BALLINA FLOOD RELIEF SCHEME

Environmental Impact Assessment (EIA) Scoping Report

MGW0290-RPS-EI-XX-R-EN-0002
Ballina Flood Relief Scheme
EIA Scoping
A1.C01
27 February 2023

rpsgroup.com

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
A1 C01	Stakeholder Review	TK, AOS	KF, CC	PJG	27/02/23

Approval for issue

PJG	27 February 2023

Prepared by:

RPS

Prepared for:

Mayo County Council

Dublin | Cork | Galway | Sligo
rpsgroup.com

RPS Group Limited, registered in Ireland No. 91911
RPS Consulting Engineers Limited, registered in Ireland No. 161581
RPS Planning & Environment Limited, registered in Ireland No. 160191
RPS Engineering Services Limited, registered in Ireland No. 99795
The Registered office of each of the above companies is West Pier Business Campus, Dun Laoghaire, Co. Dublin, A96 N6T7

Contents

Tables

Figures

Appendices

1 INTRODUCTION

1.1 Purpose of this Report

The purpose of this scoping report is to outline the content and extent of information to be contained in the Environmental Impact Assessment Report (EIAR) for the proposed Ballina Flood Relief Scheme (FRS), hereafter referred to as the Proposed Scheme.

This report will facilitate consultation on the scope of the EIAR. It outlines the following:

- the location and extent of the Proposed Scheme
- the alternatives considered
- the key environmental issues and receptors in the vicinity of the Proposed Scheme
- the likely significant effects of the Proposed Scheme and the environmental studies that are proposed to inform the EIAR

The information in this report is based on:

- Information gathered during the constraints and options stages (Constraints Report, (RPS, 2021), Options Report (RPS, 2023)
- Existing environmental data bases, reports and mapping
- Site surveys completed in 2021 and 2022
- Consultation with stakeholders and the public during 2021

This EIA scoping report will be circulated to the consultees listed in Appendix A as part of this informal scoping exercise. Consultees are invited to contribute to the EIA process by providing feedback on aspects such as additional baseline data sources, survey techniques and assessment approaches and likely significant effects that should be addressed in the EIAR.

1.2 Project Background

Ballina Town is situated on the estuary of the River Moy near Killala Bay in north County Mayo. Ballina has a long history of tidal flooding due to its location on the River Moy which flows through the town, with properties located along Bachelor's Walk, Arbuckle Row and Clare Street suffering extensive flood damage during the January 2014 and December 2015 flood events. The main sources of flooding in Ballina are the high water levels in the River Moy and the inadequate conveyance capacities of the smaller stream channels and associated culverts, along with their limited discharge capacities into the River Moy during high water levels.

As part of the implementation of the EU Floods Directive, the Office of Public Works (OPW) undertook the Western Catchment Flood Risk Assessment and Management (CFRAM) Study.

The objectives of the CFRAM study were to:

- Assess and map the existing and potential future flood risk within the CFRAM study area.
- Identify viable structural and non-structural options and measures for the effective and sustainable management of flood risk in the Areas for Further Assessment (AFAs) and within the CFRAM study area as a whole.
- Prepare a set of Flood Risk Management Plans (FRMPs) for the CFRAM study area, associated Strategic Environmental and, as necessary, Habitats Directive Appropriate Assessment (AA). These set out the policies, strategies, measures and actions that should be pursued by the relevant bodies (including the OPW, Local Authorities and other Stakeholders) to achieve the most cost-effective and sustainable management of existing and potential future flood risk within the study area. As part of this objective relevant environmental and statutory plans, as well as objectives and legislative requirements are taken into account.

Under the OPW CFRAM study, Ballina Town and its low-lying environs were identified as an Area for Further Assessment (AFA) in 2012. The study concluded that a FRS would be viable and effective for the community. Subsequently, a number of potential flood relief/protection measures were identified and assessed to be viable and effective to reduce flooding for the vulnerable properties located in Ballina Town.

RPS has been commissioned by Mayo County Council (MCC) to assist in the delivery of the Proposed Scheme. The objective of this project is:

"the identification, design, and submission (for planning consent) of a FRS that is technically, socially, environmentally, and economically acceptable, to alleviate the risk of flooding to the community of Ballina to a determined standard of protection, and to procure, manage and oversee the construction of that scheme."

1.3 Stages of the Scheme

There are five statutory phases of work in the completion of a FRS. The progression to one stage depends on the outcome of the previous stage. The five stages of the project are as follows:

- Stage I: options assessment, scheme development and design
- Stage II: planning and development consent process
- Stage III: detailed construction design, compilation of work packages, and the preparation of tenders for contracts
- Stage IV: construction supervision and project management services
- Stage V: handover of works

This EIAR scoping report is produced as part of Stage I of the project. It follows on from work carried out to date. Supporting documents to this report include the following:

- Ballina Flood Relief Scheme Constraints Study (February 2021)
- Ballina FRS Options Assessment Report (January 2023)

Documents are available at the project website (https://www.floodinfo.ie/frs/en/ballina/home/).

1.4 Site Location

1.4.1 Scheme Area

The River Moy flows through Ballina and is the main source of flooding in the town. Ballina is located just upstream of the Moy Estuary and the reach of the Moy downstream of the Salmon Weir in Ballina is tidal. There are several tributaries of the River Moy flowing through the town and these are the Quignamanger Stream, Bunree Stream (known locally as the Behy Road Stream), River Brusna, Tullyegan Stream and Knockanelo Stream. The Proposed Scheme includes flood relief measures in Ballina for the River Moy and its these tributaries.

The area in which the Proposed Scheme will be located is shown in **Figure 1-1**.

The scheme area is:

- Within which physical works are proposed to be constructed, accessed and maintained as part of any feasible scheme.
- Areas that are intended to benefit from, and be protected by, any such scheme.
- River channel/watercourses upstream and downstream that are likely to be impacted hydraulically by the scheme.

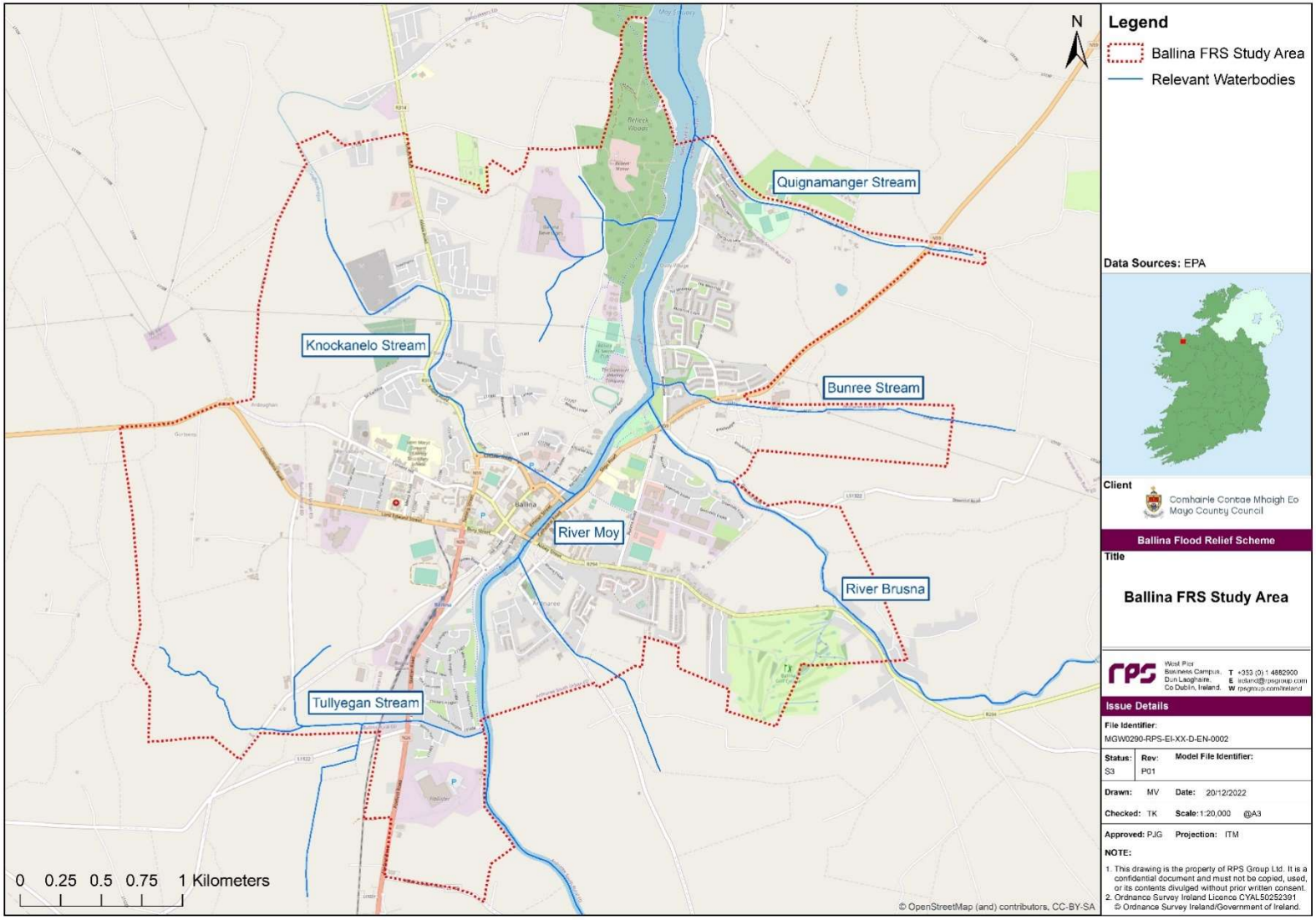

Figure 1-1: Ballina FRS study area

1.4.2 Environmental Overview

The scheme area for the Proposed Scheme is the town of Ballina, situated in County Mayo. Ballina Town is the second-largest town in County Mayo with a population of 10,171. It lies at the mouth of the River Moy near Killala Bay in the north of the county. It is a designated Key Town (Tier 1) as per the Mayo County Development Plan (MCDP) 2022-2028 and functions as the main economic driver for a large area of north Mayo. Due to its proximity to County Sligo, the town also serves as the main economic, commercial, social and educational centre for parts of west Sligo. This makes Ballina an important asset to the wider region, alongside its historical, ecological and archaeological significance, and tourism potential.

The River Moy rises in Sligo's Ox Mountains and is roughly 100 km long. For the greater part of its length, it flows southwestward, entering County Mayo and turning north at Ballylahan, before entering Foxford then turning north near the village of Kilmore and flowing northwards towards Ballina, where it enters the Atlantic Ocean at Killala Bay along the Mayo-Sligo border. Almost the entire freshwater element of the River Moy is a designated Special Area of Conservation (SAC), along with its tributaries and both Loughs Conn and Cullin. The River Moy SAC (Site Code: 002298) contains habitats and species listed on Annexes I and II of the EU Habitats Directive.

The River Moy is known for its exceptional salmon fishery, with Ballina referred to as "*The Salmon Capital of Ireland"*. The River Moy is Ireland's most productive salmon river, with over one fifth of all salmon angling catch nationally (23%) caught by rod and line on the River Moy System in 2020. Salmon fishing is a major component of tourism in Ballina, particularly at the Ridge Pool and Cathedral Beat in the centre of the town.

North of Ballina Town, the River Moy flows to the sea via a long, narrow estuarine channel. After approximately 8 km, the estuary widens to form a north-facing triangular bay, with the towns of Enniscrone (Co. Sligo) and Killala (Co. Mayo) situated on the eastern and western shores, respectively. This site is the Killala Bay/Moy Estuary SAC (Site Code: 000458), with the estuary forming the county boundary along its northern part. A long sandy island (Bartragh Island) separates the south-western side of the bay from the open water. This site has an excellent range of good quality coastal habitats, including a number listed on Annex I of the EU Habitats Directive. In particular, the dune complex at Bartragh Island is relatively undisturbed and is considered to be one of the best in the country in terms of its naturalness and intact state.

The site also holds populations of species listed on Annex II of the EU Habitats Directive. The estuary of the River Moy and the inner part of Killala Bay, including Lackan Bay and Rathfran Bay is a designated Special Protection Area (SPA) known as Killala Bay/Moy Estuary SPA (Site Code: 004036). It is a funnel-shaped estuary, approx. 7 km wide at its outer limit. It is very well sheltered by Bartragh Island, and by a sandy peninsula that extends from Enniscrone on the eastern side. Extensive intertidal sand and mud flats are exposed at low tide. The site is a SPA under the EU Birds Directive, of special conservation interest for a number of species with populations of national importance, some of which are listed on Annex I of the Directive. European Designated Sites (SACs and SPAs) within the River Moy Catchment and surrounding area are shown in **Figure 1-2**.

There are two designated Architectural Conservation Areas (ACA) located within the town of Ballina, per the Ballina and Environs Development Plan 2009-2015[1]. Pearse Street has been identified as an ACA, along with the adjoining streets of Tone Street, Tonal Street, O 'Rahilly Street, Casement Street and James Connolly Street. Another key area of built heritage significance is at Crocketstown or the Quays which also includes the location of the former Ice House (now a hotel/restaurant).

The Mayo County Development Plan 2022-2028 and Ballina & Environs Development Plan 2009-2015 outline the structures listed on the Record of Protected Structures (RPS) that are located within the scheme area (**Figure 1-3**). There are 107 National Inventory of Architectural Heritage (NIAH) structures located within the scheme area, 48 of which are also listed on the RPS (**Figure 1-3)**. These include two country houses: 'Belleek Manor' (formerly 'Abbey') and its demesne 'Ballina House' (formerly 'Belleek Castle'). Ballina House is used as a wedding venue and the grounds are regularly used for recreational walking. The demesne of 'Belleek Manor is also listed in the NIAH Garden Survey. The ACA areas of the urban core and

[1] This is the most up to date version of the Ballina and Environs Development Plan. When the Town Councils were abolished in 2014, the lifetime of the Plan was automatically extended in accordance with the provisions of section 11A of the Planning and Development Act 2000 (as amended).

layout of Pearse Street and adjoining streets, as well as the Quays at Crocketstown are notable areas of heritage significance.

A First World War concrete ship, the SS Creteboom, an ice house, and three bridges are all located on the River Moy and its tributary, the River Brusna. The majority of recorded built heritage within the scheme area reflects the late 19th century development of the town of Ballina and includes commercial and residential properties as well as landmark structures such as Saint Muredach's Catholic Cathedral, Ballina Courthouse, Ballina Railway Station, and the Vaughan Jackson Monument.

