or signs were recorded during the ecological surveys.

NNIS aquatic plants Curly Waterweed *Lagarosiphon major* and Nuttall's Waterweed *Elodea nuttallii* were recorded by Ecofact during the fisheries survey.

Other invasive aquatic fauna recorded in the wider study area upstream include Freshwater Shrimp *Crangonyx pseudogracilis* (2004), Bloody-red *Mysid Hemimysis anoma*la (2009) and the Asian Clam *Corbicula fluminea* (2011). As previously noted, the invasive Common Carp was last recorded in 2005 from the Freshwater Fish in Irish Lakes dataset.

Non-native cyprinid species, including Minnow, Dace, and Roach were also recorded by Ecofact during the fisheries survey.

Figure 3-17 3rd Schedule invasive species recorded within the study area

4 Natura 2000 Sites

4.1 Determining likely Zone of Impact

The DEHLG (2009) guidance identifies that Screening for Appropriate Assessment of a plan or project should consider the following Natura 2000 sites:

- Any Natura 2000 sites within or adjacent to the plan or project area.
- Any Natura 2000 sites within the likely zone of impact of the plan or project. This is dependent on the nature and scale of the plan, with 15km generally recommended for plans, but potentially much less for projects.
- Any Natura 2000 sites that are more than 15km from the plan or project area, but may potentially be impacted upon, for example, through a hydrological connection.

As the scale of proposed works are considered of 'Project' status, Natura 2000 sites within a 5km range of the proposed development were examined, and an extended 15km range for those with a downstream hydrological connection on the basis that there were no source-pathway-receptors identified outside these ranges, however there are no Natura 2000 sites outside the immediate 5km ZoI that have would also have any hydrological connections to the proposed works. The Natura 2000 sites within the range are listed Table 4-1 and their location are shown in Figure 4-1.

- Lower River Shannon SAC 002165
- Glenomra Wood SAC 001013
- Clare Glen SAC 000930
- Slievefelim to Silvermines Mountains SPA 004165
- Glenstal Wood SAC 001432
- Slieve Bernagh Bog SAC 002312
- River Shannon and River Estuaries SPA 004077
- Lough Derg (Shannon) SPA 004058
- Silvermines Mountains West SAC 002258
- Danes Hole, Poulnalecka SAC 000030

The descriptions of the Natura 2000 sites within the ZoI are given in Table 4-1.

Table 4-1 Natura 2000 sites within ZOI

European Site and distance from proposed development	Qualifying Interests of European Sites	Likely Zone of Impact determination
Lower River Shannon SAC 002165 SAC is overlapping with project site of proposed FRS	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]	The proposed FRS is within and adjacent to this SAC. Baseline surveys indicate the following QIs are present in the SAC at Castleconnell and within 100m of the FRS: Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260] Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0] *Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra planeri* (Brook Lamprey) [1096] *Lampetra fluviatilis* (River Lamprey) [1099] *Salmo salar* (Salmon) [1106] *Lutra lutra* (Otter) [1355] The proposed FRS footprint is directly within the SAC. Construction of the proposed flood defence walls will be adjacent to Alluvial woodlands/ within Riparian area of the River Shannon There may be surface water impacts affecting all QI habitats and species both directly and indirectly from construction. Disturbance impacts may occur to the QI species Otter

European Site and distance from proposed development	Qualifying Interests of European Sites	Likely Zone of Impact determination
	Salmo salar (Salmon) [1106] *Tursiops truncatus* (Common Bottlenose Dolphin) [1349] *Lutra lutra* (Otter) [1355]	
Glenomra Wood SAC 001013 6.2km distance from proposed FRS	Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0]	This European Site is located 6.2km north of the proposed FRS. There will be no direct effects as the project footprint is located entirely outside the designated site boundary. The site is not hydrologically connected, and outside the zone of influence for air and noise pathways. Groundwater impacts are not anticipated, due to distance and directionality of groundwater in proximity to the River Shannon. The QIs is a fixed terrestrial habitat and therefore no pathway for impact exists.
Clare Glen SAC 000930 7km distance from proposed FRS	Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0] *Trichomanes speciosum* (Killarney Fern) [1421]	This European Site is located 7km from the proposed FRS. There will be no direct effects as the project footprint is located entirely outside the designated site boundary. The site is not hydrologically connected, and outside the zone of influence for air and noise pathways. Groundwater impacts are not anticipated, due to distance and directionality of groundwater in proximity to the River Shannon. The QIs are fixed terrestrial habitats/immobile species and therefore no pathway for impact exists.
Slievefelim to Silvermines Mountains SPA 004165 7.4km distance from proposed FRS	Hen Harrier *(Circus cyaneus)* [A082]	This European Site is located 7.4km distance from proposed FRS There is no suitable habitat for hen harrier within the immediate area of the FRS, no direct effects are anticipated.
Glenstal Wood SAC 001432 8.9km distance from proposed FRS	*Trichomanes speciosum* (Killarney Fern) [1421]	This European Site is located 8.9km of the proposed FRS. There will be no direct effects as the project footprint is located entirely outside the designated site boundary. The site is not hydrologically connected, and outside the zone of influence for air and noise pathways. Groundwater impacts are not anticipated, due to distance and directionality of

European Site and distance from proposed development	Qualifying Interests of European Sites	Likely Zone of Impact determination
		groundwater in proximity to the River Shannon. The QIs is an immobile species and therefore no pathway for impact exists.
Slieve Bernagh Bog SAC 002312 9.9k distance from proposed FRS	Northern Atlantic wet heaths with Erica tetralix [4010] European dry heaths [4030] Blanket bogs (* if active bog) [7130]	This European Site is located 9.9km from the proposed FRS. There will be no direct effects as the project footprint is located entirely outside the designated site boundary. The site is not hydrologically connected, and outside the zone of influence for air and noise pathways. Groundwater impacts are not anticipated, due to distance and directionality of groundwater in proximity to the River Shannon. The QIs are fixed terrestrial habitats and therefore no pathway for impact exists.
River Shannon and River Fergus Estuaries SPA 004077 10km distance from proposed FRS	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]	This European Site is located 10km south of the proposed FRS. Cormorant and Black-headed Gull was recorded during wintering bird surveys in Castleconnell, and these species are QIs of SPA. This section of the Shannon may provide ex-situ supporting habitat for these birds. Disturbance impacts are expected to the QI birds species as they are present next to the Scheme. The construction element may have surface water impacts which may indirectly effect the QI birds.

European Site and distance from proposed development	Qualifying Interests of European Sites	Likely Zone of Impact determination
Lough Derg (Shannon) SPA 004058 11.5km distance from proposed FRS	Cormorant (Phalacrocorax carbo) [A017] Tufted Duck (Aythya fuligula) [A061] Goldeneye (Bucephala clangula) [A067] Common Tern (Sterna hirundo) [A193] Wetland and Waterbirds [A999]	This European Site is located 11.5km distance from proposed FRS. Cormorant was recorded often during wintering bird surveys in Castleconnell, and this species may be associated with the SPA. This section of the Shannon may provide supporting habitat for these birds. Disturbance impacts are expected to the QI birds species as they are present. The construction element is expected to have surface water impacts which may indirectly affect the QI birds.
Silvermines Mountains West SAC 002258 14.1km distance from proposed FRS	Northern Atlantic wet heaths with Erica tetralix [4010] European dry heaths [4030] Calaminarian grasslands of the Violetalia calaminariae [6130]	This European Site is located 14.1km distance from proposed FRS There will be no direct effects as the project footprint is located entirely outside the designated site boundary. The site is not hydrologically connected, and outside the zone of influence for air and noise pathways. Groundwater impacts are not anticipated, due to distance and directionality of groundwater in proximity to the River Shannon. The QIs are fixed terrestrial habitats and therefore no pathway for impact exists.
Danes Hole, Poulnalecka SAC 000030 14.7km distance from proposed FRS	Caves not open to the public [8310] Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0] Rhinolophus hipposideros (Lesser Horseshoe Bat) [1303]	This European Site is located 14.7km distance from proposed FRS. Lesser Horseshoe bat was recorded twice during bat surveys; however, it is unlikely the populations of this SAC are linked to this site. Impacts on local bats are assessed in the Biodiversity Chapter of the EIAR. There will be no direct effects to the Oak woods 91A0 Annex Habitat as the project footprint is located 14.7km from the site, and the QI is a terrestrial habitat and therefore no pathway for impact exists.