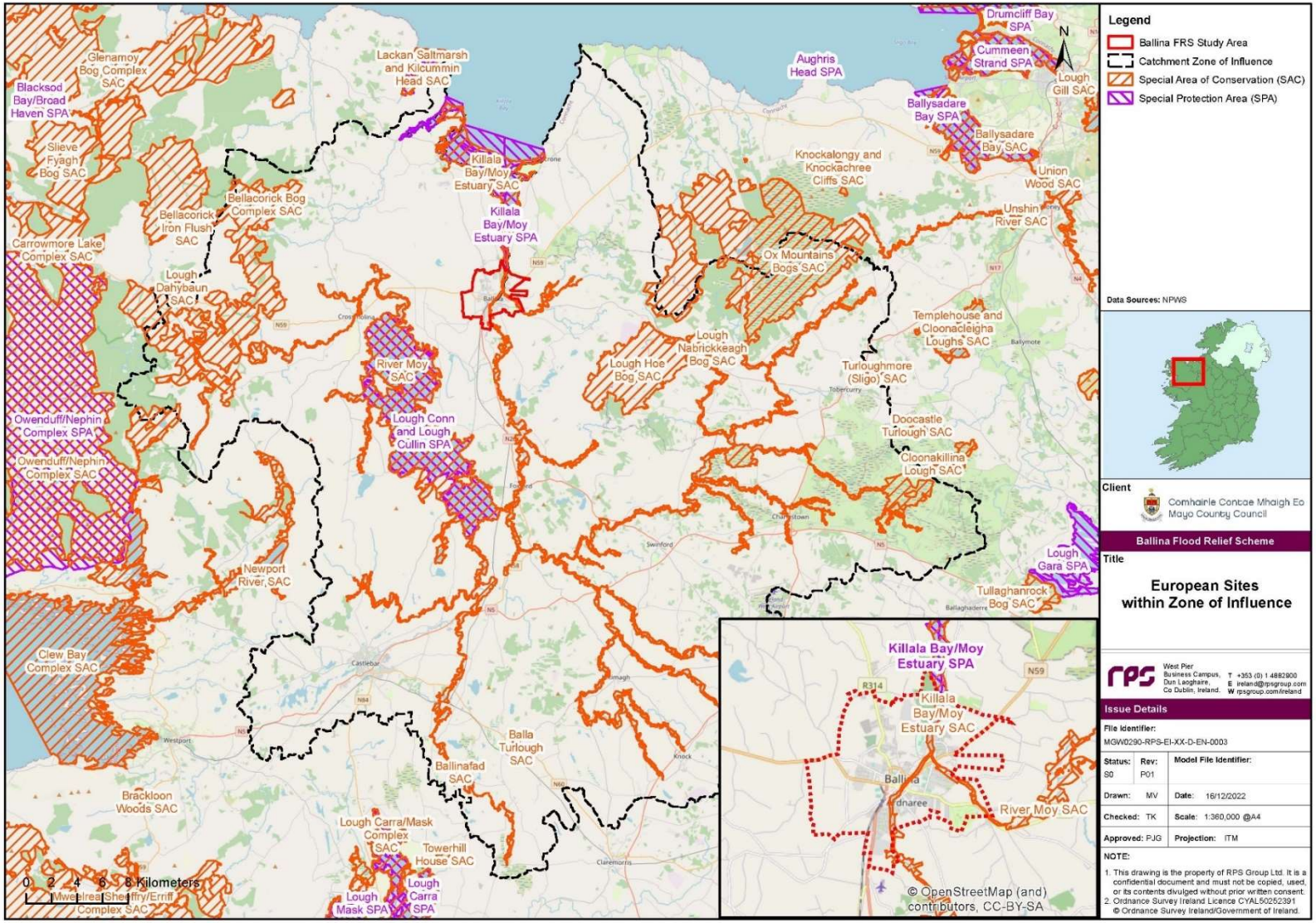

Figure 1-2: European Designated Sites (SACs and SPAs) within catchment ZoI

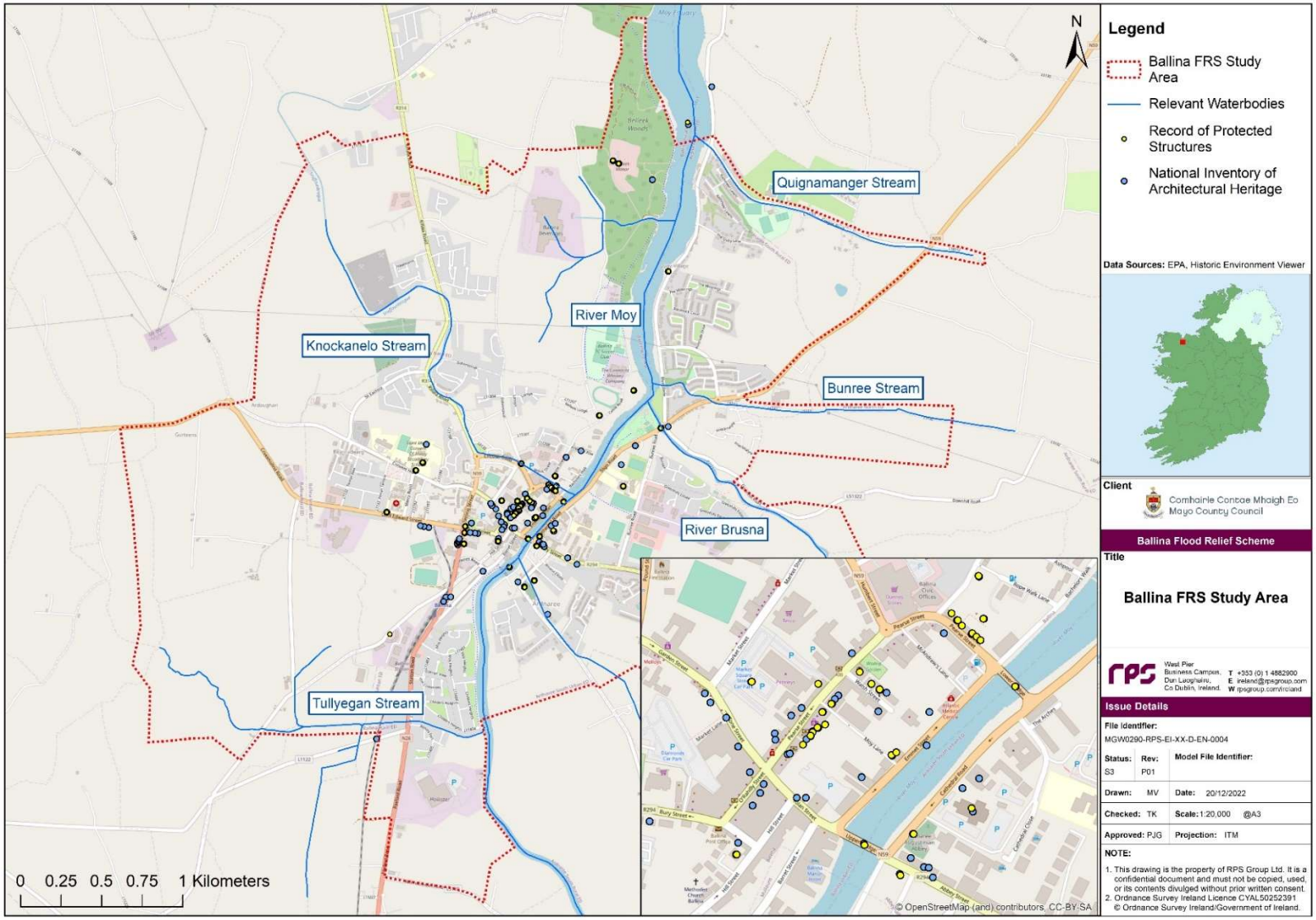

Figure 1-3: Recorded architectural heritage sites within the scheme area

1.5 Environmental Impact Assessment Process

The EIA process encompasses a number of key decision points and outputs used by the relevant competent authority to complete the EIA process. It commences with consideration of whether an EIA needs to be undertaken or not, i.e. EIA screening. Where EIA is required the process moves to EIA scoping, followed by preparation of an EIAR. This output is used by the relevant competent authority, along with any other supplementary information they deem appropriate, to complete the EIA process and to determine whether to allow or refuse the proposed application.

The content of this report relates to EIA scoping only.

1.5.1 EIA Scoping

The objective of this EIA scoping process is to identify potential environmental impacts for assessment which may be relevant to the Proposed Scheme.

The scoping process involves an assessment of a project's potential environmental impacts before deciding which should be brought forward for further consideration in the EIAR. Although scoping commences early in the process and informs the content and level of detail in the EIAR, it is noted that scoping is dynamic and only provides a starting point from which to launch an environmental assessment of the Proposed Scheme. It is regarded as an ongoing process throughout the evolution of the EIAR, which is responsive to issues that may arise as a result of field survey, changes to design and stakeholder feedback.

An initial scoping of likely significant effects may identify those issues thought to be potentially significant in EIA terms, those where significance is unclear, and those thought to be not significant. The issues in the potentially significant category are brought forward, together with those in the uncertain category. Those considered to be not significant are not considered further in the EIAR.

1.5.1.1 EIA Scoping Guidance

The preparation of this EIA scoping report has had regard to:

- Guidance on EIA Scoping (EC, 2017a)
- Guidance on EIA Report (EC, 2017b)
- Guidelines on the Information to be Contained in Environmental Impact Statements (EPA, 2022)
- Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (EPA, 2003)
- Draft Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (EPA, 2015)
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Department of Housing, Planning and Local Government, 2018a)

Having regard to the most recent guidance, based on the updated 2014 EIA Directive, scoping must be focused on issues and impacts which are:

- Environmentally based
- Likely to occur
- Significant

1.5.2 Environmental Impact Assessment Report (EIAR)

1.5.2.1 EIAR Assessment Methodology

This section presents an outline of the EIAR methodology for the Proposed Scheme. It provides the methodology for the identification and evaluation of potential likely significant environmental effects and also presents the methodology for the identification and evaluation of potential cumulative impacts.

The impact assessment will draw upon a number of key guidance documents and legislation including:

- Circular PL 05/2018 -Transposition into Planning Law of Directive 2014/52/EU amending Directive 2011/92/EU on the effects of certain public and private projects on the environment (the EIA Directive)
- Council Directive 2011/92/EU of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment, as amended by Council Directive 2014/52/EU (the EIA Directive)
- Environmental Impact Assessment of Projects Guidance on Scoping (Directive 2011/92/EU as amended by 2014/52/EU) (European Commission, 2017)
- Environmental Impact Assessment of Projects Guidance on Screening (Directive 2011/92/EU as amended by 2014/52/EU) (European Commission, 2017)
- Environmental Impact Assessment of Projects Guidance on the Preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU) (European Commission, 2017)
- Environmental Protection Agency (EPA) Guidelines including:
  - Guidelines on the Information to be Contained in Environmental Impact Statements (EPA, 2002)
  - Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (EPA, 2003)
  - Draft Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (EPA, 2015)
  - Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2022)
- European Commission (1999) Guidelines on the Assessment of Indirect and Cumulative Impacts as well as Impact interactions
- European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. 296 of 2018)
- Foreshore Act 1933 (as amended)
- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine, Chartered Institute of Ecology and Environmental Management (CIEEM, 2019)
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Department of Housing, Planning and Local Government, 2018)

The approach to assessment will utilise an iterative approach. Impacts that are initially assessed as significant will be discussed with the developer in order that changes to the design can be incorporated to reduce or offset impacts. The development of mitigation measures will also be considered as part of this iterative approach.

1.5.2.2 Identification of Impacts and Assessment of Significant Effects

The Proposed Scheme has the potential to create a range of impacts and effects with regard to the physical, biological and human environment. For the purposes of the EIAR, 'impact' will be used to define a change that is caused by an action. For example, the piling of foundations (action) will result in increased levels of noise (impact) temporarily. Impacts can be categorised as direct, indirect, cumulative and interactive. They can also be either positive or negative. In addition, for certain impacts, the reversibility of an impact is relevant to its overall effect. An irreversible (permanent) impact may occur when recovery is not possible, or not possible within a reasonable timescale. In contrast, a reversible (temporary) impact is one where natural recovery is possible over a short time period, or where mitigation measures can be effective at reversing the impact.

The term 'effect' will be used in the EIAR to express the consequence of an impact. Using the foundation piling example again, the piling of foundations (action) results in increased levels of noise (impact), with the potential to disturb sensitive receptors (effect).

In general, the EIAR will determine the magnitude of the impact, the sensitivity of the receptor, and the significance of the effect, following the methodology outlined in the EPA Guidelines (EPA, 2022). There may

be some variations to the general EIA methodology where required by specific topic guidance, and where this is the case it will be explained within each relevant topic chapter.

The criteria for determining the significance of effects is a two-stage process that involves defining the magnitude of the impacts and the sensitivity of the receptors. Each assessment will define criteria relevant to the topic to assign values to the magnitude of likely significant effects and the sensitivity of the receptors. For example the magnitude of impact and sensitivity of the receptor could be assessed as High, Medium, Low, or Negligible. The significance of the effect is determined by correlating the magnitude of the impact and the sensitivity of the receptor. However, the final assessment for each effect is based upon the specialist's expert judgement.

The EPA Guidelines include a table which describes these effects (EPA, 2022). This table has been included in this scoping report as Appendix C.

The nature and scale of the Proposed Scheme is such that it is not likely to result in any significant transboundary effects.

1.5.2.3 Competent Experts

Article 5(3)(a) of the 2014 EIA amended Directive requires that "*the developer shall ensure that the environmental impact assessment report is prepared by competent experts*" to ensure the completeness and quality of the EIAR. In this regard, the EIAR will be prepared by RPS with inputs by a team of competent, technical experts who have the knowledge and understanding of best science to assess the likely significant effects associated with the Proposed Scheme and where required develop mitigation measures (including monitoring where required).

1.5.3 Proposed Structure of the EIAR

The EIAR will be presented in a number of volumes as outlined in **Table 1-1**.

Volume A will contain the Non-Technical Summary (NTS). This will be a summary of the EIAR that is written using non-technical language and is intended to provide information to the general public. Volume B will contain the main body of the EIAR as outlined below which will give an overview of the project and the EIA process, and then move on to the specific environmental chapters. This will be followed by any technical appendices that contain supporting data for the main chapters, a book of drawings, the Natura Impact Statement (NIS), Appropriate Assessment (AA), and the Environmental Operating Plan (EOP).

Table 1-1: Proposed EIAR Structure

Volume	Chapter	Title
Volume A		Non-Technical Summary (NTS)
Volume B	1	Introduction
	2	Planning and Policy
	3	Consultation
	4	Assessment of Alternatives
	5	Project Description
	6	Traffic and Transportation
	7	Population
	8	Human Health
	9	Aquatic Biodiversity
	10	Terrestrial Biodiversity
	11	Land, Soil and Hydrogeology
	12	Water
	13	Air Quality
	14	Climate
	15	Noise and Vibration

	16	Material Assets Waste/Utilities
	17	Material Assets Landtake
	18	Cultural Heritage
	19	Landscape and Visual
	20	Interactions and Cumulative Effects
	21	Risks of Major Accidents or Disasters
	22	Schedule of Environmental Commitments
Volume C		Technical Appendices
Volume D		Book of Drawings
Volume E		Natura Impact Statement (NIS)
		Appropriate Assessment (AA)
EOP		Environmental Operating Plan (EOP)

2 CONSULTATION PROCESS

Consultation forms an essential part in the design development of a project. Engagement with stakeholders, landowners and the public provide the opportunity to give feedback and information throughout the design development process. For the scoping report consultation was undertaken to:

- Engage stakeholders and the public as early as possible on the project and encourage feedback.
- Provide a process for members of the public to participate in the project.
- Seek input from the public and from relevant stakeholders with respect to the options proposed and the preferred option.
- Identify reasonable alternatives where feasible.
- Identify measures to reduce impacts during the construction and operation phases.
- Provide opportunities for the public and stakeholders to provide information with respect to the likely significant effects that could arise as a result of implementing the project.
- Keep the public informed of the project as it progresses throughout the different stages.

2.1 Public Consultation

As part of Stage I of the Proposed Scheme, a public consultation day (PCD) was held in September 2020. This allowed interested parties to provide views on how the scheme should progress in line with the existing environment constraints identified. Details of this first public consultation ('Opening PCD') were posted on the Ballina FRS Website (www.ballinafrs.ie) with the opportunity for members of the public to submit comments online. A Virtual PCD was held for those unable to attend the event. Information gathered from these consultation days were used to inform this report.

A total of 16 people attended the Opening PCD and to date four comment forms have been received. A summary of the comments received are as follows;

- Need to ensure the project is adapted to climate change and ensure there is no impact on the local salmon population and their food sources.
- Consider reuse of the existing stone wall as cladding on any new wall.
- The project team should make sure to use the information that locals have provided in the past.
- Concerns were expressed over the timeline of the project being too long and asking for remediation works to be completed on the existing wall along Bachelor's Walk in the meantime as water is coming through the wall during high tides.
- It was noted that the Pier at Ballina house is an obstruction to water flow, around the headland (across from the Bunree inlet) there is a dock that also causes restriction to the flow of water, Bushes along both banks of the river need to be cut back between the town and the Bunree River inlet.

Overall comments were positive that the scheme is moving forward and the main area of concern is the timeline of the project being too lengthy and the lack of new information.

A second public consultation day (Options PCD) will focus on the options selection process, as well as identifying the emerging preferred option for the Proposed Scheme. The comments and queries raised at the PCD will be considered in the design of the Proposed Scheme and during the preparation of the EIAR.

2.2 Stakeholder Consultation

Stakeholder consultation was undertaken which aimed to ensure that stakeholders had the information required to make submissions. A consultation letter was issued to statutory and non-statutory bodies inviting comment on the proposals in 2020. The current list of stakeholders is included in **Appendix A Table 1.**

Stakeholders were notified in writing of the outcomes of the options selection process and the emerging preferred options in December 2022. The comments and queries raised will be considered in the Proposed Scheme design and during the preparation of the EIAR.

In accordance with statutory requirements, this scoping report will be issued to statutory consultees and others, listed in **Appendix A Table 1** for consultation. All submissions (responses, comments, and recommendations) will be acknowledged in the EIAR and will inform the final scope of the EIAR.

In June 2021, a collaborative stakeholder workshop was held with a number of public stakeholder bodies to identify any issues, constraints and opportunities that could inform the development of the scheme. The outcomes are documented in **Appendix A Table 2.**

A second collaborative workshop will be held as part of the Proposed Scheme analysis. The aim of this workshop will be to:

- outline any particular issues, constraints, opportunities or features that have been identified to date;
- discuss how any of the above any could inform the development of the Proposed Scheme; and
- discuss how the above may lead to additional benefits and/or meet objectives other than flood risk management.

3 PLANNING AND POLICY

3.1 Planning and Development Legislation

Mayo County Council wishes to prepare a Part 10 Planning Application to An Bord Pleanála, under Section 175, of the Planning & Development Act, 2000, for the development of the Proposed Scheme.

The prescribed classes of development and thresholds that trigger a mandatory EIA are set out in Schedule 5 of the Planning and Development Regulations, 2001, as amended. A review of the classes of development requiring EIA was carried out during the screening process (RPS , 2022) to determine whether the Proposed Scheme falls into any of the development classes contained therein. The classes most relevant to the Proposed Scheme identified under Schedule 5 are listed below:

(f) (ii) Canalisation and flood relief works, where the immediate contributing sub-catchment of the proposed works (i.e. the difference between the contributing catchments at the upper and lower extent of the works) would exceed 100 hectares or where more than 2 hectares of wetland would be affected or where the length of river channel on which works are proposed would be greater than 2 kilometres.

In the case of the Proposed Scheme, the combined length of river channel on which works are proposed is approximately 3.5 km. An EIAR of the Proposed Scheme is therefore required to be prepared and submitted to support the planning application. The requirements for an EIA are contained within the Planning Act.

3.2 Planning Policy Context

3.2.1 Regional Spatial and Economic Strategy 2020 - 2032 (Northern & Western Assembly)

The Regional Spatial and Economic Strategy 2020 – 2032 (RSES) for the Northern and Western region is in place to ensure that what is set out within the National Planning Framework (NPF) is carried on through to a regional/local level.

The RSES recognises the impact flooding can have on an area, especially with sea levels rising due to the harmful effects of climate change. A number of policy objectives within the RSES address flooding and how its impacts may be mitigated in the region. The policy objectives also ensures that development is avoided within inappropriate areas. These policy objectives are as follows:

Overarching Environmental Regional Policy Objective 1

"The Assembly will coordinate the core objectives of the EU Flood Directive and statutory plans across the planning hierarchy, including national guidance on the relationship between the planning system and flood risk management."

RPO 3.10

"Ensure flood risk management informs development by avoiding inappropriate development in areas at risk of flooding and integrate sustainable water management solutions (such as SUDS, non-porous surfacing and green roofs) to create safe places. Development plans should assess flood risk by implementing the recommendations of the Planning System and Flood Risk Assessment Guidelines for Planning Authorities (2009) and Circular PL02/2014 (August 2014)".

RPO 3.11

"Local Authorities, DHPLG, OPW, and other relevant Departments and agencies to work together to implement the recommendation of the CFRAM programme to ensure that flood risk management policies and infrastructure are progressively implemented".

RPO 8.13

"Support the delivery of flood defence works planned by OPW to be implemented in the short-term."

RPO 8.22

"Prioritising investment to improve stormwater infrastructure to improve sustainable drainage and reduce the risk of flooding in the urban and rural environment."

Ballina is designated as a 'Key Town' with a role in driving regional development and accommodating a significant level of growth in population and employment. Key future priorities include, "*regeneration of the riverside along the River Moy*" which is recognised as being "*crucial to facilitate an enterprise-led regeneration of the town centre*".

3.2.2 Mayo County Development Plan 2022-2028

The Mayo County Development Plan (MCDP) 2022-2028 sets out the roadmap for the overall proper planning and sustainable development of County Mayo over the plan period. The aim of this plan is to build on the development foundations already established in Mayo and to 'plant seeds' throughout to stimulate growth in sectors such as housing, tourism, transport and infrastructure.

The MCDP recognises the importance of the River Moy System and sets out a number of objectives for managing flood risk in County Mayo, most notably to:

- Assist the OPW in developing catchment-based Flood Risk Management Plans for rivers in County Mayo and have regard to their provisions/recommendations.
- Ensure that where flood risk management works take place that natural heritage, cultural heritage, rivers, streams and watercourses are appropriately protected.
- Consult, where necessary, with Inland Fisheries Ireland, the National Parks and Wildlife Service and other relevant agencies in the provision of flood alleviation measures in the County.
- Cooperate with the OPW in the delivery of flood relief schemes that may be brought forward in the lifetime of this plan.
- To identify and preserve vulnerable floodplains, wetlands and coastal areas to the maximum possible extent in both urban and rural areas.

3.2.3 Ballina and Environs Development Plan 2009-2015 (extended)

The Ballina and Environs Development Plan (BEDP) sets out a strategy and framework for the future development of the town over the plan period. The BEDP was automatically extended in accordance with the provisions of section 11A of the Planning and Development Act 2000 (as amended) when the Town Councils were abolished in 2014.

The vision for the future development of Ballina over the plan period is to ensure that the town develops in a manner which will provide a high quality environment and which is attractive to residents, workers, visitors and investors. In order to achieve this vision, the plan aims to re-establish Ballina as one of the principal service centres in the region and as the regional tourism gateway. The overall strategy in the plan therefore is to achieve the following:

- Establish Ballina as a self-sufficient town with housing development to be balanced by employment creation.
- To facilitate the development of the town centre as an attractive shopping and tourist destination.
- Promote the town's amenities – River Moy/Fishing & Water based recreational activities.
- Enhance residential areas throughout the town, by providing recreational facilities, neighbourhood centres and parks and pedestrian/cycling linkages.
- To create a vibrant town centre business and residential community.
- To develop the potential of Ballina as a commercial centre and a heritage town.
- To make Ballina town centre a commercially viable place through good land-use and retail management and the provision of an effective transport and access network.
- To capitalise on the development of the Ridgepool Pedestrian Bridge and nearby cultural centre to improve and market Ballina's image and identity as a cultural town of scenic beauty.

3.2.4 River Moy/Ballina Public Realm Strategy (in progress)

MCC is in the process of producing the River Moy/Ballina Public Realm Strategy to further enhance the public realm of within Ballina Town. The purpose of the strategy is as follows:

- Further enhance Ballina to be a better place for residents and business operators, while encouraging visitors to stay longer.
- Improve streets and spaces.
- Integrate the River Moy with the town centre.
- Enhance and better connect cycling and walking facilities within and around the town.

The Public Realm Strategy will be integrated into the planning of the Proposed Scheme, where the scheme intersects areas included in the plan.

3.3 EIA Directive (2014/52/EU)

The EIA Directive 2011/92/EU on the assessment of the effect of certain public and private projects on the environment (codification), as amended by EIA Directive 2014/52/EU (the EIA Directive), sets out the process by which the anticipated effects of public and private projects on the environment are assessed. The means of achieving this objective are laid down in Article 2(1) of the EIA Directive, which states that, before development consent is given, projects likely to have significant effects on the environment by virtue, inter alia, of their nature, size or location are made subject to a requirement for development consent and an assessment with regard to their effects on the environment.

The 2014 Directive was designed to *"strengthen the quality of the environmental impact assessment procedure"* and it notes that environmental issues, including natural resources, sustainability, biodiversity and climate change have become more important in policy making and must, therefore, be at the forefront of the environmental assessment and decision-making processes. The EIAR will be undertaken in accordance with the requirements of Directive 2014/52/EU on the assessment of the effects of a development on the environment. The EIAR will also be undertaken in accordance with the Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (Environmental Protection Agency, 2022)

3.4 Habitats Directive

The Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora ('the Habitats Directive') provides legal protection for habitats and species of European importance. Articles 3 to 9 provide the legislative means to protect habitats and species of Community interest through the establishment and conservation of an EU-wide network of sites known as Natura 2000. Natura 2000 is a European ecological network of Special Areas of Conservation (SAC), composed of sites hosting the natural habitat types listed in Annex I and habitats of the species listed in Annex II, to enable the natural habitat types and the species' habitats concerned to be maintained or, where appropriate, restored at a favourable conservation status in their natural range.

In Ireland, these Natura 2000 sites are designated as European Sites and include Special Protection Areas (SPAs), established under the EU Birds Directive (79/409/EEC, as codified by 2009/147/EC) for birds; and SACs, established under the Habitats Directive 92/43/EEC for habitats and species.

The Habitats Directive has been transposed into Irish law by Part XAB of the Planning and Development Act 2000 as amended and the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477/2011) as amended ('the Habitats Regulations').

An Appropriate Assessment (AA) is a separate but inter-related process to EIA, required under the Habitats Directive for any plan or project likely to have a significant effect on a European Site. The AA will be undertaken alongside the EIA and will be informed by a Natura Impact Statement (NIS) and other relevant information as considered appropriate.

3.5 Climate Action Plan 2023

The Climate Action Plan 2023 is the second annual update to Ireland's Climate Action 2019. This plan is the first to be prepared under the Climate Action and Low Carbon Development (Amendment) Act 2021, and

following the introduction, in 2022, of economy-wide carbon budgets and sectoral emissions ceilings. The Climate Action Plan 2023 highlights the close link between climate change and biodiversity loss and emphasises the need to safeguard biodiversity and ecosystems as a key part of all climate resilient development. Opportunities for delivering further on the objectives outlined in the Climate Action Plan 2023 will be considered in the EIAR

3.6 National Biodiversity Action Plan

Ireland's 3rd National Biodiversity Action Plan (2017-2021) set out actions through which a range of government, civil and private sectors will undertake to achieve Ireland's 'Vision for Biodiversity'. An updated version of this plan, Ireland's 4th National Biodiversity Action Plan, has been drafted and consultation on the plan closed in November 2022.

Of particular pertinence to the Ballina FRS is Action 2B14 which aims to '*ensure that Flood Risk Management planning and associated SEA, EIA and AA, minimises loss of biodiversity and ecosystem services through policies to promote more catchment-wide and non-structural flood risk management measures*'.

Opportunities for delivering further on this action will be considered in the EIAR.

3.7 Water Framework Directive

The Water Framework Directive (WFD) (2000/60/EC) requires all Member States to protect and improve water quality in all surface and groundwaters so that good status is achieved by 2027, at the latest. It applies to rivers, lakes, groundwater, transitional and coastal waters (out to one nautical mile). Good status refers to both good chemical and good ecological status.

Compliance with the WFD will assessed in the EIAR and if required appropriate mitigation identified to ensure that the objectives of the WFD are met.

3.8 Flood Risk Management Plan Moy & Killala Bay

The Flood Risk Management for the Moy & Killala Bay River Basin was prepared in 2018 by the OPW to set out measures, for sustainable and cost-effective long-term management of flood risk. The CFRAM programmes have investigated the flood risk and possible measures in 300 communities that are at risk of flood, including Ballina.

"The Plan includes feasible measures developed through a range of programmes and policy initiatives including:

- *Non-structural flood risk prevention and preparedness measures that are applicable nationally, aimed at reducing the impacts of flooding, that have been and are being developed to implement Government policy on flood risk management (OPW, 2004).*
- *Structural flood protection measures proposed for communities at significant flood risk, aimed at reducing the likelihood and/or degree of flooding, identified through the National Catchment Flood Risk Assessment and Management (CFRAM) Programme".*

Potentially viable flood relief works for Ballina are set out and considered and the likely elements of such a scheme identified.

3.9 Foreshore Act 1933 (as amended)

A foreshore licence is required by any person proposing to place any material or to place or erect any articles, things, structures, or works in or on foreshore or to get and take any minerals in foreshore or to use or occupy foreshore for any purpose unless exempt under other legislation or due to existing rights.

"Foreshore" means the bed and shore, below the line of high water of ordinary or medium tides, of the sea and of every tidal river and tidal estuary and of every channel, creek, and bay of the sea or of any such river or estuary. The requirement for an application for a Foreshore Lease will be considered for the Proposed Scheme.

4 ALTERNATIVES CONSIDERED

The EIA Directive requires the main alternatives to the Proposed Scheme to be considered and presented in the EIAR as follows:

"A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects".

This section of the EIAR will outline the main alternatives that were considered for the Proposed Scheme. This includes:

- The do nothing scenario.
- The do minimum scenario.
- The different structural measures considered for each location.
- The method used to select the proposed option.

An environmental constraints study was carried out by RPS in 2021 which identified environmental constraints within the scheme area that may be impacted by the flood relief measures (RPS, 2021). Such constraints were considered as part of the options development study. Consideration was given to constraints passed by environmental factors as provided in Article 3 of the EIA Directive (Directive 2011/92/EU as amended by Directive 2014/52/EU). These environmental factors are as follows:

- Population and Human Health.
- Biodiversity (with particular attention to species and habitats protected under the Habitats Directive and the Birds Directive).
- Land, Soils, Water, Air and Climate.
- Material Assets, Cultural Heritage and the Landscape.
- The interaction between the factors referred to above.

4.1.1 Do Nothing

The 'Do Nothing' scenario is defined as the option involving no future expenditure on flood defences or maintenance of existing defences/channels. The implication is that the existing risk of flooding persists in the study area and possibly worsens over time, both as the condition of the banks reduces and climate change impacts are felt. This is not a sustainable option, so it was not considered further.

4.1.2 Do Minimum

The 'Do Minimum' measure consists predominantly of ongoing maintenance works in order to maintain the existing standard of protection and would generally involve repairing and reinforcing existing walls and embankments now and as repairs are needed in the future. This option does not address the potential for an allowance for climate change and an increased flood levels in Ballina and was not considered further.

4.1.3 Structural Measures

4.1.3.1 Screening of Measures

Various structural measures were considered as flood relief scheme options for the River Moy and its tributaries:

- **Relocate and Reconstruct Properties**

  This measure considers relocating receptors out of the floodplain. This may be achieved if the receptor can be physically moved, if there are suitable, equivalent replacement receptors, or if the receptors can be demolished and re-constructed in a suitable location

- **Divert River and Flood Bypass Channel**

  Diverting the river would consist of constructing a new channel or culvert network which would convey the full flow of the watercourse. The reach of the river downstream of this diversion would become redundant. A flood bypass channel would be similar but would convey part of the flood flows of the watercourse. The flood bypass channel would therefore not need to be as large as a full river diversion and the reach of the river downstream would remain active.

- **Upstream Storage**

  Upstream storage was considered for risk areas in Ballina. Where suitable storage areas are available flood water can be stored during a flood event reducing flows and volumes of water in the watercourses. In screening for upstream storage, various criteria need to be confirmed. The upstream catchment needs to be able to provide suitable storage locations. The upstream catchment needs to be able to generate sufficient flood water volumes relative to flood water volumes at the risk area. These two criteria were considered for the Ballina watercourses.

- **Wall and Embankments**

  Hard defences such as flood walls or embankments form a barrier between the river and the floodplain, effectively reducing the size of the river's floodplain where receptors are at risk.

- **Increased Conveyance**

  Increased conveyance was considered for all the watercourses in Ballina with flood risk. This measure considered methods of reducing head loss through the watercourse system and considered alterations to the watercourse channel such as slope, depth, width and roughness. By increasing these parameters water levels may be reduced in the channel and flood risk reduced also. Where structures, located along a watercourse, have been identified as increasing flood risk this measure was considered. By reducing the head loss at the inlet, outlet or across the structure, flood risk may be reduced.

Measures that would improve conveyance, reduce the flow in the channels or contain the flood water before reaching receptors at risk were screened in, as shown in **Table 4-1**. This provided a shortlist of measures to be consider in the further development of options.

Table 4-1: Screening results of Structural Measures

Measure	Moy	Quignamanger	Bunree	Brusna	Tullyegan	Knockanelo
Do nothing[2]	✓	✓	✓	✓	✓	✓
Relocate / Reconstruct properties	✓	✓	✓	✓	✓	✓
Divert river	✓	✓	✓	✓	✓	✓
Flood bypass channel	✓	✓	✓	✓	✓	✓
Upstream flood storage	✓	✓	✓	✓	✓	✓
Walls & Embankments	✓	✓	✓	✓	✓	✓
Increase conveyance – change channel / floodplain, remove constraints, reduce roughness	✓	✓	✓	✓	✓	✓

[2] Do nothing will remain as the baseline scenario with which to compare options.

Measure	Moy	Quignamanger	Bunree	Brusna	Tullyegan	Knockanelo
Increase conveyance – specify ongoing maintenance[3]	✗	✗	✗	✗	✗	✗
Sediment deposition and traps[4]	✗	✗	✗	✗	✗	✗
Tidal barrage	✓	✗	✗	✗	✗	✗

4.1.3.2 Options Development

Options were selected based on achieving the Target Standard of Protection (SoP) for protecting the areas at flood risk within the community of Ballina i.e. 1% of the Annual Exceedance Probability (AEP) for fluvial areas and 0.5% of the AEP for coastal areas option development

Potential options for inclusion in the Proposed Scheme are provided in **Table 4-2**.

Table 4-2: Potential Options

Location	Option	Option elements
Moy	Option 1	• Flood walls
Quignamanger	Option 1	• Diversion culvert upgrade
	Option 2	• Diversion Culvert upgrade • Flood walls • Culvert upgrade
Bunree	Option 1	• Culvert upgrades • Channel upgrades
	Option 2	• Diversion culvert • Culvert upgrade
	Option 3	• New culvert • Culvert upgrade
Brusna	Option 1	• Flood walls and embankments
Tullyegan	Option 1	• Flood walls and embankments
	Option 2	• Upstream flood storage
Knockanelo	Option 1	• Diversion culvert inlet upgrade • Culvert upgrades
	Option 2	• Diversion culvert inlet upgrade • Upstream flood storage (online)
	Option 3	• Diversion culvert upgrade
	Option 4	• Diversion culvert inlet upgrade • Upstream flood storage (offline)
	Option 5	• Diversion culvert inlet upgrade

[3] Maintenance issues not identified as a flooding mechanism.

[4] Sediment not identified as a flooding mechanism.

Location	Option	Option elements
		• Culvert replacement

A Multi-Criteria Analysis (MCA), which considers technical, social, economic and environmental criteria (as shown in **Table 4-3**) was used to identify options with the highest MCA score.

Table 4-3: MCA Criteria

Criteria	Objective	Description
Technical	1a	Ensure flood risk management options are operationally robust
	1b	Minimise health and safety risks in construction, maintenance and operation of the flood risk management option
	1c	Ensure flood risk can be managed effectively and sustainably into the future, and the potential impacts of climate change
Economic	2a	Reduce economic damages
	2b	Minimise risk to transport infrastructure
	2c	Minimise risk to utility infrastructure
	2d	Manage risk to agriculture
Social	3a (i)	Minimise risk to human health and life - Residents
	3a (ii)	Minimise risk to human health and life - High vulnerability properties
	3b (i)	Minimise risk to community - Social Infrastructure and Amenity
	3b (ii)	Minimise risk to community - Local Employment
Environmental	4a	Support the objectives of the WFD
	4b	Support the objectives of the Habitats and Birds Directives
	4c	Avoid damage to, and where possible enhance, the flora and fauna of the catchment
	4d	Protect and where possible enhance fisheries resource within the catchment (Inland Fisheries Only)
	4e	Protect, and where possible enhance, landscape character and visual amenity within the zone of influence
	4f (i)	Avoid damage to or loss of features, institutions and collections of cultural heritage importance and their setting, and improve their protection from extreme floods.
	4f (ii)	Avoid damage to or loss of features, institutions and collections of cultural heritage importance and their setting, and improve their protection from extreme floods.

The results of the MCA are given in **Table 4-4**.

Table 4-4: MCA Scoring

Watercourse	Option No.	Technical Score	Social Score	Economic Score	Environmental Score	Total Score
Moy	**Option 1**	**550**	**830**	**1156**	**-806**	**1729**
Quignamanger	Option 1	670	279	337	-136	1150
	Option 2	**770**	**279**	**337**	**-144**	**1242**
Bunree	Option 1	570	742	764	-121	1955
	Option 2	560	742	764	-121	1945

Watercourse	Option No.	Technical Score	Social Score	Economic Score	Environmental Score	Total Score
	Option 3	**670**	**742**	**764**	**-121**	**2055**
Brusna	**Option 1**	**740**	**71**	**168**	**-632**	**347**
Tullyegan	**Option 1**	**900**	**126**	**289**	**-56**	**1260**
	Option 2	680	126	253	-262	798
Knockanelo	Option 1	300	823	714	-118	1719
	Option 2	**480**	**823**	**678**	**-92**	**1889**
	Option 3	450	823	714	-126	1861
	Option 4	430	823	642	-92	1803
	Option 5	450	823	714	-118	1869

Similarly, a Cost Benefit Analysis (CBA) identified options the highest Benefit Cost Ratio (BCR). From these analyses, the options with the best value for money and providing the most positive benefits to the community of Ballina were identified. In addition to the MCA and CBA, other factors were considered in the selection of the preferred option as listed below:

- A carbon costing assessment to identify the options with least carbon impact.
- Social factors specific to the areas being assessed.
- The robustness of the option to accommodate increased flood flows.

For the River Moy, Option 1, flood walls was the only option identified. It is the most economic and sustainable solution identified for the River Moy and can accommodate additional flow through the provision of freeboard.

For the Quignamanger, Option 1 and 2 performed similarly in the MCA and CBA. Overall Option 2, culvert upgrade has been identified as the most sustainable solution while also protecting sensitive habitats associated with the current open section near the discharge point to the River Moy. No other factors were identified that required consideration.

For the Bunree, Option 3, new culvert scored highest in the MCA and CBA. The freeboard assessment showed Option 3 to also be the most robust solution to increased flows. No other factors were identified that required consideration.

For the Brusna, Option 1, hard defences was the only option identified. It is the most economic and sustainable solution identified for the River Brusna and can accommodate additional flow through the provision of freeboard.

For the Tullyegan Option 1, hard defences scored highest in the MCA and CBA. A freeboard assessment showed Option 1 to also be the most robust solution to increased flows, requiring the least amount of freeboard and avoids additional impact to agricultural land upstream.

For the Knockanelo, Option 1 a combination of diversion culvert inlet upgrade and culvert upgrade, scored the highest in the MCA and CBA. However, Option 1 would not be able to accommodate additional flows in the Knockanelo Stream. Given that there is a high level of uncertainty associated with the flows in the Knockanelo Stream, Option 1's ability to provide the design SoP would be uncertain. As such Option 1 was not considered the most sustainable option. Option 2, diversion culvert inlet upgrade with online upstream storage scored best after Option 1 in the MCA and CBA. The freeboard assessment identified that Option 2 could only accommodate additional flow if additional flood embankment were provided upstream of the storage dam to protect properties. This potential increased flood risk due to the construction of a storage dam is considered socially unacceptable while other viable options are available. Option 2 was therefore not considered the most sustainable option. Option 5, a combination of diversion culvert inlet upgrade and culvert replacement scored best, after Options 1 and 2 in the MCA and CBA. The freeboard assessment identified that Option 5 can accommodate additional flows with further inlet wing wall modifications. No other

factors were identified that required consideration and Option 5 was therefore identified as the most sustainable option for the Knockanelo.

4.1.3.3 Proposed Option

The proposed options for the Ballina Flood Relief Scheme are as follows:

- River Moy (Option 1) – Flood walls and embankments along the left and right bank of the River Moy. Starting upstream of the Salmon Weir and finishing at Clare Street and Bachelors Walk. Walls will replace existing walls except at Emmet Street where existing walls will be adapted. Flood walls also around the properties at Ballina Quay.
- Quignamager (Option 2) - Culvert upgrade to existing diversion culvert by installing a larger diameter pipe (1.5 m) and flood walls along the edges of the existing open section near the River Moy. The existing culvert under Quay Road will also be upgraded.
- Bunree (Option 3) - Replacing the multiple culverts along the Bunree Stream with one new culvert at 1.2 m diameter, changing into a 1.5 m diameter as it approaches the N59. Removal of a culvert downstream of the N59. Upgrading a field access culvert in the upper reach of the stream.
- Brusna (Option 1) - Flood walls and embankments along the left and right bank of the River Brusna, including spanning across the river at Shanaghy Heights bridge.
- Tullyegan Stream (Option 1)- Flood walls along the left and right bank of the Tullyegan Stream.
- Knockanelo (Option 5) - Diversion culvert inlet upgrade and replacement of the twin culverts in the lower reach of the stream with a large 2.4 m diameter culvert, laid along the southern most route of the twin culverts.

5 DESCRIPTION OF THE PROPOSED SCHEME

The main objective of the Proposed Scheme is to provide flood relief measures along the River Moy and tributaries for all events up to 1% AEP flood event. A new public realm will also be provided along Cathedral Road.