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4.2 Description of European sites within likely zone of impact

This section provides baseline information on the Natura 2000 sites within the Zone of Influence (ZoI) of the Scheme, as screened-in in Section 4.1. The following list included Natura 2000 sites that occur within the ZoI;

- Lower River Shannon SAC, and
- River Shannon and River Fergus Estuaries SPA.
- Lough Derg (Shannon) SPA

4.2.1 Lower River Shannon SAC (002165)

The Lower River Shannon SAC is an extensive Special Area of Conservation (SAC) encompassing the Rivers Shannon, Feale, Mulkear and Fergus. The River Shannon within this SAC flows through Carboniferous limestone as far as Foynes town and west of Foynes, through mostly Namurian shales and flagstones.

The section of the River Shannon which is adjacent to the proposed development site, is part of the of the freshwater section of the river and is not influenced by the tides (NPWS, 2012b).

The site synopsis indicates that floating river vegetation characterised by species of water-crowfoot (*Ranunculus* spp.), pondweeds (*Potamogeton* spp.) and the moss *Fontinalius antipyretica* are present throughout the major river systems within the site. The rivers contain an interesting bryoflora with *Schistidium alpicola var. alpicola* recorded from in-stream boulders on the Bilboa, new to Co. Limerick.

Several Irish Red Data Book species have been recorded within this SAC including (but not limited to) Triangular Club-rush (*Scirpus triquetrus*) and Opposite-leaved Pondweed (*Groenlandia densa*). Triangular Club-rush is a rare and highly threatened vascular plant in Ireland with restricted distribution to tidal stretches of the River Shannon. It is protected under the Wildlife Acts (1976 and 2000) and is listed on the Flora Protection order 2015. Opposite-leaved Pondweed is typically associated in Ireland with tidal stretches of rivers or disturbed watercourses. It is protected under the Wildlife Acts (1976 and 2000) and is listed on the Flora Protection Order 2015 (NPWS, 2012b). Locations where Opposite-leaved Pondweed and Triangular Club-rush are present on this site are classified as sub-types of the Annex I habitat Water courses of plain to montane levels with the *Ranunculion fluitanis* and *Calltricho-Batrachion* vegetation (3260).

The site synoposis ((N.P.W.S. 2013)Alluvial woodland ocurs on the banks of the Shannon and on islands in the vicinity of the University of Limerick. The woodland is up to 50 m wide on the banks and somewhat wider on the largest island. The most prominent woodland type is gallery woodland where White Willow *(Salix alba)* dominates the tree layer with occasional Alder *(Alnus glutinosa).* The shrub layer consists of various willow species with Rusty Willow (*Salix cinerea ssp. oleifolia*) and what appear to be hybrids of *S. alba x S. viminalis*. The herbaceous layer consists of tall perennial herbs. A fringe of bulrush (Typha sp.) occurs on the river side of the woodland. On slightly higher ground above the wet woodland and on the raised embankment remnants of mixed oak-ash alder woodland occur.

4.2.1.1 Qualifying Interests

The site is a SAC selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

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]

Table 4-2 Screening for Features of Qualifying Interest, Distance from Proposed FRS and Potential Pathway(s)

Interceptor	Closest location	Pathway / ZOI	Screen in/ out
Sandbanks	80km+ downstream (near Loop Head)	None identified (distance)	Screen Out
Estuaries	11.2km downstream	None identified (distance)	Screen Out
Tidal Mudflats and Sandflats	16.4km downstream	None identified (distance)	Screen Out
Coastal Lagoons*	40+km downstream, Shannon airport	None identified (distance)	Screen Out
Large Shallow Inlets and	>70km downstream	None identified	Screen Out

Bays		(distance)	
Reefs	30+km downstream	None identified (distance)	Screen Out
Perennial Vegetation of Stony Banks	50km+ downstream (near Kilrush)	None identified (distance)	Screen Out
Vegetated Sea Cliffs	45km+ downstream (Near Killimer)	None identified (distance)	Screen Out
Atlantic Salt Meadows	Nearest mapped by NPWS is 30+km downstream at the mouth of Ratty River	None identified (distance)	Screen Out
Mediterranean Salt Meadows	Nearest mapped by NPWS is 30+km downstream at the mouth of River Maigue	None identified (distance)	Screen Out
Floating River Vegetation	Not recorded within 100m of the study area.	None identified (distance)	Screen Out
Molinia Meadows	n/a terrestrial habitat.	None identified (terrestrial habitat with no functional pathway).	Screen Out
Alluvial Forests*	**Present in study area**	**Needs further assessment**	**Screen in**
Freshwater Pearl Mussel	Present only in the Cloon River, Co. Clare 60Km downstream in separate tributary	None identified (distance)	Screen Out
Sea Lamprey	**Habitat on-site**	**Needs further assessment**	**Screen in**
River Lamprey	**Recorded during surveying.**	**Needs further assessment**	**Screen in**
Brook Lamprey	**Recorded during surveying.**	**Needs further assessment**	**Screen in**
Atlantic Salmon	**Recorded during surveying.**	**Needs further assessment**	**Screen in**
Bottle-nosed Dolphin	Critical habitat mapped by NPWS around Killimer approx. 70km downstream.	None identified (distance)	Screen Out
European Otter	**Recorded during surveying**	**Needs further assessment**	**Screen in**

Not all the qualifying features of the SAC occur in the Zone of Influence of the proposed works. The qualifying features that could be potentially significantly impacted through surface water, groundwater and land and air pathways are;

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

Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]

Petromyzon marinus (Sea Lamprey) [1095]

Lampetra planeri (Brook Lamprey) [1096]

Lampetra fluviatilis (River Lamprey) [1099]

Salmo salar (Salmon) [1106]

Lutra lutra (Otter) [1355]

4.2.1.2 Site Vulnerabilities

There is a wide range of land uses within the SAC. The most common use of the terrestrial parts is grazing by cattle, and some areas have been damaged through over-grazing and poaching. Much of the land adjacent to the rivers and estuaries has been improved or reclaimed and is protected by embankments (especially along the Fergus estuary). Further, reclamation continues to pose a threat, as do flood relief works (e.g. dredging of rivers). Gravel extraction poses a major threat on the Feale.

In the past, Cord-grass (*Spartina spp*.) was planted to assist in land reclamation. This has spread widely and may oust less vigorous colonisers of mud and may also reduce the area of mudflat available to feeding birds.

Domestic and industrial wastes are discharged into the Shannon, but water quality is generally satisfactory, except in the upper estuary where it reflects the sewage load from Limerick City. Analyses for trace metals suggest a relatively clean estuary with no influences of industrial discharges apparent. Further industrial development along the Shannon and water polluting operations are potential threats.

More recently invasive species such as Japanese Knotweed, Giant Hogweed and Himalayan Balsam have become a notable threat throughout the Lower River Shannon (NPWS, 2013). Threats and pressures to Lower River Shannon SAC are listed in Table 5-2.