The following sections provide a summary of the works to be carried out on the Moy and the tributaries.

5.1 River Moy

The River Moy is a large watercourse. The channel is unable to convey the flow during a flood event. This is contributed to by both fluvial flows down the river and tidal surge up the river as far as the salmon weir. The following roads are impacted by flooding along with the properties in that area; Ridgepool Road, Barrett Street, Cathedral Road, Emmet Street, Clare Street and Bachelor's Walk. Tidal flood events also cause out of bank flooding at Ballina Quay and River Moy Harbour. The fluvial design event is the dominant flooding mechanism from the salmon weir to around the mid-point between Upper Bridge and Lower Bridge. At this point downstream the tidal design event is the dominant flood mechanism.

The proposed works on the River Moy (**Figure 5-1**) include flood walls and embankments along the left and right bank of the River Moy. These start upstream of the salmon weir and finishing at Clare Street and Bachelor's Walk. Walls will replace existing walls, except at Emmet Street where existing walls will be adapted. Flood walls are proposed around the properties at Ballina Quay.

Mayo County Council is the process of developing a Public Realm scheme for the town of Ballina. Where feasible some of these works will be completed in conjunction with the proposed FRS.

5.2 Quignamanger Stream

The Quignamanger is a small watercourse with numerous culverts. It has been modified further with the addition of a storm diversion culvert. All upstream flows are diverted down the diversion culvert and an additional inlet point, taking all the remaining flow from the Quignamanger Stream, is located along the lower reach. During a flood event the diversion culvert, at the second inlet, reaches capacity. The inlet and downstream manhole are surcharged resulting in out of bank flooding which travels overland through Rathmeel Lawns housing estate and Creggs Road. Additional head losses were identified at the diversion culvert's outlet where a weir and flap valve system are located. The culvert which conveys flow under Quay Road is also undersized.

The proposed works on the Quignamanger consist of an upgrade of the existing culvert from 0.9 m diameter to 1.5 m diameter running along the existing stream route. The new diversion culvert will discharge into he open reach at the current discharge location. The existing flap valve will be removed. Flood walls (0.5 m) will be put in place along the sides of the open reach of the channel. The existing culvert under Quay Road will be replaced with a larger (1.5 m) culvert (**Figure 5-2**).

5.3 Bunree / Behy Road Stream

The Bunree is a small watercourse with numerous culverts of various shapes and sizes. Many of these culverts are undersized and constrict the flow so that out of bank flooding occurs upstream of the inlets. Out of bank flooding therefore occurs in numerous locations along the Behy Road.

The proposed works on the Bunree/Behy Road consist of a new culvert replacing the existing culvert and open channel, running along the existing stream route. The proposed culvert would be 1.2 m diameter. The new culvert would start at the industrial estate with one field access bridge requiring upgrading further upstream (**Figure 5-3**).

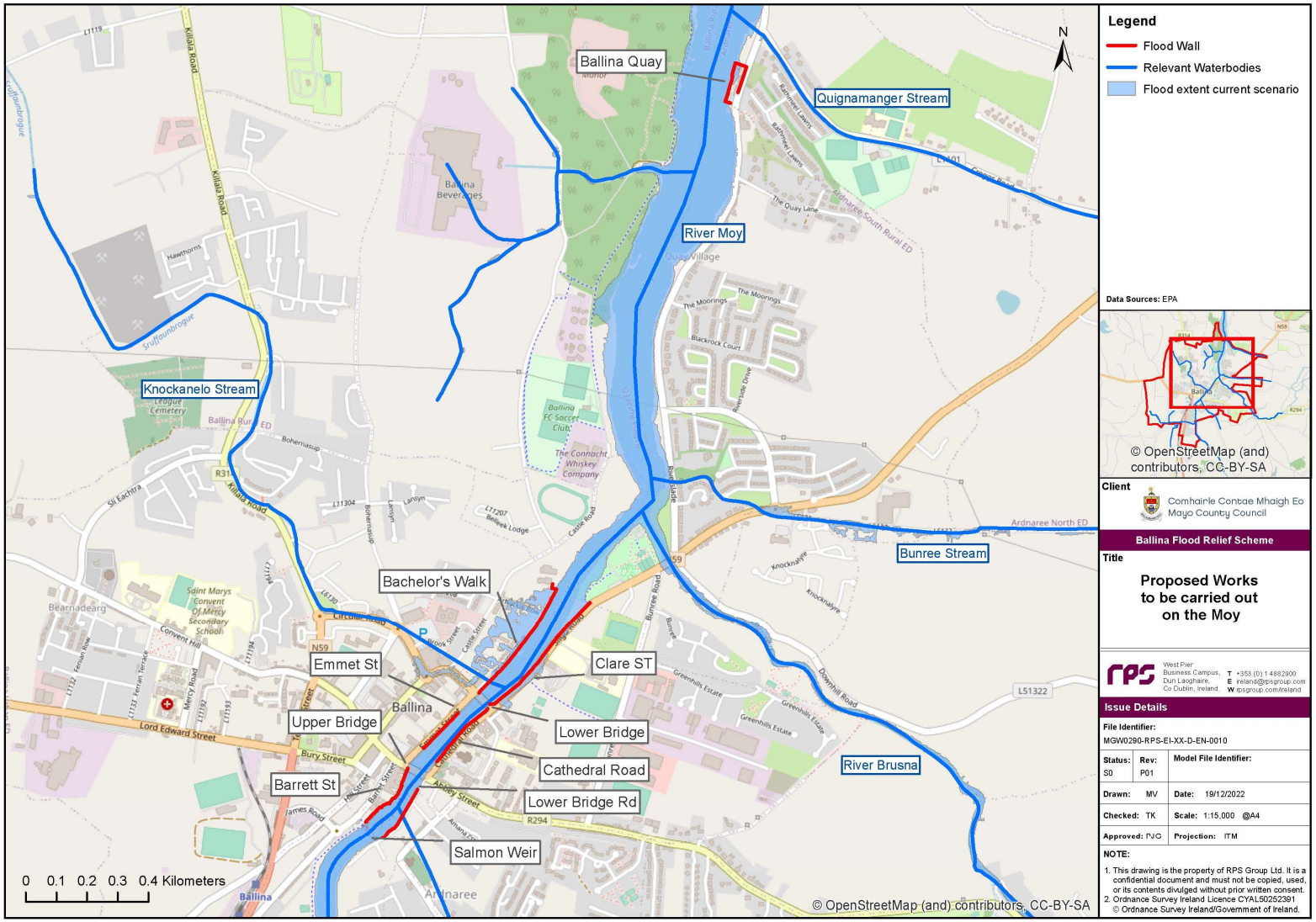

Figure 5-1: Proposed works to be carried out on the River Moy

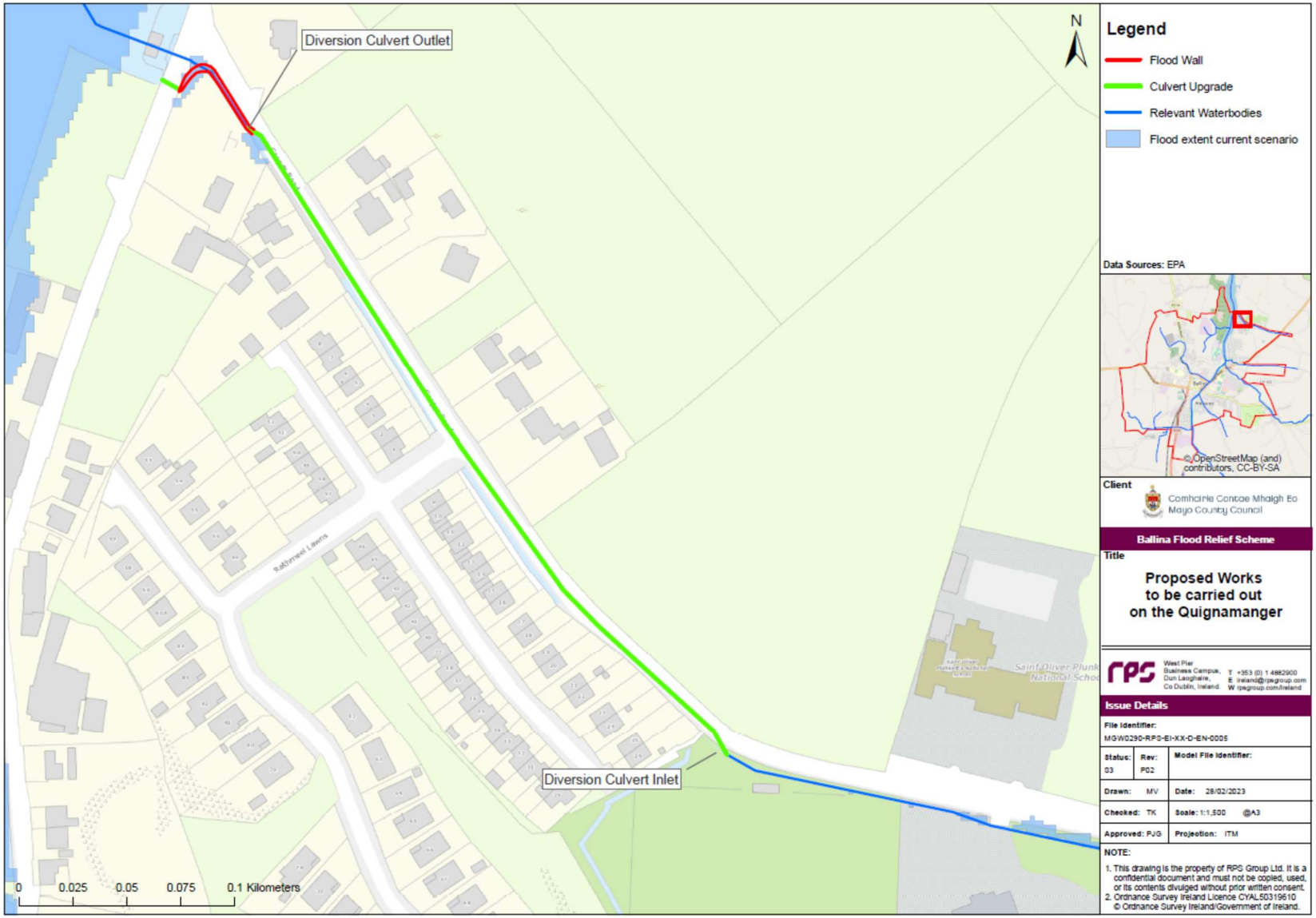

Figure 5-2: Proposed works to be carried out on the Quignamanger Stream

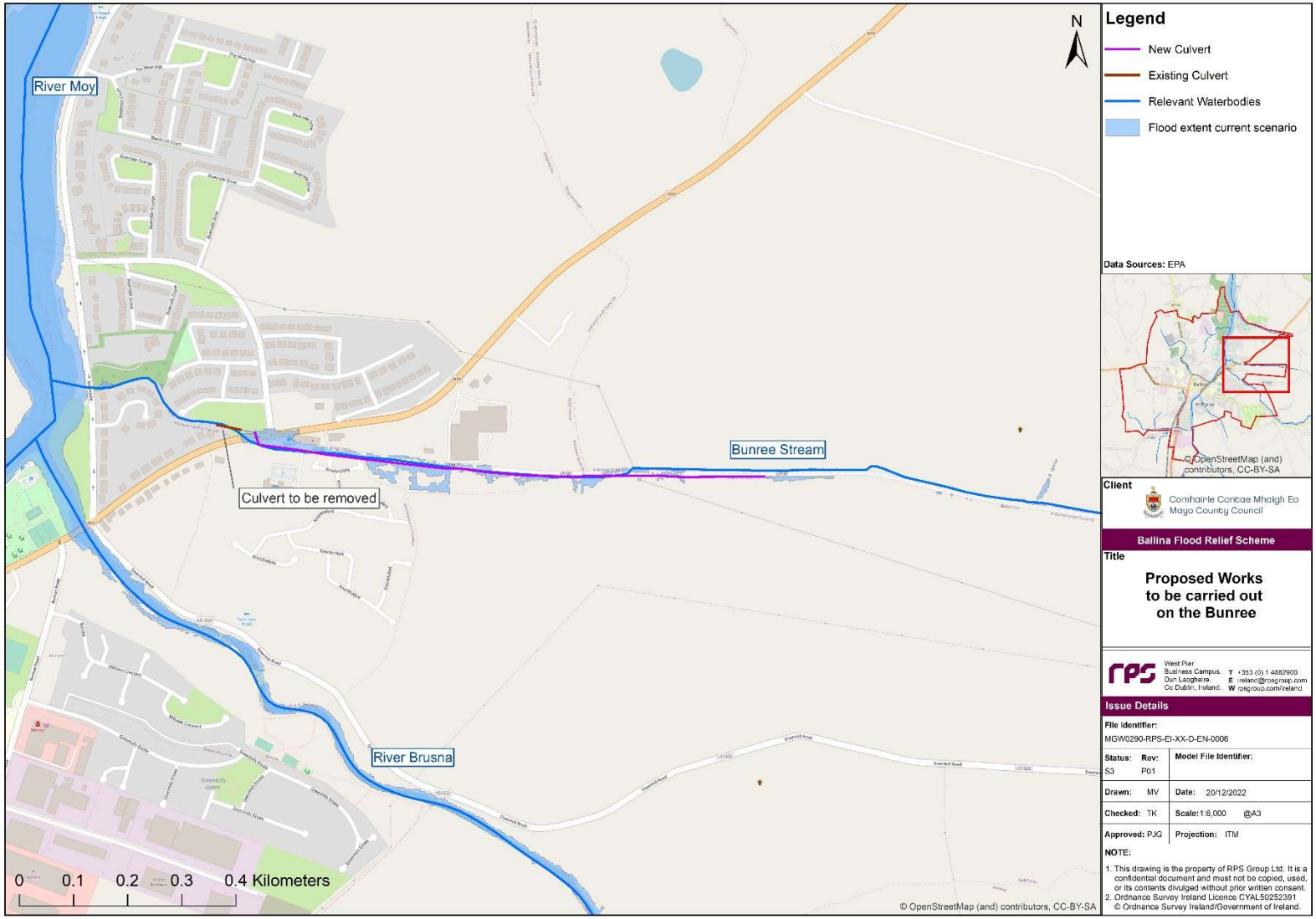

Figure 5-3: Proposed works to be carried out on the Bunree Stream

5.4 Brusna (Glenree) River

The Brusna (Glenree) is a small to medium river. One section of the river, in the Shanaghy Heights area, shows a potential flood risk to properties and infrastructure. The road bridge providing the only access to and from Shanaghy Heights also constricts the flow creating higher than normal water levels upstream of it.

The proposed works on the Brusna (Glenree) River includes for hard defences consisting of flood walls and embankments with an average defence height of 0.8 m and maximum height of 1.7 m. Works will also include for a beam in front of the existing bridge to support the flood defence across the bridge and raising of the access road to the bridge (**Figure 5-4**).

5.5 Tullyegan Stream

The Tullyegan is a small, mainly open watercourse. The potential for a flood event out of bank flood occurs in one location due to a reach of the channel which is unable to convey the flow along with the N26 road bridge which constricts the flow downstream causing raised water levels.

The proposed works on the Tullyegan includes for hard defences consisting of flood walls with an average defence height of 0.3 m and maximum height is 0.5 m. The defences will tie into the railway embankment at the upstream end (**Figure 5-5**).

5.6 Knockanelo Stream

The Knockanelo is a small watercourse. It has been heavily modified with twin culverts making up the lower reach before it discharges to the River Moy. In the middle reach some flow is diverted into a diversion culvert which then takes an alternate route before discharging into the River Moy.

The inlet is undersized with the potential to cause out of bank flooding resulting in overland flows at Marian Crescent (housing areas), Circular Road, Humbert Street and Dillon Terrace. Flooding is added to where some manholes are surcharged. Manhole surcharging is due to a combination of the flow in the culvert and the backwater levels caused by flood conditions in the River Moy.

Although not a contributing factor to flooding, the diversion culvert design to alleviate flood risk has been shown to be inefficient.

The proposed works on the Knockanelo (**Figure 5-6**) includes the diversion culvert inlet upgrade and replacement of the twin culverts in the lower reach of the stream with a large 2.4m diameter culvert, laid along the southern most route of the twin culverts.

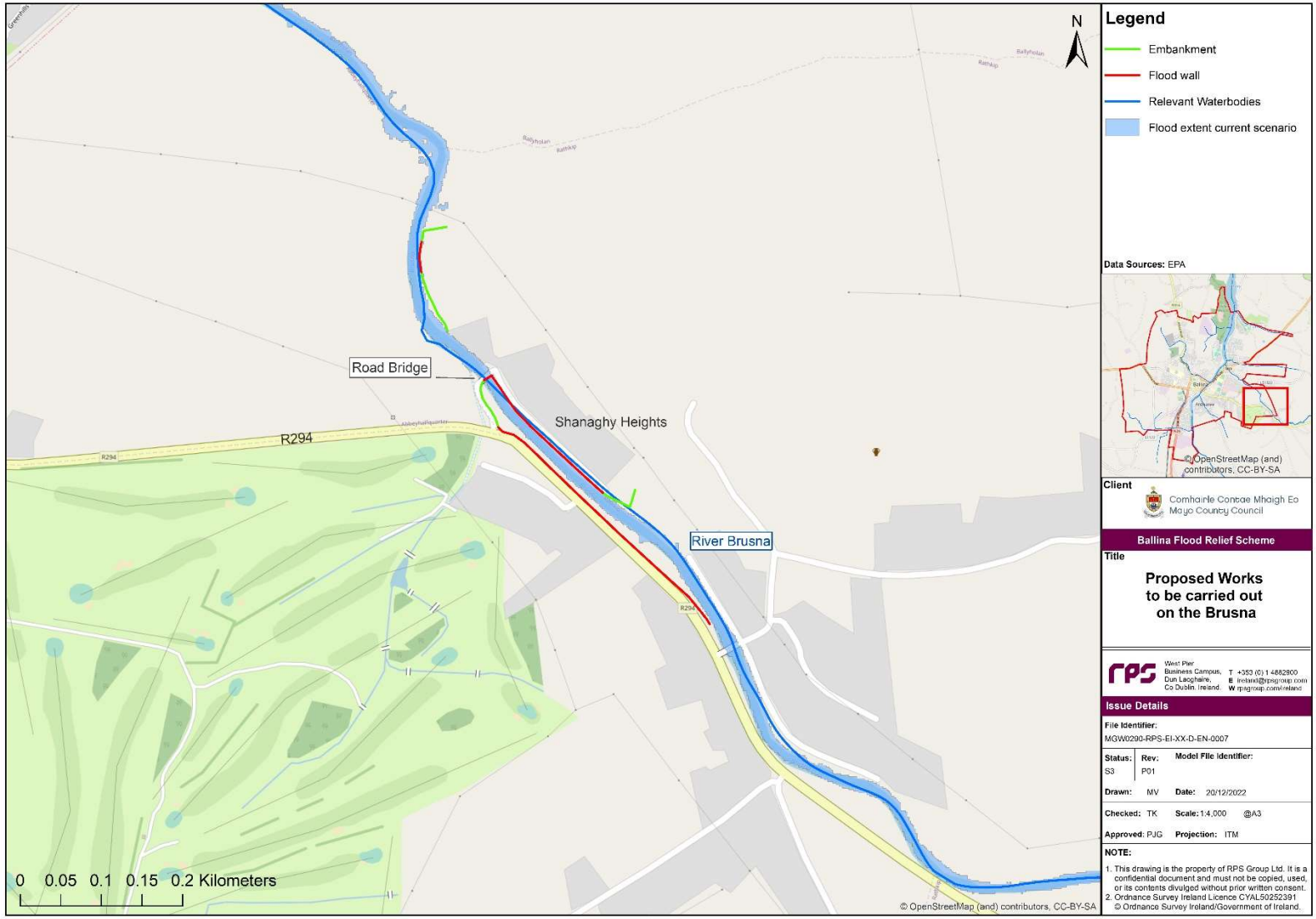

Figure 5-4: Proposed works to be carried out on the River Brusna

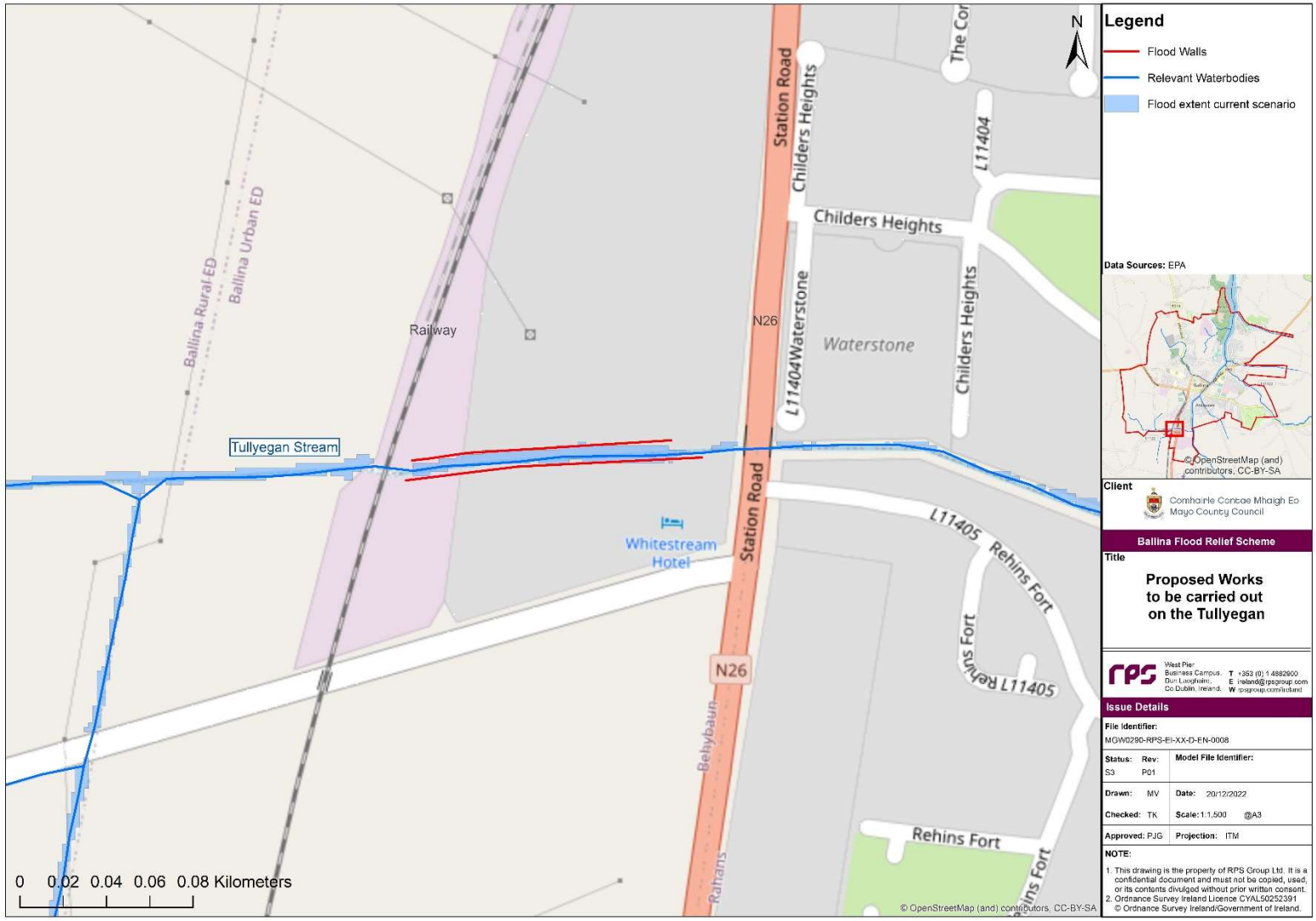

Figure 5-5: Proposed works to be carried out on the Tullyegan Stream

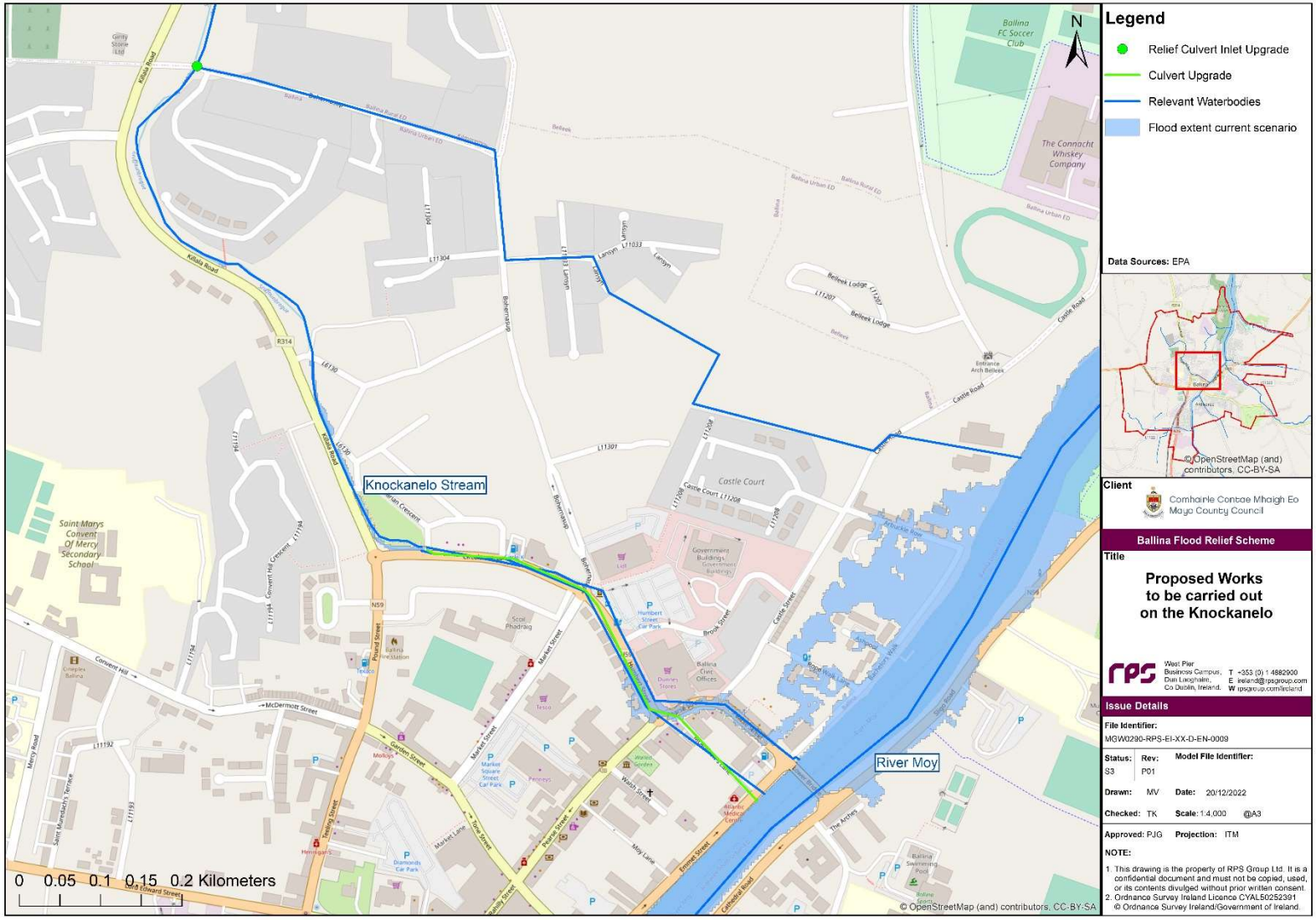

Figure 5-6: Proposed works to be carried on the Knockanelo Stream

6 PROPOSED SCOPE OF THE EIAR

In accordance with Annex IV of the EIA Directive, the environmental factors to be addressed in the EIAR are:

- Traffic and Transportation
- Population
- Human Health
- Biodiversity (Aquatic and Terrestrial)
- Land, Soils and Hydrogeology
- Water
- Air Quality
- Climate
- Noise and Vibration
- Material Assets (Utilities, Waste, and Landtake)
- Cultural Heritage
- Landscape and Visual
- Major Accidents or Disasters

Each environmental factor is addressed in section 6-1 to 6-15 by identifying the following:

- Scope of Assessment
- Likely Significant Effects
- Proposed Assessment Methodology

Each assessment will look at direct, indirect and cumulative effects associated with the Proposed Scheme. Interactions between disciplines and cumulative effects with other projects will be also assessed. A Schedule of Environmental Commitments will be compiled in the EIAR to outline all mitigation identified for the Proposed Scheme. Temporary and permanent effects will be considered. Mitigation measures may not be limited to construction phase. Best practice mitigation measures will be proposed to ensure no significant emissions of dust are released from construction activities

It is not expected that the Proposed Scheme will entail a decommissioning phase. Due to the type of project and nature of proposed works, the majority of impacts will occur during the construction phase and once constructed, the Proposed Scheme will provide positive impact/benefits to the town of Ballina. There will be minimal operational and maintenance requirements associated with the Proposed Scheme.

6.1 Traffic and Transportation

6.1.1 Scope of Assessment

This assessment will identify the potential impact of the Proposed Scheme on the existing roads and active travel measures within the vicinity of the Proposed Scheme.

The baseline assessment will include assessing the road widths and characteristics within the urban area to see what impact the works could have on the operating capacity of the routes (i.e in terms of maintaining full traffic movements). As it will have a direct impact on an urban area, the baseline assessment will comprise a full review of the pedestrian and cycling routes to establish what works are required to ensure full connectivity as the scheme is being undertaken.

The location of site compounds will have a significant impact on the scale of impact on the local roads and active travel measures. The sensitive receptors are the roads along the sides of the River Moy through Ballina as these are National Roads and key routes through the town. In addition, there are public realms facilities and parking along the waterside which will need to be maintained as much as possible throughout the works.

In addition, the impact on the residential estates in the vicinity of the culvert works at Knockanelo, Bunree and Quignamanger will need to be assessed to ensure full accessibility is provided at all times.

Traffic management measures will be required and considered in the assessment.

6.1.2 Likely Significant Effects

Construction phase

During construction, activities such as construction of the flood defences, removal of the quay wall, installation of culverts, etc. have the potential to result in increases in traffic and impacts to accessibility of residential and commercial development, the operating capacity of the local roads, full connectivity of active travel facilities and public transport services and parking.

Operational Phase

The operational and maintenance phase of the Proposed Scheme has no potential for impacts on roads and active travel measures due to the limited nature and type of maintenance activities proposed. The proposed scheme may include the benefit of reducing the risk of flooding of roads.

6.1.3 Proposed Assessment Methodology

Table 6-1 provides details on the baseline data sources to be used to inform the traffic and transportation assessment; the surveys proposed to inform the baseline; the relevant standards and guidance that will be used to inform the assessment methodology and a list of organisations that will be contacted regarding the assessment.

Table 6-1: Traffic and Transport Scope of Assessment

Scope of Assessment	Summary of Scope of Work
Baseline data sources to inform	Traffic Survey data (Automatic Traffic Count data completed for Mayo County Council in August 2022)
	OSI Mapping
	Road Collison Data
	Census Commuting Data
Baseline survey to inform	A survey of the characteristics of the roads and active travel measures impacted by the works
Relevant standards and guidance	Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022)
	Transport Assessment Guidelines (TII, May 2014)
Proposed consultation	Mayo County Council
	Transport Infrastructure Ireland (TII)

6.2 Population

6.2.1 Scope of Assessment

This assessment will identify the potential impact of the Proposed Scheme on population, including employment, socio-economic impacts and impacts on local amenities and residential amenity within the study area.

It will also have regard to the findings of the Traffic and Transportation, Air Quality, Noise and Vibration, Human Health and Water assessments, as relevant.

An understanding of demography and employment in the area is of crucial importance to assessing the receiving human environment. The primary official record and analysis of demographic trends is the Central Statistics Office (CSO) Census of Population. The census records demographic information at state, county, and local levels. In this regard, the key geographical units distinguished by the 2022 Census is the Small Area (SA) and Electoral Division (ED). The most recent census was taken in 2022, however much of the data gathered in this census has not yet been published. Relevant available data from the 2022 census, in addition to 2016 and 2011 census data, will be used. It should also be noted statistics and projections for various indicators are updated regularly outside of the national census.

A detailed analysis of the demographic trends within the study area and local and wider environs will be undertaken, identified by SA and/or ED as appropriate, with reference to the most recent census statistics and the work undertaken to date. These results will then be compared with similar data recorded in the census publications of 2011 and 2016 (where relevant). This gives a ten-year profile of population and population change. Areas of analysis will include:

- Population numbers
- Employment levels
- Principal occupations
- Unemployment rates

Local amenities, community facilities, retail and commercial activities will also be described. Any landtake impacts will be considered in Material Assets – Landtake.

It is envisaged that the study area will include all electoral divisions within which FRS works are proposed.

6.2.2 Likely Significant Effects

Construction phase

During construction activities such as construction of the flood defences, removal of the quay wall, installation of culverts, etc. have the potential to result in the following likely significant effects on population:

- Increased employment and economic activity arising from construction and related activities.
- Potential negative impacts and disturbance to the community, including increases in ambient noise and dust levels, greater levels of traffic, road closures and diversions.
- Access to the River Moy for recreation may be impacted during construction.

Operational Phase

During the operation phase, likely significant effects on population arising from the project include:

- Provision of protection from flood thereby facilitating increased economic activity, employment, and potential opportunities for improvements to the public realm and socioeconomic effects.
- Residential amenity may be compromised by the loss of lands / impacts on accessibility.
- Visual aspects of the project impacting on the enjoyment the population takes in their natural / built environment.

- Light overspill may impact on population and possibly human health. Further detail on the design and potentially a light spill study may be required to assess the potential impact of this aspect.
- Access to the River Moy for recreation may be impacted during operational phase.

6.2.3 Proposed Assessment Methodology

Table 6-2 provides details on the baseline data sources to be used to inform the assessment on Population, the surveys proposed to inform the baseline, the relevant standards and guidance that will be used to inform the assessment methodology and a list of organisations that will be contacted regarding the assessment.

Table 6-2: Population Scope of Assessment

Scope of Assessment	Summary of Scope of Work
Baseline data sources to inform	CSO
	Pobal
	Tusla
	Project Ireland 2040 - National Planning Framework & National Development Plan 2021-2030
	Mayo County Development Plan 2022-2028
	ESRI Quarterly Economic Commentary
	Google Earth
	Housing Agency
	Ordnance Survey Ireland Mapping
	Department of Housing Planning & Local Government / Myplan.ie
	Department of Education
	Regional Spatial and Economic Strategy 2020-2032 (RSES)
	Other technical disciplines as relevant e.g. Air Quality, Noise and Vibration, Traffic and Transport, Climate Change and Risk of Major Accidents
Baseline survey to inform	Desktop analysis of the local area and its facilities including population level, population age structure, households and economic activity
	Windshield survey to confirm general land uses around the Project elements and provide an overview of the area and its environs
Other	The chapter will include reference to surveys undertaken as part of other technical disciplines such as Air Quality, Noise and Vibration, Traffic and Transport, Climate, Human Health and Major Accidents or Disasters
Relevant standards and guidance	Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022)
	Guidelines on the Treatment of Tourism in an Environmental Impact Assessment (Fáilte Ireland, 2011)
Proposed consultation	Mayo County Council
	Fáilte Ireland

6.3 Human Health

6.3.1 Scope of Assessment

The human health assessment within the EIAR will bring together the relevant conclusions of the impact assessments made in other topics of the EIAR. Human health will be informed by analysis undertaken within relevant topics, including, air quality, noise, populations, traffic and transport. In addition, the human health chapter will consider wider determinants of health not covered by other EIAR chapters.

The human health assessment will take a population health approach, informed by discussion of receptors within the topic specific EIA chapters. For each determinant of health, the human health EIAR chapter will identify relevant inequalities through consideration of the differential effect to the 'general population' of the study area and effects to the 'vulnerable population group' of that study area.

The scope of the assessment will consider the World Health Organisation (WHO) definition of health, which states that health is "a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity" (WHO, 2005). The focus of the human health assessment within the EIAR will be on community health and wellbeing and not on occupational health and safety. The potential for Major Accidents and Natural Disasters arising from the Proposed Scheme is considered separately in **Section 6.15**.

The human health assessment will be informed by the study areas, zones of influence and receptors impacted or potentially impacted by air quality, noise, water quality, traffic and transport, and population impacts. This will enable the effects on human health to be better understood. It is noted that the study areas for these topics do not necessarily define the boundaries of potential population health effects. As such, the Human Health assessment will also define a Human Health study area in order to broadly characterise representative population groups, which will focus on electoral divisions within County Mayo and Ireland averages as comparators.

The wider determinants of health and health inequalities are key considerations when undertaking an assessment of human health as part of EIAR. The following population groups are present and will be considered:

- The 'general population' including residents, workers, service providers, and service users.
- The 'vulnerable group population' including potential vulnerability due to: young age, older age, low income, poor health status, social disadvantage, restricted access or geographic proximity to Proposed Scheme activities.

6.3.2 Likely Significant Effects

Likely significant effects and scoping conclusions for the Proposed Scheme are based on the tools used by the Institute of Public Health (IPH, 2021) and Institute of Environmental Management & Assessment (IEMA, 2022). The scoping exercise undertaken was informed by the following guiding principles contained in the IEMA guidance (IEMA, 2022):

- The scoping exercise should be robust and complete, based on the information available (as set out in **Section 5**).
- Scoping sought to be proportionate, i.e. focused on the likely and potentially significant effects on population health due to the Proposed Scheme.

Table 6-3 identifies the determinants of health that were scoped in for further assessment. Determinants of health not considered for further assessment is provided in **Appendix B**. The scoping exercise was undertaken for the Proposed Scheme's construction and operational phases (as a flood relief scheme, it is not expected that the Proposed Scheme will entail a decommissioning phase).