Table 4-3: Threats and pressures to Lower River Shannon SAC (NPWS, 2017a)

Code	Threat or pressure	Ranking and Location
I01	invasive non-native species	L, i
A08	Fertilisation	M, o
A04	grazing	M, i
H04	Air pollution, air-borne pollutants	M, o
A08	Fertilisation	M, i
E01	Urbanised areas, human habitation	M, o
D01.01	paths, tracks, cycling tracks	L, i
K02.03	eutrophication (natural)	M, o
G01.01	nautical sports	L, i
B	Sylviculture, forestry	L, i
F01	Marine and Freshwater Aquaculture	L, i
F03.01	Hunting	L, i
C01.01.02	removal of beach materials	L, i
C01.03.01	hand cutting of peat	L, i
E03	Discharges	M, o

J02.01.01	polderisation	M, i
J02.10	management of aquatic and bank vegetation for drainage purposes	L, i
E03	Discharges	M, i
J02.01.02	reclamation of land from sea, estuary or marsh	M, o
J02.12.01	sea defence or coast protection works, tidal barrages	L, i
Location: i = inside, o = outside, b = both Rank: H = high, M = medium, L = low		

4.2.2 River Shannon and River Fergus Estuaries SPA (004077)

This site is located 10+km downstream of the proposed FRS. However, the area around Castleconnell may provide supporting habitat for the Qualifying Interests of the SPA.

This site is of great ornithological interest, being of international importance on account of the numbers of wintering birds it supports. It also supports internationally important numbers of three species, i.e., Dunlin, Black-tailed Godwit and Redshank. In addition, there are 16 species that have populations of national importance. For several of the bird species, it is the top site in the country. Also of note is that three of the species which occur regularly are listed on Annex I of the E.U. Birds Directive i.e., Whooper Swan, Golden Plover and Bar-tailed Godwit. The site is most effectively censused from the air and this is carried out most winters (NPWS 2015).

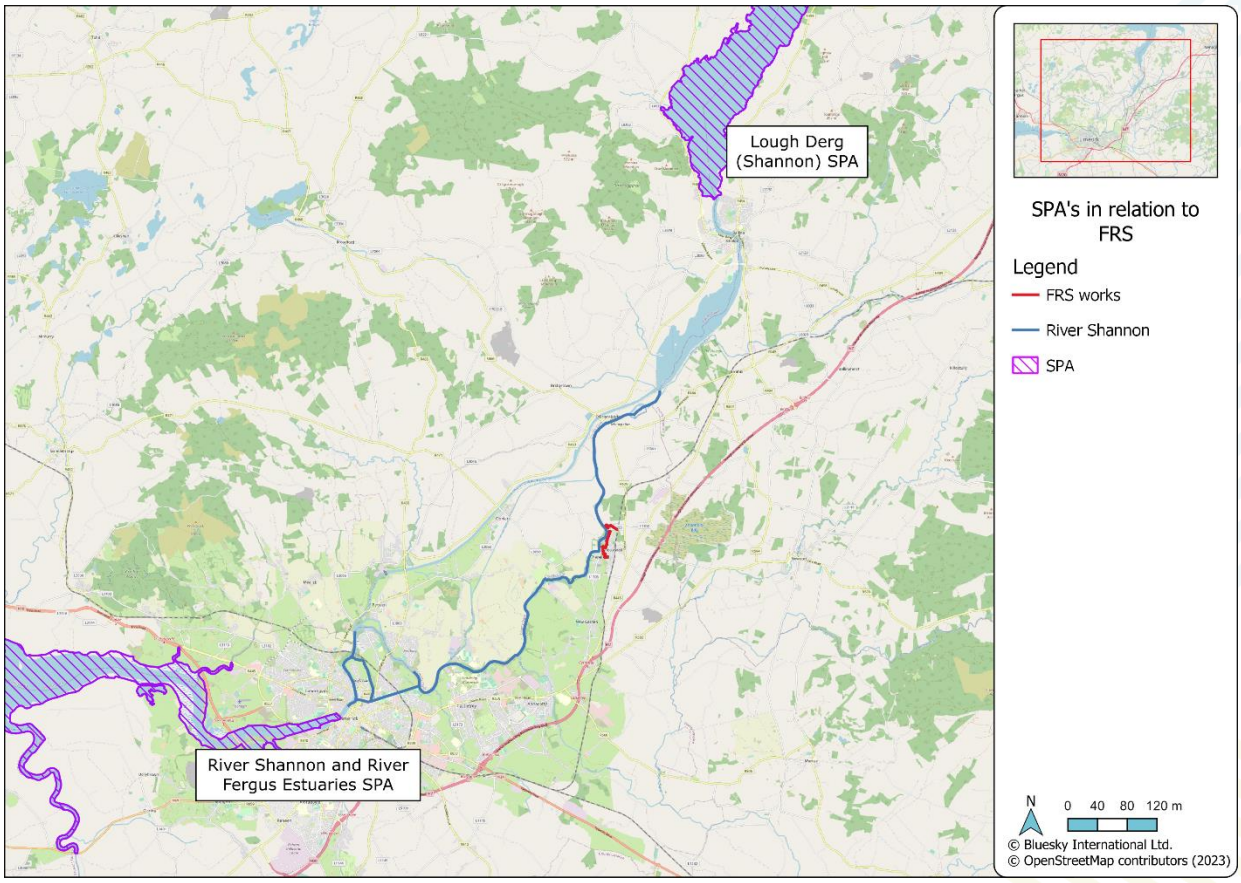

Figure 4-1 SPAs in relation to the proposed scheme

4.2.2.1 Qualifying Interests

The River Shannon and River Fergus Estuaries SPA is designated for the following Qualifying Interests:

A017 Cormorant *Phalacrocorax carbo*

A038 Whooper Swan *Cygnus cygnus*

A046 Light -bellied Brent Goose *Branta bernicla*

A048 Shelduck *Tadorna tadorna*

A050 Wigeon *Mareca penelope*

A052 Teal *Anas crecca*

A054 Pintail *Anas acuta*

A056 Shoveler *Anas clypeata*

A062 Scaup *Aythya marila*

A137 Ringed Plover *Charadrius hiaticula*

A140 Golden Plover *Pluvialis apricaria*

A141 Grey Plover *Pluvialis squatarola*

A142 Lapwing *Vanellus vanellus*

A143 Knot *Calidris canutus*

A149 Dunlin *Calidris alpina*

A156 Black-tailed Godwit *Limosa limosa*

A157 Bar-tailed Godwit *Limosa lapponica*

A160 Curlew *Numenius arquata*

A162 Redshank *Tringa totanus*

A164 Greenshank *Tringa nebularia*

A179 Black-headed Gull *Chroicocephalus ridibundus*

A999 Wetlands and Waterbirds

Cormorant and Black-headed Gull were recorded during wintering bird surveys in Castleconnell, and this species may be associated with the SPA. This section of the Shannon may provide supporting habitat for these birds.

Cormorant *Phalacrocorax carbo*

Black-headed Gull *Chroicocephalus ridibundus*

4.2.2.2 Site Vulnerabilities

Identified negative threats and pressures on the River Shannon and River Fergus Estuaries SPA are listed in Table 4-4.

Table 4-4: Threats and pressures to River Shannon and River Fergus Estuaries SPA (NPWS, 2017b)

Code	Threat or pressure	Ranking

		and Location
E02	Industrial or commercial areas	H, o
G01.01	Nautical sports	M, i
E03	Discharges	H, i
D03.02	Shipping lanes	M, i
A08	Fertilisation	H, o
F01	Marine and Freshwater Aquaculture	M, i
E01	Urbanised areas, human habitation	H, o
Location: i = inside, o = outside, b = both Rank: H = high, M = medium, L = low		

4.2.3 Lough Derg (Shannon) SPA

This European Site is located 10km south of the proposed FRS. Lough Derg is of importance for both breeding and wintering birds. The islands in Lough Derg support important breeding colonies of Common Tern and Cormorants. The lake supports nationally important numbers of wintering birds Tufted Duck and Goldeneye.