Table 6-3: Determinants of Health Scoped in for Assessment

Categories	Wider determinants of health	Justification
Social environment	Housing	It is assumed that the construction workforce for the Proposed Scheme will mostly be local. An influx of workers (and their families) that could lead to significant pressure on local housing availability is considered unlikely, this issue is scoped out. During operation, the Proposed Scheme will increase protection of commercial and residential areas from flood risk; this is expected to have a beneficial effect in reducing the physical and mental health effects of flooding, as well as also reducing the incidence of secondary effects of health, such as poor housing quality and damp as a result of flooding. It is also assumed that the Proposed Scheme is not likely to lead to

		increased flooding elsewhere. Operational benefits of flood relief to housing are scoped in.
	Open space, Leisure and Play	The construction phase of the Proposed Scheme may lead to temporary disruption of river accesses (thus potentially disrupting recreational activities such as fishing or water sports), as well as accesses to, or use of (due to e.g. construction noise), public open spaces, including public parks and sports facilities located in the vicinity of the river Moy (public parks, basketball court), and greenfield land along the river Brusna and along the sections proposed for culverting works. Temporary construction disruption of accesses to green and blue open space is scoped in. The human health chapter will also assess the Proposed Scheme's impact on access to open spaces and play spaces during the operational phase; any changes to the provision of pedestrian or cycling infrastructure that may positively or negatively affect access to open spaces and opportunities for physical activity. Any potential changes to the provision of parking spaces, in particular for vulnerable groups will be assessed. As the Proposed Scheme will protect the public realm from flooding, including Ballina town centre and amenities, there is also a potential significant beneficial effect of the Proposed Scheme in increasing continued access to open spaces through flooding prevention. These operational benefits are scoped in.
	Transport Modes, Access and Connections	There is the potential that construction works (construction site activities as well as vehicle traffic associated with construction activities) may disrupt local vehicle traffic (private and public transport) as well as active travel (pedestrian and cycle traffic). The population health effects during construction of increases in health, education, social care and commuting journey times and the potential reduction in active travel is scoped in. During operation the human health assessment will consider likely significant beneficial effect of safeguarding accesses from flooding, thus safeguarding active travel routes, commuting routes, emergency services, and access to health and education facilities. These operational benefits are scoped in.
Economic environment	Employment and Income	Construction activities may disrupt businesses through the disruption of access to businesses facilities, including temporary loss of pedestrian walkways, parking or temporary traffic disruption. Additionally, there is likely to be an increase in employment opportunities during construction activities. The human health assessment will assess the population health effects of potential changes to employment and income during construction, this issue is scoped in. During operation, the Proposed Scheme will safeguard businesses from flooding thus mitigating against loss of income and employment as a result of flooding. Likely significant beneficial effects on population health as a result of the Proposed Scheme's operation are scoped in. The scale of operational employment is expected to be modest and is scoped out.
Bio-physical environment	Noise and Vibration	The project's construction activities are likely to have an effect on noise and vibration on human receptors in the vicinity of the construction works. The human health assessment will be informed by the noise and vibration assessment and will consider the effects on population health from noise disturbance during construction, this issue is scoped in. Operational effects from noise and vibration are scoped out.
Institutional and built environment	Wider Societal Infrastructure and Resources	Construction effects are scoped out. Operational benefits of the Proposed Scheme in adapting to severe weather, including due to climate change, and thereby protecting public health directly and indirectly, including through safeguarded communities and their supporting infrastructures and services is scoped in.

6.3.3 Proposed Assessment Methodology

Table 6-4 provides details on the baseline data sources to be used to inform the assessment on Human Health; the surveys proposed to inform the baseline; the relevant standards and guidance that will be used to inform the assessment methodology; and a list of organisations that will be contacted regarding the assessment.

Table 6-4: Human Health Scope of Assessment

Scope of Assessment	Summary of Scope of Work

Baseline data sources to inform	• Central Statistics Office (CSO) • Pobal • Project Ireland 2040 - National Planning Framework & National Development Plan 2018-2027 • Government of Ireland, Healthy Ireland outcomes framework 2019 • Regional Spatial & Economic Strategy for the Northern and Western Region • Mayo County Development Plan 2022-2028 • Other EIA technical disciplines as relevant
Baseline survey to inform	• Desktop analysis of the local population health data using publicly available statistics. Where data is available small area statistics will be used, e.g. electoral division, other data will be at the local authority level. • An Electoral Division study area population will be profiled; this will provide representative small area data, e.g. indicating more deprived areas. • The baseline will inform the identification of relevant vulnerable groups, e.g. with increased sensitivity due to age, income level, health status, social disadvantage or access and geographical factors.
Relevant standards and guidance	• Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022) • Institute of Public Health, Health Impact Assessment Guidance (IPH, 2021) • Effective scoping for Human Health in Environmental Impact Assessment (IEMA, 2022a) • Determining Significance for Human Health in Environmental Impact Assessment (IEMA, 2022b) • World Health Organisation (WHO) guidelines on air quality and noise (Berglund *et al.*,1999; WHO, 2021; WHO, 2018; and WHO, 2009)
Proposed consultation	The assessment will be informed by project wide consultation. In line with proportionate assessment, and acknowledging EIA includes appropriate consultation that will inform the assessment, no health specific consultation with the community of health stakeholders is proposed. This decision will be reviewed if the assessment identifies the likelihood of residual significant adverse population health effects.

6.4 Biodiversity – Aquatic

6.4.1 Scope of Assessment

This assessment will identify the potential impact of the Proposed Scheme on aquatic ecological receptors within the study area.

The study area primarily comprises the main channel of the River Moy between the confluences of the Tullyegan and the Quignamanger streams and includes the main channels and side branches of the Moy tributaries: Quignamanger, Bunree, Brusna (Glenree), Knockanelo and Tullyegan.

The sections of watercourse subject to proposed works are the primary focus of the Biodiversity - Aquatic discipline. An additional Zone of Influence (ZoI) is considered in relation to proposed works and their potential to generate effects on aquatic ecological receptors either upstream or downstream. For example, potential sediment entrainment impacts on downstream receptors and/or potential migration effects on upstream or downstream fisheries values.

The study area covers the following river waterbodies (RWBs) and Transitional waterbody (TWB):

- Moy_120 (RWB code: IE_WE_34M021100) [*River Moy and Knockanelo Stream*]
- Moy Estuary (TWB code: IE_WE_420_0300) [*Estuarine River Moy*]
- Tullegan_010 (RWB code: IE_WE_34T830920) [*Tullyegan Stream*]
- Glenree_030 (RWB code: IE_WE_34G010200) [*River Brusna*]

- Dooyeaghny_or_Cloonloughan_010 (RWB code: IE_WE_34D310990) [*Bunree and Quignamanger*]

The main channel of the River Moy is tidal up as far as the salmon weir. The study reach is classified as transitioning from fluvial to estuarine, but is freshwater dominated within the potentially affected reach.

The entire main channel study reach is covered by Natura 2000 designations. The Lower River Moy from the Abbey Street Bridge downstream is within the Killala Bay/Moy Estuary SAC (Site Code: 000458), while upstream of Abbey Street Bridge the River Moy is within the River Moy SAC (Site code: 002298). From these designations the following species are aquatic qualifying interests with relevance to the proposed scheme and the Biodiversity (Aquatic) discipline: Atlantic salmon (*Salmo salar*), Sea Lamprey (*Petromyzon marinus*) Brook Lamprey (*Lampetra planeri*), White-clawed crayfish (*Austropotamobius pallipes*).

In a wider context, water quality, instream habitat quality and fisheries value of each of the potentially affected watercourses are of relevance to the Biodiversity (Aquatic) impact assessment for the proposed scheme.

6.4.2 Likely Significant Effects

Construction phase

During construction, proposed works with an instream footprint and those that occur near water have potential to result in the following significant effects and impacts:

- Waterborne pollutant (sediment, hydrocarbon, concrete/mortar) entrainment to surface waters with resulting impact on instream habitats, macroinvertebrates, fish and plant communities.
- Removal of riparian vegetation along watercourses resulting in loss of cover for instream species and loss of instream thermoregulation function.
- Temporary fish barriers and/or disturbance to fish migration as a result of temporary river/stream diversions relating to culvert insertion/upgrade.
- Temporary disturbance to fish migration as a result of instream works such as flood defence wall construction/repair, sheet piling, pile driving and ancillary works.
- Temporary loss of habitat as a result of temporary instream works platforms / cofferdams.
- Direct mortality of juvenile lamprey at river margins as a result of temporary works within the main channel of the River Moy and River Brusna (Glenree).
- Direct mortality of salmonids, lampreys and other fish as a result of stream diversion (e.g., tributaries) and cofferdam construction (e.g. Rivers Moy and Brusna (Glenree)).
- Transfer of Invasive Alien Species (IAS) between or within sub-catchments, e.g., crayfish plague, invasive plants along riparian corridors.

Operational Phase

During the operation and maintenance phase, the potentially significant impacts on aquatic receptors may include:

- Introduction of permanent fish migration barriers as a result of inappropriate culvert design and installation on tributaries where those are fish-bearing.
- Permanent loss of instream habitat as a result of increased culvert lengths on tributaries, where those are of at least Local (higher) significance, i.e., with at least some potential salmonid or other fisheries value.
- Permanent changes to hydromorphology that may affect fisheries habitats, biological water quality, instream plant communities with subsequent impact on ecological status.

Opportunities for improving aquatic habitats will be investigated within the EIA.

6.4.3 Proposed Assessment Methodology

Table 6-5 provides details on the baseline data sources to be used to inform the assessment on Aquatic Biodiversity; the surveys proposed to inform the baseline; the relevant standards and guidance that will be used to inform the assessment methodology and a list of organisations that will be contacted regarding the assessment.

Table 6-5: Aquatic Biodiversity Scope of Assessment

Scope of Assessment	Summary of Scope of Work
Baseline data sources to inform	Environmental Protection Agency (EPA) maps and data
	Water Framework Directive (WFD) maps and data (https://www.catchments.ie/)
	NPWS maps and data (https://www.npws.ie/maps-and-data)
	Geohive historical mapping (https://www.geohive.ie/)
	Geological Survey of Ireland (GSI) mapviewer
	National Biodiversity Data Centre (NBDC) maps and data
	Inland Fisheries Ireland (IFI) and WFD fish survey data
Baseline survey to inform	All watercourses potentially affected by proposed scheme measures will be subject to walk-over survey and, at selected sites, will undergo targeted instream habitat, fisheries and biological water quality (Q-value) evaluation. The aim of baseline studies is to fully characterise each of the potentially affected watercourses in terms of aquatic habitats, fisheries value, protected species and overall ecological quality and value.
	Aquatic habitat characterisation: • Q -value assessment at selected points in relation to proposed works. • Surveys of watercourses at selected reaches in relation to proposed works to identify aquatic receptors, including salmonid, crayfish and lamprey habitat assessment, macroinvertebrate (Q-value) survey, crayfish survey and general aquatic plant and general habitat descriptions with hydromorphological character recorded.
Relevant standards and guidance	Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022)
	Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2018)
	Guidelines for assessment of ecological impacts of national road schemes. Versions 1 and 2 (NRA, 2003, 2009)
	Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (IFI, 2016)
Proposed consultation	Inland Fisheries Ireland (IFI)
	National Parks and Wildlife Service (NPWS)

6.5 Biodiversity – Terrestrial

6.5.1 Scope of Assessment

This assessment will identify the potential impact of the Proposed Scheme on terrestrial biodiversity within the study area. The study area will comprise an area approximately 150 m either side of proposed works area to establish zone of ecological influence.

Key baseline conditions and sensitivities that will be considered include:

- European Sites
- Nationally designated sites

- Rare and protected species including Qualifying Interest (QI) and Site of Community Importance (SCI) Species
- Annex I Habitats including QI Habitats
- Other areas of biodiversity value
- River/stream interactions
- Birds
- Mammals
- Invasive species
- Major aquifers and dependent ecosystems

6.5.2 Likely Significant Effects

Construction phase

During construction, activities such as removal of quay walls, installation of culverts, etc. have the potential to result in the following likely significant effects on terrestrial biodiversity:

- Disturbance/destruction of Annex I habitats – Floating River Vegetation [3260], Tidal Mudflats [1140], Estuaries [1130]
- Disturbance/destruction of otter resting spots i.e. holts
- Disturbance/destruction of bat roosts
- Disturbance of over-wintering waterbirds
- Disturbance of breeding birds
- Disturbance and spreading of Invasive Alien Plant Species (in particular Japanese knotweed)

Operational Phase

During operation and maintenance phase, activities have the potential to result in the following likely significant effects on terrestrial biodiversity:

- Disturbance of protected mammal resting sites via flooding of resting areas
- Disturbance of Annex I Habitat Floating River Vegetation [3260] via increased outflow directly upstream of this habitat

Opportunities for improving terrestrial habitats will be investigated within the EIA.

6.5.3 Proposed Assessment Methodology

Table 6-6 provides details on the baseline data sources to be used to inform the assessment on Terrestrial Biodiversity; the surveys proposed to inform the baseline; the relevant standards and guidance that will be used to inform the assessment methodology and a list of organisations that will be contacted regarding the assessment.

Table 6-6: Terrestrial Biodiversity Scope of Assessment

Scope of Assessment	Summary of Scope of Work
Baseline data sources to inform	National Parks and Wildlife Service (NPWS)
	National Biodiversity Data Centre
	Heritage Council Mapping
	ESM Webtool hosted by UCD
	Mayo County Development Plan

	EPA mapping (EPA GIS and catchments.ie)
	EPA Water Quality Data
	GSI mapping
	OSI mapping
	BSBI Mapping
	Irish Red Data Lists
	Information on the conservation status of birds in Ireland (Gilbert et al., 2021)
	Irish Wetland Bird Species (I-WeBS) data
	Bat Conservation Ireland Records
Baseline survey to inform	Habitats (intertidal, agricultural, woodland, hedgerow and built environment): • Fieldwork approximately 150 m either side of proposed works area to establish zone of ecological influence. • The entire length of the route will be walked as will lands required for any construction related elements (such as temporary works areas). Other lands adjacent to the route identified during the field survey may also require surveying. • This survey will include potential for protected species (habitats, structures etc.).
	Protected species – species-specific/activity surveys (bats, otters, badgers etc.) will be undertaken where suitable habitat is identified from the terrestrial habitat surveys above.
	Flora and invasive alien species (Japanese knotweed proximal to a number of works area – will be undertaken as part of the terrestrial habitats survey.
	Breeding birds - for the proposed works area; monthly walkover survey for breeding birds.
	Overwintering water birds – focus would be on the intertidal area of the River Moy Estuary. At least one season (i.e. winter 2022-2023) of overwintering waterbird usage of the Moy estuary.
	The requirement to undertake additional or specific surveys separate from those listed above (which were identified from a review of online databases) cannot be ruled out e.g. amphibian. This may also be relevant based on location of proposed infrastructure and/or site compounds.
Relevant standards and guidance	Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022)
	Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2018)
	Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (IFI, 2016)
	A guide to habitats In Ireland. The Heritage Council, Ireland; Fossitt, J. (2000)
	Best Practice Guidance for Habitat Survey and Mapping. The Heritage Council. Smith, G, F, O'Donoghue, P, O'Hora, K, Delaney, E. (2011)
	Bat Surveys: Best Practice Guidelines, 3rd Edition. Bat Conservation Trust (2016)
	Environmental Planning and Construction Guidelines Series (National Roads Authority, 2005 – 2011)
	Bird Atlas 2007-11 The breeding and wintering birds of Britain and Ireland Blamer, D., Gillings, S., Caffrey, B., Swann, B., Downie, I., Fuller, R. (2013)
	Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes (NRA, 2008)
	Bat Mitigation Guidelines for Ireland v2. Irish Wildlife Manuals, No. 134. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin. Marnell, F., Kelleher, C. & Mullen, E. (2022)
Proposed consultation	National Parks and Wildlife Service (Development Applications Unit)
	Inland Fisheries Ireland
	Mayo County Council (Heritage/Biodiversity Officers)
	BirdWatch Ireland

6.6 Land, Soils and Hydrogeology

6.6.1 Scope of Assessment

This assessment will identify the potential impact of the Proposed Scheme on land, soils, geology, and hydrogeology within the study area. The study area incorporates the wider environs adjacent to the River Moy within the extents of the area underlain by the Ballina Groundwater body, which underlies the proposed works.

The assessment will have regard and make reference to other related chapters of the EIAR such as Material Assets, Biodiversity-Aquatic and Water, as relevant.

Information for key baseline features will be compiled from various sources including the Geological Survey Ireland (GSI), Ordinance Survey Ireland (OSi), Mayo County Council and the EPA to provide information on land, soils, geology, and hydrogeology within the study area.

The GSI's spatial viewer will be consulted to identify variations in soils and subsoil type and thickness across the study area as well as locations of potential soft soil deposits and mineral and/or aggregate resources.

An initial high level review reveals that superficial soil deposits within the study area are predominantly comprised of limestone till, generally greater than 3 m in thickness, with alluvial deposits present in the river/floodplain areas. The underlying bedrock comprises Carboniferous Limestone from the Dinantian series and the study area is underlain by dark grey calcareous limestones and shales of the Ballina Limestone Formation (BU). Depth to bedrock is likely to be between 5.0-10.0 m below the surface. There is one geological heritage area within the study area. The River Moy is designated a County Geological Site due to its significance as one of the best examples of a U-shaped River channel. Geological heritage will be appraised in the context of the potential impact of the Proposed Scheme on the integrity of this site.

A preliminary review of the GSI's Groundwater Viewer identified that groundwater vulnerability is predominantly classified as High across the study area with vulnerability decreasing along the River Moy. The study area is largely underlain by a Regionally Important karstic (RK) bedrock aquifer with groundwater flow occurring through fissures and faults in the upper portion of the aquifer. There is a high degree of interconnection between groundwater and surface water.

There are no mapped karst features within the study area, however cavities at depth have been encountered in boreholes. Well yields within the study area are variable with the Ballina Water Supply Scheme being reliant on groundwater. A review of groundwater resources within the study area, such as public water supply, private wells and group water schemes, will be undertaken. The interaction of Groundwater Dependent Terrestrial Ecosystems (GWDTE) within the Killala Bay/Moy Estuary SAC will be assessed in terms of the dependence of Annex I habitats on groundwater in the study area.

6.6.2 Likely Significant Effects

Construction phase

During construction, activities such as demolition works, construction of flood walls and embankments, removal of quay wall, installation or upgrade of culverts, etc. have the potential to result in the following likely significant effects on the soils, geology and groundwater environment of the study area:

- Overburden removal creating disturbance to soil structure and shallow groundwater flow, if encountered.
- Soil and groundwater pollution as a result of accidental spillages and generation of suspended solids.
- Soil erosion as a result of earthwork operations.
- Made ground excavations encountering contamination.

- Embankment settlement/ slope instability.
- If dewatering is required during excavations, there may be an impact on groundwater resources.
- Alteration to river bed geomorphology during culvert installation.

Operational Phase

During the operation and maintenance phase, the newly constructed embankments have the potential to result in soil slippage resulting in sediment runoff to watercourses and blockage of culverts.