Cormorant and Black-headed Gull were recorded during wintering bird surveys in Castleconnell, and this species may be associated with the SPA. This section of the Shannon may provide supporting habitat for these birds.

Disturbance impacts are expected to the QI bird's species as they are present.

The construction element is expected to have surface water impacts which may indirectly impact upon the QI birds.

4.2.3.1 Qualifying Interests

The site is designated for the following Qualifying Interests:

Cormorant *Phalacrocorax carbo* [A017]

Tufted Duck *Aythya fuligula* [A061]

Goldeneye *Bucephala clangula* [A067]

Common Tern *Sterna hirundo* [A193]

Wetland and Waterbirds [A999]

Cormorant were recorded during wintering bird surveys in Castleconnell, and this species may be associated with the SPA. This section of the Shannon may provide supporting habitat for these birds.

5 Other Relevant Plans and Projects

This chapter provides a summary of projects in the planning system. The cumulative effects of the proposed development in combination with other relevant existing, planned and permitted projects will be assessed to determine whether these would give rise to significant effects on the environment.

Any predicted cumulative effects arising from the proposed development in combination with other existing. Figure 5-1and Table 5-1 below provide summary details of the projects/developments that have the potential to impact resources, traffic, or the local area, and so could have potential cumulative effects with the proposed flood relief scheme and the Screened-in Natura 2000 sites.

Only those projects whose duration of permission overlaps with the likely construction period of the proposed development (i.e., 2025 onwards) are included. Small developments such as house extensions and alterations, or the construction of a single dwelling or structure, have been excluded as the likely effects of such developments will not be significant, except where they are taking place adjacent to or in close proximity to the proposed defences.

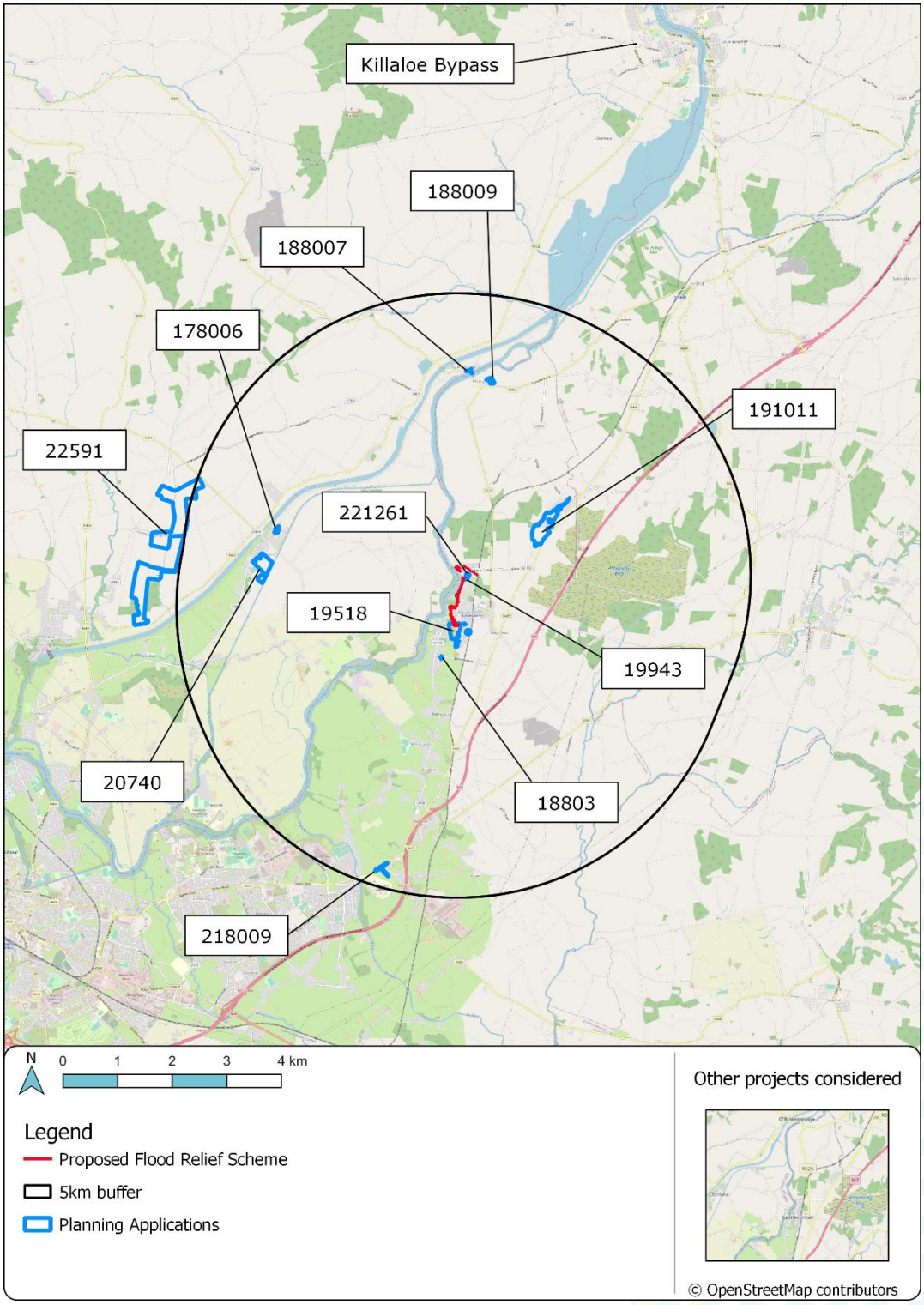

Figure 5-1 Other projects considered

Table 5-1 List of projects considered for Cumulative Effects

Project name or Reg. Ref.	Location	Description	Status
Killaloe Bypass / Shannon Bridge Crossing / R494 Upgrade	Killaloe, Co. Clare	The proposed scheme has been broken down into three sections as follows: Killaloe Bypass: This part of the scheme aims to create a western bypass around the town of Killaloe which will connect the R463 to the north of town with the proposed Shannon Bridge Crossing section and R463 to the south of the town. Shannon Bridge Crossing: This section of the scheme will cross the River Shannon approximately 1km south of the existing Killaloe Bridge and will connect the proposed Killaloe Bypass with the R494. R494 Upgrade: This section will involve widening, regrading and local realignment of the R494 from its junction with the R496 and proposed Shannon Bridge Crossing south of Ballina, as far as the junction with the R445 (previously known as N7) north of Birdhill.	Construction progressing as of October 2023, likely to continue into 2026
178006	Knockbrack Lower, Cloonlara Townland, Clonlara	The construction of 9 no. dwelling houses with access road, public lighting and all associated ancillary site development works	Permission granted 08/01/2018
188003	St. Patrick's Villas, Stradbally North, Castleconnell Co. Limerick.	(I) provision of 4 no. residential units (3 no. 3 bedroom houses and 1 no. 4 bedroom house (universally accessible unit), (ii) hard landscaping including replacement of existing footpaths, new entranceways, boundary treatments and boundary walls, (iii) upgrading and re-routing of foul sewers and surface water drainage and (iv) all associated site works	Permission granted 13/06/2018
188007	O'Briensbridge, Co. Clare	For the following development: O'Briens Bridge is a Protected Structure (RPS No. 215) located in the Village O'Briens bridge and carries Regional Road R466 across the River Shannon into Montpelier, Co. Limerick. The trailhead for the Loop Walks is located in the Riverside Park. The walkway under the bridge is closed off at present on safety grounds and the proposed development will allow it to be reopened. The proposed development shall include the following works: 1. Construction of structures on the riverside walk upstream and downstream of O'Brien's Bridge to provide protection from falling masonry from the parapet walls above. The bridge had been struck by vehicles and dislodged masonry had fallen onto the walkway below. The	Permission granted 09/07/2018

Project name or Reg. Ref.	Location	Description	Status
		structures will provide canopies over the walkway for a short distance. 2) Repairs to the surface of the riverside walk in the vicinity of the proposed structures. 3) Provision of traffic signals which will limit traffic to one direction at a time over the bridge. 4) Provision of a traffic detection system consisting of ducting, chambers and loops on the road surface approaching the bridge. 5)Provision of all necessary signs and road markings	
191011	Gooig, Castleconnell, Co. Limerick.	Removal of the intervening aggregate reserve (c. 1.47ha. and 80,000m cubed aggregate in volume) currently dividing the registered quarries at Gooig (Ref. No. 05/7026 and 05/7037). The restoration of the combined quarries through importation if uncontaminated soils and stones (c. 12.2ha. and 1,250,000m cubed). The provision and operation of a wheel wash facility and use of the site access and infrastructure of existing permitted Roadstone manufacturing operations to fully restore the land to agricultural use. An Environmental Impact Assessment Report (EIAR) and a Natura Impact Statement (NIS) accompany this planning application	Permission granted 02/04/2020. Expires 01/04/2025
19518	Coolbane, Castleconnell, Co. Limerick.	The provision of a total of 52 no. dwellings as follows – 12 no. 2.5 storey 4 bed units, 20 no. 2 storey terraces/semi-detached 3 bed units, 16 no. 2.5 storey semi-detached 4 bed units and 4 no. 2 storey semi-detached 4 bed units together with all associated landscaping and site works and connection to existing services. The proposed development also includes for a crèche with a gross floor area of 467.7 square metres and all associated works. The planning application is also accompanied by a Nature Impact Statement	Permission granted 03/10/2019. Expires 20/12/2025 Under construction. Current programme suggests completion in April 2024 (as advised by Torca Homes)
198009	Brookhaven, Montpelier, Co. Limerick.	(a) provision of 12 no. residential units comprising; 3 no. single storey 2-bedroom dwellings; 4 no. two storey 2 bedroom dwellings, 5 no. two storey 3 bedroom dwellings; (b) hard landscaping including roads, footpaths, parking, garden walls, and public lighting; (c) soft landscaping including lawns, trees and hedgerows; (d) provision of new water connections, a foul sewer connection, and a surface water drainage system; (e0 all associated site works	Permission granted 12/12/2019
19943	The Parochial House, The Mall, Castleconnell Co. Limerick.	A driveway and entrance to parochial house 2 and alter existing entrance to parochial house 1 and erect a fence/concrete block wall between houses 1 and 2 and carry out associated site works	Permission granted 30/06/2020. Expires 29/06/2025

Project name or Reg. Ref.	Location	Description	Status
20740	Clonlara, Co Clare	For the construction of a total of 70 Dwellinghouses (including 14 no. Detached 4 Bed houses, 4 No. split level 4 Bed houses, 12 No. Semi-Detached 4 Bed houses, 36 No. Semi-Detached 3 Bed houses, 4 No. Semi-Detached 2 Bed houses) and for new connections to public services including water & foul sewerage including pumping station, rising main and associated plant. PERMISSION is also sought for vehicular and pedestrian entrances, access roads, footpaths, landscaping works, parking areas, boundary treatments & all ancillary site works. A Natura Impact Statement (NIS) shall be submitted to the Planning Authority as part of this application.	Permission granted 29/09/2021. Expires 28/09/2026
211348	"The Lodge", Coolbawn, Castleconnell Co. Limerick	The construction of a new single storey family room to the northwest (rear) corner of our existing house, the provision of a ground floor utility and shower room within the existing footprint of the house at ground floor level also, minor alterations to the entrance way, and all ancillary site works.	Permission granted 17/11/2021. Expires 13/04/2027
218009	Cappamore Road(R506) & Dublin Road(R445) Junction, Garraunykee & Woodstown, Co. Limerick.	Junction improvement works on the R445(Dublin Road)/R506(Cappamore Road), Limerick. The proposed works will include the construction of new footpaths, new cycle lanes, new junction slip lanes, new controlled pedestrian crossings, new public lighting scheme, new surface water drainage system, improved road markings, new traffic signal control, signage and carriageway resurfacing.	Permission granted 29/12/2021.
221261	The Commons, Cloon & Commons, Castleconnell	1 no. detached dwelling house, connection to main drainage, adjustment of existing boundary to existing dwelling to provide access to new dwelling house & associated site works.	Permission granted 06/03/2023. Expires 05/03/2028
22394	Coolbawn Meadows, Coolreiry, Castleconnell Co. Limerick	The construction of 13 houses, which include 1 detached & 12 semi-detached (numbers 18-26 & 29-32), as partial completion of the development approved under planning file reference. p.06/1354 and associated site works.	Permission granted 27/10/2022. Expires 26/10/2027 Under construction, likely to be complete before the proposed scheme begins construction
22591	Ballyglass Coolderry Dromintobin	For a 10-year planning permission for a solar array at Ballyglass, Coolderry, Dromintobin North, Reanabrone, and Oakfield (townlands) Ardnacrusha, Co Clare. The development will consist	Appealed to ABP. Decision due 17/07/2023

Project name or Reg. Ref.	Location	Description	Status
	North Reanabrone, and Oakfield (townlands) Ardnacrusha, Co Clare	of c265,000 m2 of solar panels on ground mounted frames, 8 no. single storey control cabins with associated electrical transformer units and hardstand areas, 2 no. ring main units, underground cabling within the solar array site and within the L70382 public road to connect solar array field parcels, security fencing, CCTV, access tracks (upgrade of existing and new), upgrades to four existing agricultural field entrances on the R463, l3046 and L70382 and creation of new entrance on L70382, temporary construction compound, landscaping and all associated ancillary apparatus and development works. The solar array will connect to the national grid and will have an operational lifespan of 35 years. A Natura Impact Statement (NIS) has been prepared in respect of the proposed development and will be submitted to the planning authority with the application.	
2360808	Coolbawn Meadows, Castleconnell	Montpelier Coolbawn Developments Limited seeks planning permission for development at Coolbane, Castleconnell, Co. Limerick. The development comprises 74 no. residential units comprising: 20 no. 4 bed detached units; 12 no. 4 bed semi-detached units; 18 no. 2 bed terrace units; 6 no. 3 bed terrace units; and 18 no. 3 bed semi-detached units • new estate link road with dedicated cycle lane as an extension to the existing access road serving Coolbawn Estate; • off and on street car parking and bicycle stands; and • all associated site works including pumping station and emergency storage; and 2 no. attenuation tanks. The existing temporary construction access from Station Road / Railway Road shall continue to be used to facilitate construction of the development.	Pre-Validation Planning Submission lodged on 06/11/2023.

6 Screening Assessment

6.1 Introduction

This section identifies the potential impacts which may arise as result of the proposed project. It then goes on to identify how these impacts could potentially impact on Natura 2000 sites. The significance of potential impacts is also assessed, with any potential in-combination effects also identified.

This section further examines the source > pathway > receptor chains that could potentially result in adverse impacts arising on:

- Lower River Shannon SAC
- River Shannon and River Fergus Estuaries SPA
- Lough Derg (Shannon) SPA

6.2 Identification of Potential Sources of Impact

The project will primarily affect the site only, but a wider area of influence is used for impacts relating to:

- noise disturbance (1km),
- air pollution (1km),
- surface water (all Natura 2000 sites downstream of the site, and upstream where migratory species are QI's), and
- any supporting habitat for SAC/SPA species (10km).

This means the final 'Zone of Influence' is not a single distance figure, includes all relevant sites whilst avoiding unnecessary inclusion of other sites. For demonstrative purposes a 10km radius ZoI around the site is used as a scale reference, but should not be considered a hard boundary for potential impacts.