6.6.3 Proposed Assessment Methodology

Table 6-7 provides details on the baseline data sources to be used to inform the assessment on Land, Soils and Hydrogeology; the surveys proposed to inform the baseline; the relevant standards and guidance that will be used to inform the assessment methodology and a list of organisations that will be contacted regarding the assessment.

Table 6-7: Land, Soil and Hydrogeology Scope of Assessment

Scope of Assessment	Summary of Scope of Work
Baseline data sources to inform	Mayo County Council
	Environmental Protection Agency (EPA)
	Geological Survey of Ireland (GSI)
	Ordnance Survey Ireland maps (OSi)
	Teagasc soils and subsoils
	Office of Public Works (OPW)
	National Parks & Wildlife Service (NPWS)
	Mayo County Development Plan 2022-2028
Baseline survey to inform	Windshield survey of and field walkover survey proposed works along channel upgrades, river banks and proposed flood walls
Relevant standards and guidance	Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022)
	Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements (IGI, 2013)
	Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' (National Roads Authority (now Transport Infrastructure Ireland (TII, 2009)
	Geology in Environmental Impact Statements – A Guide (IGI, 2002)
Proposed consultation	Geological Survey of Ireland (GSI)
	Teagasc
	Mayo County Council Water Services

6.7 Water

6.7.1 Scope of Assessment

The Ballina FRS area comprises of Ballina Town and its surrounding environs, and covers an approximate land area of 10.2 km^2. The entire scheme area falls under the River Moy Catchment area. The River Moy has an approximate catchment area of 1,984 km^2 (upstream of Ballina), which is around 85% of the hydrometric area no. 34. It has a reach length of approximately 52 km from its confluence with the Mullaghanoe River. Ballina lies almost at the mouth of the River Moy where it enters Killala Bay approximately 12 km downstream.

The catchment is predominantly rural but has a number of large settlements including Ballina, Castlebar and Charlestown. Rainfall within the River Moy catchment area varies significantly with the higher in the mountainous areas. The Standard Period Average Annual Rainfall (SAAR: 1981-2010) at Ballina, Castlebar, Derryhillagh, Knock Airport, Straide and Curry are 1154 mm, 1518 mm, 1651 mm, 1368 mm, 1261 mm and 1215 mm respectively (source: https://www.met.ie/climate/30-year-averages).

The River Moy at Ballina is tidally influenced, because of its close proximity to Killala Bay. A number of smaller tributary streams are also located within Ballina Town and discharge through the built-up areas into the River Moy. Outflows of these rivers/streams are influenced by the high water level in the River Moy.

The River Moy catchment area experienced severe flooding in the past, notably in October 1989, November 2009, January 2014 and December 2015. The floods of winter 2015/2016 were believed by many to be the worst on record. Ballina Town area also experienced significant flooding during these events. The principal flood mechanisms on the tributaries are short intense rainstorms and the presence of blockages or debris in the river channel or at structures resulting in floodplain flows.

For the River Moy there are two flood mechanisms, one from high tides with flooding lasting for a few hours and the other from prolonged periods of high flows from upstream on the River Moy. The October 1989 flood event caused significant damages to roads and properties located on Cathedral Road and Bachelor's Walk and Arbuckle Row. On 3rd January 2014, a combination of high tide levels and a storm surge in the Killala Bay resulted in flooding affecting Clare Street, Bachelors Walk, Arbuckle Row and Cathedral Road in Ballina. Ten residential and three commercial properties were flooded during this flood event (source: www.floodinfo.ie)

The Ballina FRS study area falls under the Water Framework Directive (WFD) River Basin No. 34 (Moy and Killala Bay). It also encroaches the Moy Estuary (*EPA Code: IE-WE_420_0300*) transitional waterbody and the Killala Bay (*EPA Code: IE_WE_420_0000*) coastal waterbody.

6.7.2 Likely Significant Effects

Construction phase

During construction, activities such as flood defences, removal of quay wall, installation of culverts, etc. have the potential to result in the following likely significant effects on Water:

- During the construction phase, particularly during instream channel conveyance capacity improvement works and culvert/bridge crossings upsizing works, impacts on the existing flooding risk could occur.
- Furthermore, construction of temporary construction compounds could cause increased flooding risks unless an appropriate mitigation measure is implemented.
- Water quality of receiving water bodies could be significantly impacted, from either routine runoff or spillages of toxic substances. This could lead to loss in habitats and aquatic animal population (fishes and others). The physical accumulation of sediment (silt and clays) resulting from the construction sites can also alter habitats by covering surfaces as well as smothering flora and fauna.

Operational Phase

During operation and maintenance phase, the activities have the potential to result in the following impacts on Water:

- The Proposed Scheme will involve construction of hard defences along the river banks, improving channel conveyance capacities (channel widening and deepening), upsizing existing culvert capacities, construction of emergency online/offline flood volume storage facilities. These structures will have a positive impact in terms flood management along the river channels.
- Negative impacts associated with ongoing maintenance and management are expected to be minimal.

6.7.3 Proposed Assessment Methodology

Table 6-8 provides details on the baseline data sources to be used to inform the assessment on Water; the surveys proposed to inform the baseline; the relevant standards and guidance that will be used to inform the assessment methodology and a list of organisations that will be contacted regarding the assessment.

Similar to the flood risk assessments, water quality impact assessments will be carried out in accordance with the TII Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA, 2009). These assessments will be carried out by analysing the relevant baseline information gathered from EPA and also through collecting project specific water quality data during the initial stage of the project.

Appropriate mitigation measures will be recommended in order to minimise any significant impacts on water quality. In this, recommendations provided in the NRA Guidelines for the Crossing of Watercourses during Construction of National Road Schemes and CIRIA 648 Control of Water Pollution from Linear Construction Projects will be followed.

The design flood flows at the watercourse crossings will be estimated in accordance with the Flood Studies Report (FSR) and Flood Studies Update (FSU) recommended methodologies. Appropriate allowances to cater for the future climate change impacts will also be applied to the design flow estimates.

The hydrological impact assessments will be carried out by analysing the relevant baseline information gathered for the scheme area and also considering the proposed engineering designs of the physical infrastructures required for the project, and also through consultation with the project aquatic ecologist and material assets specialist. Site visits will also be carried out to get an appreciation on the existing hydrological environment and the likely significant effects that may cause to this environment due to the construction of the proposed scheme.

Table 6-8: Water Scope of Assessment

Scope of Assessment	Summary of Scope of Work
Baseline data sources to inform	Mayo County Council
	EPA
	Office of Public Works (OPW)
	CFRAMS and flood risk mapping/ Hydro-data mapping (floodinfo.ie; waterlevel.ie)
	EPA Water Quality Data (www.epa.ie)
	Aerial photography
	Relevant Flood Risk Management Plans.
	WFD River Basin Management Plan for Ireland (2022-2027)
	Irish Coastal Protection Strategy Study Results (ICPSS, OPW, 2012)
	Irish Wave and Water Levels Modelling Study Results (ICWWS, OPW, 2018)
Baseline survey to inform	Walkover Survey: • Walkover survey will be required to have an appreciation of the existing hydrological regime, flooding risk and hydraulic constraints
	Water Quality Data (sampling and Testing) – for baseline condition: • The water quality impact assessments will be carried out by analysing the relevant baseline information gathered from EPA. Collection of project specific water quality data (grab sampling and testing) during the initial stage of the project may also be required.
	Topographical survey data, particularly at the river crossings (river channel cross sectional information): • This information has already been gathered through a third-party survey contract.
Relevant standards and guidance	Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022)
	The Planning System and Flood Risk Management Guidelines (DEHLG, 2009a)
	TII Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology Hydrogeology for National Road Schemes (NRA, 2009)
	The SuDs Manual C697 (CIRIA, 2007)
	NRA Guidelines for the Crossing of Watercourses during Construction of National Road Schemes and CIRIA 648 Control of Water Pollution from Linear Construction Projects
	Road Drainage and the Water Environment (DN-DNG-03065), TII, March 2015

	Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (IFI, 2016)
	Planning for Watercourses in the Urban Environment (IFI, 2020)
	Climate Change Sectoral Adaptation Plan, Flood Risk Management' (OPW, Sept. 2021)
Proposed consultation	Mayo County Council
	Office of Public Works (OPW)
	EPA
	Inland Fisheries Ireland (IFI)
	Irish Water

6.8 Air Quality

6.8.1 Scope of Assessment

This assessment will identify the potential impact of the Proposed Scheme on air quality within the study area. The study area for the proposed scheme includes the watercourses and environs adjacent to and surrounding Ballina, Co. Mayo.

The route study area is within EPA air quality Zone D. A review of EPA monitoring data for representative Zone D locations was undertaken to provide an indication of the prevailing air quality conditions within the study area. The TII guidelines (2011) state that the local air quality assessment should focus on NO_2 and PM_{10}.

NO_2 monitoring was carried out at two rural Zone D locations in Emo and Kilkitt in recent years and an urban location, Castlebar (EPA, 2022a). The NO_2 annual average in 2021 was 3 µg/m^3 at both rural sites with an annual average of 6 µg/m^3 for Castlebar. Long-term average concentrations measured at all locations were significantly lower than the annual average limit value of 40 µg/m^3. The maximum 1-hour limit value of 200 µg/m^3 (measured as a 99.8th percentile i.e. 18 exceedances are allowed per year) was not exceeded in any year for any of the Zone D locations. The average results at the Zone D locations over the last five years suggests an average of 8 µg/m^3 as a background concentration. Based on the above information, a conservative estimate of the current background NO_2 concentration for the region of the Proposed Scheme is 8 µg/m^3.

Long-term PM_{10} measurements carried out at the closest suburban background Zone D location in Castlebar in 2021 gave an average level of 10 µg/m^3 (EPA, 2022a). Results are also available for Castlebar to observe the trend in concentrations over the last five years. The average result at Castlebar over the last five years is 12 µg/m^3. Based on the above information a conservative estimate of the current background PM_{10} concentration for the region of the Proposed Scheme is 12 µg/m^3.

6.8.1.1 Sensitive Receptors

Sensitive receptors in the vicinity of the Proposed Scheme have the potential to experience air quality related impacts. For the purposes of this assessment, high sensitivity receptors are regarded as residential properties where people are likely to spend the majority of their time. Commercial properties and places of work are regarded as medium sensitivity while low sensitivity receptors are places where people are present for short periods or do not expect a high level of amenity. There are a number of high and medium sensitivity receptors in close proximity to the Proposed Scheme. These are mainly located within Ballina Town which mainly consists of medium sensitivity commercial properties lining the river Moy and high sensitivity residential receptors further back from the river bank itself.

6.8.2 Likely Significant Effects

Construction phase

The greatest potential impact on air quality during the construction phase of the Proposed Scheme is from construction dust emissions and the potential for nuisance dust and particulate matter (PM_{10} and $PM_{2.5}$) emissions. According to the Institute of Air Quality Management guidance (IAQM, 2014) while construction dust impacts can occur within 350m of a construction site, the majority of the deposition occurs within the first 50m. Therefore, sensitive receptors which fall within this distance of construction activities will be most at risk.

Dust management measures will be incorporated into the overall Construction Environmental Management Plan (CEMP) for the Proposed Scheme. Best practice mitigation measures will be proposed to ensure no significant emissions of dust are released from construction activities. Provided the dust minimisation measures are adhered to, the air quality impacts during the construction phase will not be significant.

Operational Phase

The operational and maintenance phase of the Proposed Scheme is not predicted to have significant impacts on air quality due to the limited nature and type of maintenance activities proposed.

6.8.3 Proposed Assessment Methodology

Table 6-9 provides details on the baseline data sources to be used to inform the assessment on Air Quality, the surveys proposed to inform the baseline; the relevant standards and guidance that will be used to inform the assessment methodology and a list of organisations that will be contacted regarding the assessment.

Table 6-9: Air Quality Scope of Assessment

Scope of Assessment	Summary of Scope of Work
Baseline data sources to inform	The air quality assessment will include a review of the relevant standards and legislation, a review of background ambient air quality data from the EPA and establishment of the baseline environment in the region of the Proposed Scheme. The sensitivity of the surrounding environment to air quality impacts will be established based on the IAQM guidance (IAQM, 2014) and the likely significant effects from the construction and operation of the Proposed Scheme will be identified.
Baseline survey to inform	A desktop-based review of long-term EPA monitoring data from representative locations will be conducted to determine background levels of NO2, PM10 and PM2.5 in the region of the Proposed Scheme.
Relevant standards and guidance	The air quality assessment will be carried out in accordance with the following guidance and established best practice, and will be tailored accordingly based on professional judgement and local circumstance: • Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022) • Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2014) • Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes (TII, 2011) • UK Design Manual for Roads and Bridges (DMRB), Volume 11, Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 1 LA 105 Air quality and Part 14 LA 114 Climate (UK Highways Agency, 2019)
Proposed consultation	Comprehensive consultation will be undertaken with prescribed bodies, other consultees and the public. Further details can be found in Appendix A.

6.9 Climate

6.9.1 Scope of Assessment

This assessment will identify the potential impact of the Proposed Scheme on climate within the study area. Impacts to climate are assessed in relation to Ireland's national targets and compliance with the measures outlined within various plans including the Climate Action Plan 2023. Therefore, the study area in relation to climate is the Republic of Ireland. In addition the vulnerability of the Proposed Scheme to climate change must be assessed which will include the watercourses and environs adjacent to and surrounding Ballina, Co. Mayo.

Anthropogenic emissions of greenhouse gases (GHGs) in Ireland included in the European Union's Effort Sharing Regulation (ESR) (EU 2018/842) are outlined in the most recent review by the EPA which details provisional emissions up to 2021 (EPA, 2022b). The greenhouse gas emission inventory for 2021 is the first of ten years over which compliance with targets set in the ESR will be assessed. This Regulation sets 2030 targets for emissions outside of the Emissions Trading Scheme (known as ESR emissions) and annual binding national limits for the period 2021-2030. Ireland's target is to reduce ESR emissions by 30% by 2030 compared with 2005 levels, with a number of flexibilities available to assist in achieving this. Ireland's ESR emissions annual limit for 2021 is 43.48 Mt CO_2eq[5]. Ireland's provisional 2021 GHG ESR emissions are 46.19 Mt CO_2eq, this is 2.71 Mt CO_2eq more than the annual limit for 2021 (EPA, 2022b). Agriculture continues to be the largest contributor to overall emissions at 37.5% of the total. Transport, energy industries and the residential sector are the next largest contributors, at 17.7%, 16.7% and 11.4%, respectively. GHG emissions for 2021 are estimated to be 4.7% higher than emissions in 2020, this is due to a gradual lifting of covid restrictions and an increase in the use of coal and less renewables within electricity generation. Ireland's GHG emissions have increased by 11.4% from 1990 – 2021.

Provisional National total emissions (including Land Use, Land-use Change and Forestry (LULUCF)) for 2021 are 69.29 Mt CO_2eq, these have used 23.5% of the 295 Mt CO_2eq Carbon Budget for the five-year period 2021-2025. This leaves 76.5% of the budget available for the succeeding four years, requiring an 8.4% average annual emissions reduction from 2022-2025 to stay within budget.

The EPA 2022 GHG Emissions Projections Report for 2021 – 2040 (EPA, 2022c) provides an assessment of Ireland's total projected greenhouse gas (GHG) emissions from 2021 to 2040, using the latest Inventory data for 2020 and provides an assessment of Ireland's progress towards achieving its National ambitions under the Climate Action and Low Carbon Development (Amendment) Act 2021 (Government of Ireland, 2021) and EU emission reduction targets for 2030 as set out under the EU Effort Sharing Regulation (ESR) 2018/842. Two scenarios are assessed – a "With Existing Measures" (WEM) scenario, which is a projection of future emissions based on the measures currently implemented and actions committed to by Government, and a "With Additional Measures" (WAM) scenario, which is the projection of future emissions based on the measures outlined in the latest Government plans at the time Projections are compiled. This includes all policies and measures included in the WEM scenario, plus those included in government plans but not yet implemented.

The EPA report states under the "With Existing Measures" scenario, the projections indicate that Ireland will cumulatively exceed its ESR emissions allocation by 52.3 Mt CO_2eq over the 2021-2030 period even with full use of the flexibilities available. Under the "With Additional Measures scenario", the projections indicate that Ireland can achieve compliance under the ESR over the 2021-2030 period using both flexibilities but only with full implementation of the 2023 Climate Action Plan. Both projected scenarios indicate that implementation of all climate plans and policies, plus further new measures, are needed for Ireland to meet the 51% emissions reduction target and put the country on track for climate neutrality by 2050 (EPA, 2022c).

6.9.1.1 Sensitive Receptors

Climate itself is a sensitive receptor which may be impacted by the Proposed Scheme through the release of GHG emissions. In addition, people and properties in close proximity to the scheme may experience climate change related impacts.

[5] Mt CO_2eq – million tonnes carbon dioxide equivalent

6.9.2 Likely Significant Effects

Construction phase

There is the potential for a number of greenhouse gas emissions to atmosphere during the construction of the Proposed Scheme which could impact climate. Construction vehicles, generators etc., may give rise to CO_2 and NO_2 emissions. In addition, embodied carbon within construction materials and construction activities will impact climate. However, the impact on climate is not predicted to be significant.

Operational Phase

Emissions of carbon dioxide (CO_2) are not predicted to have a significant impact on climate during the operational phase of the Proposed Scheme.

6.9.3 Proposed Assessment Methodology

Table 6-10 provides details on the baseline data sources to be used to inform the assessment on Climate; the surveys proposed to inform the baseline; the relevant standards and guidance that will be used to inform the assessment methodology and a list of organisations that will be contacted regarding the assessment.

Table 6-10: Climate Scope of Assessment

Scope of Assessment	Summary of Scope of Work
Baseline data sources to inform	The climate assessment will include a review of all relevant standards and legislation, a review of the existing climate baseline and identification of the potential climate related impacts as a result of the construction and operational phases of the proposed development.
Baseline survey to inform	A desktop-based review of climate baseline and relevant legislation will be undertaken to identify likely significant effects from the construction and operation of the Proposed Scheme.
Relevant standards and guidance	The air quality and climate assessment will be carried out in accordance with the following guidance and established best practice, and will be tailored accordingly based on professional judgement and local circumstance: • Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022) • Climate Action Plan 2023 (Government of Ireland, 2023) • Climate Action and Low Carbon Development (Amendment) Act 2021 (Government of Ireland, 2021) • UK Design Manual for Roads and Bridges (DMRB), Volume 11, Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 1 LA 105 Air quality and Part 14 LA 114 Climate (UK Highways Agency, 2019)
Proposed consultation	N/A

6.10 Noise and Vibration

6.10.1 Scope of Assessment

This assessment will identify the potential noise and vibration impacts of the Proposed Scheme on noise sensitive locations within the study area. The study areas for noise and vibration respectively will be as follows:

- Noise: all noise sensitive premises[6] (NSPs) within 300m of proposed works.
- Vibration: all vibration sensitive premises within 50m of proposed works and any national monuments or special conservation structures within 100m of proposed works.

The locations of proposed works include urban, suburban and more rural locations and are therefore expected to have a range of baseline noise levels, i.e., ranging from relatively high daytime baseline noise in urban areas to lower levels in rural areas. A range of sensitivities for receptors are expected to noise and vibration, generally high sensitivity for residential locations and ranging to low sensitivity for certain commercial or industrial NSPs.