Of the Natura 2000 sites listed in Section 4.1, the Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA have hydrological connectivity to the proposed project. Due to their proximity to the site, the proposed project also poses potential impacts via land and air pathways to the Lower River Shannon SAC and River Shannon and River Fergus Estuaries SPA. Lough Derg (Shannon) SPA is located upstream.

Some qualifying interests of the Natura 2000 sites are not likely to be significantly impacted due to the location of the works in relation to their distribution.

From the baseline and desktop surveys, the QI habitats and species present in the immediate surrounds of the proposed FRS, and therefore those likely to be impacted by the works are listed below. This includes Alluvial forest habitat, lamprey species, Salmon, Otter and wintering water birds, particularly Cormorant and Black-headed Gull could also be impacted by the proposed works.

Therefore, the QI Habitats and species likely to be impacted by the works are:

- Lower River Shannon SAC
  - Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0]
  - Sea Lamprey (*Petromyzon marinus*) [1095]
  - Brook Lamprey (*Lampetra planeri*) [1096]
  - River Lamprey *(Lampetra fluviatilis*) [1099]

- Atlantic Salmon (*Salmo salar*) [1106]
- Otter (*Lutra lutra*) [1355]

- River Shannon and River Fergus Estuaries SPA and Lough Derg (Shannon) SPA
  - Wintering water birds, but in particular Cormorant *Phalacrocorax carbo* [A017] and Black-headed Gull *Chroicocephalus ridibundus* [A179]

6.3 Assessment Criteria

6.3.1 Description of the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the Natura 2000 sites

Potential adverse impacts that could cause a significant effect on the qualifying interests of the Natura 2000 sites, during the construction and operational phases of the project, will impact on the sites via surface water pathways, groundwater pathways and land and air pathways. Surface water pathways can impact on surface water quality and surface water dependent habitat quality. Groundwater pathways can impact on groundwater quality and quality of groundwater dependent habitats. Land and air pathways can impact by release or discharges of sediment or chemicals to surface or groundwater.

The proposed project is not anticipated to impact on the qualifying interests of any of the identified SACs or SPAs. The rationale for excluding impacts via the main pathways is given in more detail in the following section.

6.3.2 Construction phase impacts

The FRS is directly adjacent to and within the River Shannon which is part of the Lower River Shannon SAC. The FRS connects to the River Shannon and River Fergus Estuaries SPA via the River Shannon >10km downstream.

6.3.2.1 Direct works in Lower River SAC

The proposed flood relief scheme will require works within the Lower River Shannon SAC boundary and within the Riparian area of the SAC. This will be adjacent or within the SAC boundary in: Rivergrove B&B and Grange House, Mall House, Mall Road (phase 1) – Mall house to Island House, Mall Road (phase 2) - Scanlon Park Junction up to Maher's Pub, Maher's Pub, Meadowbrook Estate, Impacts at Stormont Property.

The construction of a new flood wall is generally at the interface between the riparian zone of the River Shannon and the built environment of Castleconnell village, which is the boundary of the River Shannon SAC, but will be required to enter the SAC for construction of certain elements on this boundary.

The FRS has been designed to avoid the Lower River Shannon SAC, particularly riparian habitats. Construction directly within the SAC boundary cannot be avoided. Therefore, significant adverse effects from construction within the boundary of the SAC are likely to occur as a result of the proposed project. Mitigation is required to limit direct impacts from construction phase.

6.3.2.2 Disturbance and Noise and vibration impacts

Construction works along the boundary of the River Shannon/ SAC will generate noise and disturbance as a result of machinery operation and workforce movement during the 18-monthr phase of the project.

Otter

Otter, a QI of the Lower River Shannon SAC, has been observed in the main channel and potentially in the Cloon Stream. No evidence of breeding Otter was observed, nor their resting places.

Otter that are feeding and commuting up and down the River Shannon at Castleconnell may be disturbed by machinery noise and increased presence of humans and machinery during construction over the 18 months. This may lower their preference to hunt and move past the area of construction for this period.

QI waterbirds Cormorant Phalacrocorax carbo [A017] and Black-headed Gull Chroicocephalus ridibundus [A179]

Two QI birds of the neighbouring SPAs, Cormorant *Phalacrocorax carbo* [A017] and Black-headed Gull *Chroicocephalus ridibundus* [A179] were recorded during surveys. Based on these surveys and best scientific judgement it is considered that these birds could be part of the wintering waterbirds populations of the River Shannon and River Fergus SPA and / or Lough Derg (Shannon) SPA.

Construction works along the boundary of the Lower River Shannon SAC will generate noise and disturbance as a result of machinery operation and workforce movement during the 18-month construction phase of the project. These two QI birds may be impacted by the construction of the FRS through noise, disturbance and general increase in human presence and machinery.

Any work within 50m of Black-headed gull and work within 100m of Cormorant will cause disturbance (distances based on Ryan Hanley (2014)).

QI Fish

A number of flood defence measures will be constructed in close proximity to the River Shannon and tributaries. Pile driving will be the most intensive construction methodology in relation to noise output.

Pile driving has the potential to disturb fish species through intense vibrations and can even result in injury/mortality where vibration levels are high, and barotrauma occurs. There are varying degrees of sensitivity to sound in different fish species dependent on fish physiology. Fish species with swim bladders are sensitive to barotraumatic stress. Where the swim bladder is connected to/close proximity to the inner ear, high levels of sensitivity to barotraumatic stress is observed and a lower threshold to disturbance is observed. The impact of sound on fish species in summarised in a technical assessment published by AECOM (2021), which reviews guidelines published by American National Standards Institute (ANSI) (Popper et al. 2014).

Popper et al., 2014 consider species like Salmon as a medium sensitivity species while Lamprey are considered a low sensitivity species.

The construction of the flood walls at Maher's pub comes in close proximity to the Cloon Stream. All efforts will be made to keep works up on the dry bankside; however, the construction of a cofferdam/sheet piling may be required if deemed necessary during detailed design. Lamprey ammocoetes are known to be present within silt beds of the Cloon Stream. The construction of a cofferdam/sheet pilling has the potential to result in the disturbance of these juvenile lamprey as well as entrapment and mortality as a result. There is also a possibility of juvenile salmon entrapment and mortality if they are present in the area during the construction of the cofferdam/sheet piling.

Therefore, in the absence of mitigation, significant adverse effects from disturbance, noise and vibration are likely to occur as a result of the proposed project on QIs of Lower River Shannon SAC, River Shannon and River Fergus Estuaries SPA and Lough Derg (Shannon) SPA during the construction phase of the FRS.

6.3.2.3 Dust & Emissions

A separate Air Quality report has been carried out for the EIAR (Construction Impacts Chapter 4). The volume of deposition due to demolition, earthworks, construction and track-out has the potential to affect sensitive habitats and plant communities. Dust could smother Alluvial Woodland Habitat adjacent to the works. There is also a potential impact that any dust

settling in the river or watercourses could introduce pollutants which could impact QI Fish species.

Once operational, no air and climate impacts are expected.

Therefore, in the absence of mitigation, significant adverse effects from dusts are likely to occur as a result of the proposed project on QIs of Lower River Shannon SAC, River Shannon and River Fergus Estuaries SPA and Lough Derg (Shannon) SPA during the construction phase of the FRS.

6.3.2.4 Direct impact to QI Alluvial Forests

Alluvial Forests 91E0 is located in two locations of this Scheme in the riparian areas beside the Mall Road in which the old wall be replaced by a flood wall, and around the Cloon Stream behind Mahers Pub and Meadowbrook Estate and Stormont House, in which a flood wall will be constructed between the Cloon stream and these properties.

The proposed flood wall has been designed such that all of the foundation of the new wall will be located within existing built environment. The new flood wall will be stepped back into the roadside by 1.5metres to avoid permanently damaging the Alluvial Forest adjacent to this area. Construction impacts have also been designed to minimise construction area into the Annex I habitat.

To construct the wall and embankments a small construction area of 1m into the Alluvial woodland will be required but no excavation will occur in the woodland. The construction area will be non-intrusive works by hand only.

Therefore, in the absence of mitigation, significant adverse effects from direct habitat disturbance are likely to occur as a result of the proposed project on QI Alluvial Forests of Lower River Shannon SAC, during construction phase of the FRS.

6.3.2.5 Direct impact from works next to Hydrophylious tall herb habitat

This Annex habitat is recorded in the River Shannon next to Rivergrove B&B and Grange house, as well as next to causeway at Island House. This is not a QI of the Lower River Shannon SAC but its protection is dealt with in the EIAR.

6.3.2.6 Release of suspended solids and pollutants to surface water

All sections of the FRS is adjacent to the river and Annex I habitats and species. Release of suspended solids, dust, hydrocarbons from construction activities could impact through changes in water quality, turbidity, smothering etc.

During site preparation, removal of existing infrastructure, excavations, piling and construction of new walls and embankments, there is potential for accidental release of suspended solids, nutrients and pollutants into the adjacent River Shannon associated habitats over the year to 18 month construction period.

Other Construction works close to the Shannon but not adjacent such as road raising, installing demountable barriers, could lead to pollutants/contaminants entering the River Shannon and as such the Lower River Shannon SAC. Instream works are required in some locations. Significant impacts are possible during instream works, while the addition of sheet piling will impact hydrology and riverbank morphology.

Additionally, the Cedarwood stream, which is partially culverted and partially open at Grange House will be completely culverted, and upstream of the Cedarwood for 430m the Cedarwood will be cleared of vegetation. Without mitigation this will create suspended solids as the vegetation will be cleared from this stream, and there is a lot of silt in this stream from being trapped by the vegetation.

Once operational, the FRS will reduce the flood area in urban parts of Castleconnell, reducing the likelihood of pollutants being mobilised and entering the watercourse during flood events.

Point sources which will be protected from flooding include houses, roads, cars and parking areas, and sewers, so there will be a greater reduction in potential pollutants during flood events.

Water quality impacts directly affecting Fish QIs

Release of sediment associated with the bankside and instream works may have an adverse impact on the Sea Lamprey (*Petromyzon marinus*) [1095], Brook Lamprey (*Lampetra planeri*) [1096], River Lamprey *(Lampetra fluviatilis*) [1099], Atlantic Salmon (*Salmo salar*) [1106]. Fine silt can settle on Lamprey and Salmon breeding grounds which mainly consist of coarse gravels. Large releases of sediment after spawning can result in sediment settling over fertilised eggs resulting in mortality. Increased turbidity and fine particulate in the water column can also result in gill irritation.

The works to construct the wall will involve in-situ concrete. Cement within the concrete is highly toxic to Salmon and Lamprey species and can result in mortality where levels are concentrated. Accidental release of hydrocarbons associated with construction machinery can also result in mortality of these QIs.

Water quality impacts indirectly impacting **Otter [1355] Cormorant [A017] and Black-headed Gull [A179]**

Indirect impacts to Otter and Cormorant from reduced water quality could result in reduction of prey biomass, as described above for fish, are anticipated.

Water quality impacts indirectly impacting Alluvial Forests

There may be indirect impacts from release of sediments from the excavations and building of the new flood wall. During site preparation, removal of existing infrastructure, excavations, piling and construction of new walls and embankments, there is potential for accidental release of suspended solids, nutrients and pollutants into the adjacent River Shannon associated habitats over the 12–18-month construction period. Release of suspended solids, dust, hydrocarbons from construction activities could impact through changes in water quality, turbidity, smothering etc. Polluting materials from accidental spills could enter the River Shannon and have a deleterious effect on water quality which can affect Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0].

Therefore, in the absence of mitigation, significant adverse effects from reduced water quality are likely to occur as a result of the proposed project on QIs of Lower River Shannon SAC, River Shannon and River Fergus Estuaries SPA and Lough Derg (Shannon) SPA during the construction phase of the FRS.

6.3.2.7 Groundwater Pathways

Given the proximity of the proposed works to the River Shannon, any pollutants that may enter groundwater are anticipated to discharge directly to surface waterbodies within the area of the scheme, and are therefore considered as surface water pathways.

6.3.2.8 Invasive Non-native Species

Himalayan balsam and Giant Hogweed are pervasive on the banks of the Shannon. Sycamore *Acer pseudoplatanus* is also listed as an impactful species to Alluvial forests and is present in the riparian edges.

Zebra Mussel was forming large colonies at most of the survey points. Zebra Mussel is a Part 2A species listed in the Third Schedule under Regulations 49 & 50 in the European Communities (Birds and Natural Habitats) Regulations 2011 (Note: Regulation 50 not yet enacted). This means it is illegal to cause dispersal of Zebra Mussel and due diligence must be given to work methods in the vicinity of this invasive non-native species during installation.

Invasive Non-native Species have the potential to spread during construction works and have significant effects on habitats including Annex I Alluvial forest habitat. Invasive species have

legal implications if left untreated, including Zebra Mussel, Giant Hogweed, and Himalayan Balsam. They can spread rapidly over suitable habitat, including riverbanks, wetlands or disused waste land. Section 49 and 50 of Part 6 of the European Communities (Birds and Natural Habitats) Regulations 2011 restricts the dispersal, spread and transportation of these invasive species.

Therefore, in the absence of mitigation, it is expected that construction works could spread Third Schedule invasive species.

6.3.3 Operational Phase Impacts

As the flood defence walls are permanent structures, and the embankments will be revegetated, the operation of the FRS will generally not result in any additional discharges into the River Shannon (Lower River Shannon SAC).

However, periodic/annual maintenance of embankments and drainage scheme (i.e., clearing of build-up of silt) will contribute additional particulate matter to the water courses. In particular, the Cedarwood Stream will require removal of silt and vegetation along approximately 400m of the stream, which will need to be carried out annually. This will result in continued disturbance to local fish QIs present within the stream.

This has the potential to have significant effects on water quality and sensitive QI species such as Salmon and Lamprey species in the Lower Shannon SAC.

Lighting

No new lighting columns are proposed for the scheme. Where lighting columns have to be removed to construct the new flood walls and embankments, the columns will be replaced on completion of the works. For instance, on the Mall Road, the existing columns will be removed and replaced in line with the new wall.

Therefore, there is no potential for significant effects from lighting on any of the QIs such as Otter or fish as the lighting regime will remain the same.

Fish

The modification of the existing culverts within Cedarwood Stream may have the potential to have significant effects on Salmon parr that may use this adjoining tributary of the River Shannon as a feeding territory during years 1 – 3 after spawning, before migrating to sea. Lamprey are not considered to be using the stream. The current series of obstacles to fish movement reduce the potential for Salmon to use this channel.

In the worst-case scenario, that these culverts are replaced with culverts that do not follow best practice guidance for fish passage, movement of Salmon upstream will be completely restricted. Although use of the stream by salmonids is considered to be limited to relatively low abundance, reduced access to a second order stream within the Lower River Shannon SAC would be in direct contravention of the QIs Conservation Objectives for the Lower River Shannon SAC.

Currently, the sluices are closed in high water levels to prevent the Cloon Stream from flooding, but as this is manually carried out, it has been observed that the sluices remain closed or partially closed for many months. In 2022-2023, the sluices were partially closed for 6 months. Note that in the current condition, fish species are not trapped, as the Cloon Stream is open at the downstream end, where it joins the River Shannon. However, the closed sluice effectively closes off the Cloon Stream as a corridor for Otter and for any fish.

During operation, the sluices on the bridge will no longer be required due to the measures implemented by the Scheme, such as road raising, demountable barriers and higher flood walls. Therefore, the sluices will be become obsolete and can be removed from the causeway structure. This will result in the Cloon Stream becoming open and accessible for QI species at all times of the year.

Maintenance

An annual maintenance program will be completed which is anticipated to include the following elements:

- Annual inspection of Cedarwood Stream and removal of vegetation for improved conveyance if required.
- Twice-annual cutting of grass on embankments
- Inspection of entire scheme following a flood event
- Annual inspection and installation of demountable barriers and flood gates, and inspection non-return valves and drainage outfall

T**hese works have the potential to significantly affect local fish Qis within the stream.**

6.3.4 Do Nothing Impact

If the 'do-nothing' approach is adopted and the development of the Castleconnell FRS does not take place, flooding events will keep occurring within the residential and road/access areas of the village, resulting in reoccurring and long-term socio-economic pressures on the local community. This could result in the requirement for emergency works or ad-hoc remedial measures in the future, such as sand bags and re-pointing of walls, which may negatively affect Natura 2000 sites if they proceed without a coherent and rational approach of a flood relief scheme.

6.3.5 Cumulative Impact

The site of the proposed works is situated on a major river (Shannon) in the village of Castleconnell.

Projects within the village environs that could have a cumulative or in-combination impact are listed in Section 5, which generally include new housing developments. None of their associated Environmental reports indicate significant cumulative impacts.

6.4 Summary

Due to the proximity of the FRS to Lower River Shannon SAC and QI species and habitats, the nature and scale of the proposed project, impacts via surface water, land and air pathways to the listed Natura 2000 sites, likely significant impacts are anticipated, either alone or in combination with other projects.

6.4.1 Description of likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the Natura 2000 sites

Project Elements	Comment	
Size and scale	The FRS will comprise a series of walls and embankments along the banks of the River Shannon in Castleconnell, along with several demountable flood barriers, road raising works, and removal of vegetation and alterations of a culvert on the Cedarwood Stream, a tributary of the River Shannon in the northern part of Castleconnell.	
Land-take	There will be minimal land take from Natura 2000 sites. The embankment and low flood wall at Stormont House will be constructed slightly within the SAC boundary, but not within QI habitats. No other permanent take of SAC land is expected however, some of the new walls and embankments will be situated on the boundary of the SAC.	
Distance from Natura 2000 site or key	**Natura 2000 site**	**Approximate distance from site**

features of the site	Lower River Shannon SAC	0km (adjacent)
	River Shannon and River Fergus Estuaries SPA	10.5km downstream
	Lough Derg (Shannon) SPA	12.4km upstream
Resource requirements (water abstraction etc.)	There will be no resource abstraction from any Natura 2000 site for this project	
Emissions (disposal to land, water or air)	**Construction Phase:** Surface water During construction, there is the potential for pollutants such as dust, silt, oils, concrete washings, etc. within the proposed sites to enter into the River Shannon and thus the adjacent Lower River Shannon SAC. Ground Water Groundwater impacts are not anticipated during construction. Any connection to groundwater or the water table is expected to be connected to Shannon or nearby watercourses (Cloon, Cedarwood, Stradbally) which connect to the Shannon, and therefore is a surface water pathway. Land QI and Annex I habitat Alluvial Forests of Lower River Shannon SAC is located directly adjacent to the proposed works. Avoidance of this habitat has been designed into the scheme, however construction mitigation is required. Disturbance (noise, visual) During construction, there will be increased noise and disturbance to QI bird species and non-QI Annex II & IV species Otter, and QI fish. These impacts will be temporary and localised however may have significant adverse impacts on QIs of Natura 2000 sites. Air The level of increase in air emissions during construction is not expected to have significant adverse impacts on Natura 2000 sites in terms of air quality. **Operational Phase:** During the operation of the proposed FRS there may be some impacts to Lower River Shannon SAC, such as water quality, direct impact to habitats.	
Excavation requirements	Excavation depths are not expected to exceed 1.5m. Impacts on Natura 2000 sites via groundwater pathways have been screened out. Sheet piling will be used in a few locations to construct flood walls.	
Transportation requirements	The proposed FRS will not generate a significant volume of additional vehicular traffic. The level of increase is not likely to have any adverse transport-related environmental impacts.	
Duration of	The FRS is expected to be constructed over 18 months	

construction, operation, decommissioning etc.	Decommissioning is not anticipated, however there will be removed of existing boundary walls and sections of roads Operation will be permanent and will require maintenance

6.4.2 Description of likely changes to the Natura 2000 sites

Potential Impact	Comments
Reduction of habitat area	There will be reduction in habitat that is noted as affinity to Alluvial Forests [91E0] in two locations to construction the flood walls. 14 no. of trees (excluding the area of woodland) will be removed, to provide a construction area (which has been designed to be the smallest footprint possible). The trees to be removed are mostly non-native trees. Therefore, short term impacts are anticipated. It is expected that the woodland will quickly regenerate, particularly due to presence of fast growing Willow trees and there is no expected long term impact to Alluvial Forests [91E0].
Disturbance to key species	*Temporary Impacts:* The construction works will be along the riparian area of the Lower River Shannon SAC, and this will temporarily increase the noise level and disturbance locally to QIs Otter, and any QI birds of the River Shannon and River Fergus Estuaries SPA. Pile driving has the potential to have noise impacts on QI fish species. *Permanent Impacts*: Once the scheme is built no permanent impacts from noise or disturbance is expected to otters.
Habitat or species fragmentation	No habitat or species fragmentation is likely as the project poses no restrictions to habitats or species of the Natura 2000 sites.
Reduction in species density	There will be no temporary or permanent reduction in species density within any of the Natura 2000 sites, or any QIs of these sites.
Changes in key indicators of conservation value (water quality etc.)	Potential temporary changes to key elements (i.e. water quality) Natura 2000 sites are anticipated.
Interference with the key relationships that define the structure of the site	There will be no interference with the key relationships that define the structure of the sites.
Interference with key relationships that define the function of the site	There will be no interference with the key relationships that define the function of the sites.

6.4.3 Provide indicators of significance as a result of the identification of effects set out above in terms of:

Potential Impact	Indicators
Loss (Estimated	The FRS will create new walls and embankments along the

percentage of lost area of habitat)	boundary Lower River Shannon SAC. Much of this will replace existing stone walls and therefore there will be no loss of habitat. No Natura 2000 sites will experience a direct loss in habitat area.
Fragmentation	Fragmentation of habitat and/or species is not anticipated.
Disruption & disturbance	Disruption and/ or disturbance is anticipated.
Change to key elements of the site (e.g. water quality etc.)	Potential change in flow of water off the land into the River Shannon is anticipated. Potential temporary changes to key elements (i.e. water quality) of the Natura 2000 sites are anticipated.

6.4.4 Describe from the above those elements of the project or plan, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is unknown

Following initial screening and based upon best scientific judgement, it is concluded that likely significant effects are anticipated from the project on the following Natura 2000 sites either alone or in combination with any other plans or projects:

- Lower River Shannon SAC
- River Shannon and River Fergus Estuaries SPA
- Lough Derg (Shannon) SPA

6.5 Concluding Statement

Following this initial screening of the proposed Flood Relief Scheme in Castleconnell, Co. Limerick it can be concluded that likely significant effects are anticipated on the River Shannon SAC and the River Shannon and River Fergus Estuaries SPA and Lough Dery (Shannon) SPA. It will therefore be necessary to carry out a Stage 2 Appropriate Assessment to determine whether the impacts would have a detrimental effect on site integrity, and if so whether the impacts can be avoided or reduced sufficiently to prevent any impacts.

In carrying out this AA screening, mitigation measures have not been taken into account. Standard best practice construction measures which could mitigate impacts on any European Sites have similarly not been considered.

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