6.10.2 Likely Significant Effects

Construction phase

During construction, activities such as flood defences, removal of quay wall, installation of culverts, etc. have the potential to result in the following likely significant effects on noise and vibration sensitive premises:

- Noise impacts from piling and construction equipment.
- Vibration impacts from piling and/or rock breaking if required.

Operational Phase

The operational and maintenance phase of the Proposed Scheme has no potential for noise and vibration impacts due to the limited nature and type of maintenance activities proposed:

- With the exception of occasional activation of pumps and occasional maintenance activities, there will be no operational phase noise emissions from the Proposed Scheme.
- There will be no operational phase vibration emissions from the Proposed Scheme.

6.10.3 Proposed Assessment Methodology

Table 6-11 provides details on the baseline data sources to be used to inform the assessment on Noise and Vibration; the surveys proposed to inform the baseline; the relevant standards and guidance that will be used to inform the assessment methodology and a list of organisations that will be contacted regarding the assessment.

Table 6-11: Noise and Vibration Scope of Assessment

Scope of Assessment	Summary of Scope of Work
Baseline data sources to inform	Mayo County Council
	Environmental Protection Agency
	GeoDirectory
	County Mayo Local Authorities Noise Action Plan 2018-2023
Baseline survey to inform	• Attended daytime baseline noise surveys will be conducted. • If the construction calls for evening and/or night-time works then baseline noise surveys will be required for these periods also. • Baseline noise surveys will characterise the noise environment to determine construction noise threshold levels.

[6] BS 5228-1:2009+A1:2014 sets out guidance sets out guidance on permissible noise levels relative to the existing noise environment. It defines noise sensitive premises (NSPs) as any occupied premises outside a site used as a dwelling (including gardens), place of worship, educational establishment, hospital or similar institution, or any other property likely to be adversely affected by an increase in noise level. Note: This can include national parks, areas of outstanding natural beauty or other outdoor spaces where members of the public might reasonably expect quiet enjoyment of the area.

	• Baseline vibration surveys will not be required unless there are premises with vibration sensitive equipment in close proximity to rock breaking or piling activity.
Relevant standards and guidance	Guidelines on the information to be contained in Environmental Impact Assessment Reports, (EPA, May 2022)
	ISO 1996-1:2016 - Description and Measurement of Environmental Noise
	British Standard BS5228:2009+A1:2014 Noise and Vibration Control on Construction and Open Sites
	BS 6472-1:2008 Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting
	BS 7385-2:1993 Evaluation and measurement for vibration in buildings. Guide to damage levels from ground-borne vibration
Proposed consultation	Mayo County Council

6.11 Material Assets – Utilities and Waste

6.11.1 Scope of Assessment

This assessment will identify the potential impact of the Proposed Scheme on Material Assets – Utilities and Waste within the study area.

According to the EPA Guidelines (2022) Material Assets include built services, roads and traffic and waste management. Roads and traffic will be assessed as part of the Traffic and Transport assessment (see section 6.1). Therefore, this assessment will examine the likely significant effects of the Proposed Scheme on built services (utilities) in the area and the management of waste arising as a result of the Proposed Scheme.

Key baseline conditions and sensitivities that will be considered include:

- Existing utilities including electricity supply networks, gas pipelines, telecommunications, water supply networks and storm and foul sewers.
- Estimated waste types and quantities arising from the construction and operational phases of the Proposed Scheme.
- Potential options for disposal of any waste arising as a result of the Proposed Scheme.

Utilities are typically deemed to be receptors of high to medium vulnerability, high recoverability, and high value. Any potential disruption to utilities in the area as a result of the Proposed Scheme will be assessed in the EIAR.

Waste management measures will be included in the CEMP to manage waste during construction. This will identify waste types likely to arise as a result of the construction of the Proposed Scheme and measures to manage this waste. Appropriate measures will be recommended to deal with any contaminated waste material associated with the Proposed Scheme (should it arise), including quantification of volumes and treatment/disposal mechanisms.

6.11.2 Likely Significant Effects

Construction phase

During construction, activities such as flood defences, removal of quay walls, installation of culverts, etc. have the potential to result in the following likely significant effects on Material Assets – Utilities and Waste:

- Potential disruption to utilities such as electricity supply networks, gas pipelines, telecommunication networks, and water supplies.
- Generating of hazardous and non-hazardous waste during construction activities.

Operational Phase

The operational and maintenance phase of the Proposed Scheme has no potential for impacts on Material Assets – Utilities and Waste due to the limited nature and type of maintenance activities proposed.

6.11.3 Proposed Assessment Methodology

Table 6-12 provides details on the baseline data sources to be used to inform the assessment on Material Assets – Utilities and Waste; the surveys proposed to inform the baseline; the relevant standards and guidance that will be used to inform the assessment methodology and a list of organisations that will be contacted regarding the assessment.

Table 6-12: Material Assets - Utilities and Waste

Scope of Assessment	Summary of Scope of Work
Baseline data sources to inform	Utility providers datasets (ESB; Irish Water; Gas Networks Ireland; Eir) to inform baseline mapping for the assessment using GIS.
	Mayo County Development Plan 2022-2028
	Information provided by the Design Team regarding predicted waste quantities and characterisations, e.g. hazardous or non-hazardous.
	Connacht Ulster Waste Management Plan 2015-2021 (This will be superseded by the National Waste Management Plan for Circular Economy, which is expected to be adopted in 2023)
	Ordnance Survey Ireland maps
	Google Maps and Google Earth
Baseline survey to inform	A desktop study will be completed to inform this assessment, which will have regard to the EPA guidelines.
Relevant standards and guidance	Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022)
Proposed consultation	Where required, consultation will take place with relevant utility providers (ESB; Irish Water; Gas Networks Ireland; Eir; National Broadband Ireland) to inform the baseline and to understand the potential for disruption to services during the construction phase of the Proposed Scheme.

6.12 Material Assets – Landtake

6.12.1 Scope of Assessment

This assessment will identify the potential impact of the Proposed Scheme on landtake within the study area. Landtake is as defined in the *Guidelines on the information to be contained in Environmental Impact Assessment Reports* (EPA), is the "*removal of productive land from potential agricultural or other beneficial uses*".

The study area will comprise of the full area of the Proposed Scheme and lands immediately adjacent to the Proposed Scheme. The existing land uses within the study area will be described in the receiving environment section of the EIAR chapter. The impact of the proposed scheme on land use will be described. The assessment will be based both on a desktop study examining the extent of the proposed CPO in relation to properties, and on discussions with landowners. Residential, commercial (including agricultural) and community property will be considered sensitive receptors, while vacant / derelict properties will be medium sensitive receptors and public roads / private road and small plots of lands will be considered low sensitive receptors.

6.12.2 Likely Significant Effects

Construction phase

During construction, activities such as flood defences, removal of quay wall, installation of culverts, etc. have the potential to result in the following potential landtake impacts:

- Land use change.
- Impacts on commercial / agricultural enterprise.
- Impacts on residential properties.
- Severance of properties (temporary and permanent).
- Severance of services / drainage (temporary and permanent).
- Impacts on amenity (views) (temporary and permanent).

Operational Phase

During operation and maintenance phase, the landtake has the potential to result in the following likely significant effects:

- Impacts on amenity (views).
- Impacts on commercial / agricultural enterprise.
- Impacts on residential properties.

6.12.3 Proposed Assessment Methodology

Table 6-13 provides details on the baseline data sources to be used to inform the assessment on Material Assets- Landtake; the surveys proposed to inform the baseline; the relevant standards and guidance that will be used to inform the assessment methodology and a list of organisations that will be contacted regarding the assessment.

Table 6-13: Material Assets- Landtake

Scope of Assessment	Summary of Scope of Work
Baseline data sources to inform	Department of Agriculture, Food and the Marine (Census of Agriculture)
	Census of Agriculture 2010, final results (www.cso.ie)
	Mayo County Council
	Property Registration Authority of Ireland (PRAI)
	Ordnance Survey Ireland maps
	Google Map and Google Earth
Baseline survey to inform	Windshield survey of current land uses
Relevant standards and guidance	Guidelines on the information to be contained in Environmental Impact Assessment Reports, (EPA, May 2022)
	Advice notes for preparing Environmental Impact Statements (draft) (EPA, 2015)
	Guide to Process and Code of Practice for National Road Project Planning and Acquisition of Property for National Roads, March 2003 (revised 2005)
	Environmental Impact Assessment of National Road Schemes – A Practical Guide, November 2008
Proposed consultation	Mayo County Council
	Local tourism and commercial interests
	Department of Agriculture, Food and the Marine

6.13 Cultural Heritage

6.13.1 Cultural Heritage

6.13.1.1 Scope of Assessment

This assessment will identify any potential significant impact of the Proposed Scheme on Cultural Heritage within the study area. The term 'Cultural Heritage' encompasses several aspects of heritage. UNESCO define it as including tangible assets (immovable: archaeological sites and monuments, architectural heritage buildings movable: artefacts and underwater: shipwrecks and ruins) and intangible assets (e.g. folklore, oral tradition and language). In broad terms, 'Cultural Heritage' includes the designated and non-designated heritage categories of (i) archaeology (known and unknown), (ii) architectural (built) heritage and (iii) history and folklore.

6.13.1.2 Likely Significant Effects

Construction phase

In general terms, the proposed construction activities for the Ballina flood relief scheme will involve removal of existing flood walls, installation of new flood defences in the form of hard defences (reinforced concrete walls and/or embankments ranging from 0.3 m-1.7 m in height), and upgrade and/or replacement to existing culverts/screens/inlets.

Likely significant effects on the Cultural Heritage resource are likely to be both negative direct and negative indirect at construction phase and largely relate to the River Moy study area and the Knockanelo study area. Removal and replacement of quay walls along the River Moy is a measurable negative direct impact although the architectural heritage value of these locations is largely limited (Bachelor's Walk, Howley Street, Cathedral Rd, Ridgepool Road). However the replacement tie-in points with the Upper and Lower Bridges will require careful consideration in terms of design, materials and avoidance of any direct impact on the bridge structures themselves and contemporary flanking quay walling.

The quay walls along Emmett Street are of robust dressed ashlar limestone and any proposed modifications to the closure of openings along same will also present material alteration and a negative direct construction phase impact. Careful consideration will be required in terms of design, materials and overall opportunity to enhance the public realm/amenity value of same. Similarly, any design proposals for new flood wall defences at Ballina Quay will require sensitive installations appropriate to the character and setting of the ACA at Crocketstown (or the Quays).

There is archaeological evidence within the River Moy study area in the form of the medieval Augustinian Abbey and graveyard. The eastern banks of the river at this location has been host to centuries of urban modifications however this does not negate the possibility of negatively directly impacting potential surviving sub-surface stray finds and/or archaeological features. The same can be noted for the Knockanelo study area within the historic urban area of Dillon Terrace, Lower Pearse Street and Humbert Street.

As the River Moy region has been continuously settled from the prehistoric period, it is likely that the riverine sediment within the study area contains artefacts as a result of accidental loss and deliberate deposition. Therefore, any disturbance to or removal of sediment within the watercourses during construction phase may result in direct negative impacts on previously unrecorded archaeological artefacts or features.

Indirect negative impacts may arise during construction phase with regard to inadvertent damage to protected architectural structures located within the works areas (Upper and Lower Bridges, Salmon Weir, Dillon Terrace and Humbert Memorial). Careful management plans for tracking of machinery and exclusion zones will be required to avoid any negative indirect impacts. In addition, the design (including material usage) of any hard defences along the quays will require careful consideration to avoid any negative direct or indirect impact on the character and setting of adjacent protected Cultural Heritage structures (both archaeological and architectural).

Operational Phase

Provided that any proposed appropriate mitigation measures are implemented at construction phase, it is not predicted that there will be significant operational phase effects on the Cultural Heritage resource. However, it would be prudent that operation and maintenance works conduct regular monitoring of the integrity of the structural condition of the Upper and Lower Bridges and the Salmon Weir to ensure there is no operational impact on these protected structures.

Due cognisance of the Creteboom shipwreck location and any potential indirect operational impact that the proposed flood relief measures may present in the form of change to the baseline environment (predicted water levels, water velocity etc.) will require assessment to avoid any direct or indirect impact on this protected structure (RPS 1).

6.13.1.3 Proposed Assessment Methodology

Table 6-14 provides details on the baseline data sources to be used to inform the assessment on Cultural Heritage; the surveys proposed to inform the baseline; the relevant standards and guidance that will be used to inform the assessment methodology and a list of organisations that will be contacted regarding the assessment. The EIA assessment of Cultural Heritage will seek to comply with the requirements of Directive 2011/92/EU as amended by Directive 2014/52/EU.

Table 6-14: Cultural Heritage Scope of Assessment

Scope of Assessment	Summary of Scope of Work
Baseline data sources to inform	• World Heritage Sites Ireland and Ireland's Tentative World Heritage List (2022) • Sites and Monuments Record (SMR)/ Record of Monuments and Places (RMP) for Co Mayo • National Monuments in State Care List (2009) (ownership and Local Authority guardianship) Co Mayo • Preservations Orders List (2019) for Co Mayo • Register of Historic Monuments (RHM) for Co Mayo • Wreck Inventory of Ireland Database (WIID) for Co Mayo • The Record of Piers and Harbours (1800-1890) • Record of Protected Structures (RPS) per the *Mayo County Development Plan 2022-2028* • Record of Protected Structures (RPS) per the *Ballina & Environs Development Plan 2009-2015 (as extended*) • National Inventory of Architectural Heritage (NIAH) for Co Mayo • Database of Irish Excavation Reports • National Museum of Ireland Topographical Files • Historical cartographic sources (incl Down Survey Map and 1st – 3rd edition OS historical mapping) • Placename Database of Ireland • Irish National Folklore Collection 1935-1970 (including The Schools Collection 1937-1939) • Aerial imagery/Orthophotography (OSI Digital Globe, Bing Satellite, Google Satellite) • Published reference material
Baseline survey to inform	The baseline data sources listed above shall be utilised to compile a desktop study and assessment. • Terrestrial field surveys conducted for purposes of evaluation and impact assessment of the Cultural Heritage resource will comprise a walkover survey of the proposed Scheme Area design measure footprints and inspection of adjacent areas. Primary objectives of the walkover survey is to locate and ground-proof recorded cultural heritage sites and to verify the condition and extent (where possible) of same. In addition, terrestrial field inspection will facilitate an interpretation of landscape setting relevant to recorded sites and site groupings, a consideration of local topography, existing land-use and potential presence of unrecorded Cultural Heritage sites, as well as identification of areas/locations of archaeological potential/heightened sensitivity. A detailed written and photographic record will be taken.

	• It is not envisaged that additional site investigations will be required to inform the terrestrial Cultural Heritage record for the Proposed Scheme area (such as archaeological geophysical surveys, archaeological test-trenching etc.). • A**n** underwater inspection of the Proposed Scheme area will be undertaken to support the documentary research. This will include an underwater visual and metal detection survey.
Relevant standards and guidance	The management and protection of cultural heritage in Ireland is achieved through a framework of national laws, policies and charters which are in accordance with the provisions of: • *The World Heritage Convention* (1972) (UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage) ratified by Ireland in 1991 • *Valetta Convention (*1995) (formally the European Convention on the Protection of the Archaeological Heritage, 1992) ratified by Ireland in 1997 • *Granada Convention* (1985) (European Convention on the Protection of Architectural Heritage) ratified by Ireland in 1997 • *Florence Convention* (2000) (European Landscape Convention) ratified by Ireland in 2002 • *UNESCO Convention on the Protection of the Underwater Cultural Heritage (2001)* Ireland is a signatory and underwater Cultural Heritage is protected under the National Monuments Acts 1930-2014 • *Paris Convention* (2003) (UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage) ratified by Ireland in 2015 • *Venice Charter* (1964) International Charter for the Conservation and Restoration of Monuments and Sites and its addendum the *Florence Charter* (1981) concerning the preservation of Historic Gardens • *Washington Charter* (1987) ICOMOS Charter for the Conservation of Historic Towns and Urban Areas • *Charter on the Built Vernacular Heritage* (1999) ratified by ICOMOS to establish principles in addition to the Venice Charter for the care and protection of built vernacular heritage • *Xi'an Declaration* (2005) ICOMOS Declaration on the Conservation of the Setting of Heritage Structures, Sites and Areas • *Burra Charter* (2013) Australia ICOMOS Charter for Places of Cultural Significance Relevant national legal statutes include: • *National Monuments Act (1930 - 2014)* • *Heritage Act (1995) (as amended)* • *National Cultural Institutions Act (1997) (as amended)* • *Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act (1999)* • *Planning and Development Act (2000) (as amended)* The methodology utilised for the EIA assessment will be based on a range of guidance documents including: • Department of Arts, Heritage, Gaeltacht and the Islands (1999) *Framework and Principles for the Protection of the Archaeological Heritage* • ICOMOS (2011) *Guidance on Heritage Impact Assessments for Cultural World Heritage Properties* • Department of Environment, Heritage & Local Government (2008) *National Policy on Town Defences* • Historic England (2017) *The Setting of Heritage Assets: Historic Environment Good Practice Advice in Planning Note 3 (Second Edition)* • Historic Environment Scotland (2016) *Managing Change in the Historic Environment: Setting* • Department for Communities NI (Historic Environment Division (HED)) (2018) *Guidance on Setting and the Historic Environment* • Department of Arts, Heritage, and the Gaeltacht (2011) *Architectural Heritage Protection: Guidelines for Planning Authorities*

	• Department of Housing, Local Government & Heritage (2021) *A Living Tradition: A Strategy to Enhance the Understanding, Minding and Handing on of Our Built Vernacular Heritage* • Department of Housing, Local Government & Heritage (2022) *Places for People: National Policy on Architecture* • Mayo County Council Mayo County Development Plan 2022-2028 • Mayo County Council Ballina & Environs Development Plan 2009-2015 (as extended) • Department of Arts, Heritage and the Gaeltacht (2015) *A National Landscape Strategy for Ireland 2015-2025* • Department of Culture, Heritage and the Gaeltacht (2019) *Built & Archaeological Heritage Climate Change Sectoral Adaptation Plan* • Department of Culture, Heritage and the Gaeltacht (2020) *Culture 2025 – A National Cultural Policy Framework to 2025* • Department of Housing, Local Government & Heritage (2022) *Heritage Ireland 2030: A Framework for Heritage*
Proposed consultation	Relevant statutory and non-statutory consultees for the proposed Scheme will comprise the following: • Development Applications Unit (DAU), National Monuments Service (DHLGH) • Underwater Archaeology Unit, National Monuments Service (DHLGH) • Built Heritage Policy Unit, National Monuments Service (DHLGH) • National Museum of Ireland (NMI) • Mayo County Council (Conservation Officer / Archaeological Officer / Heritage Officer) • The Heritage Council • Royal Irish Academy • An Taisce • Local Historical and Heritage community interest groups

6.14 Landscape and Visual

6.14.1 Scope of Assessment

This assessment will identify the potential impact of the Proposed Scheme on Landscape and Visual Amenity within a study area.

A study area of up to 2 km centred on the proposed change will initially be considered for the assessment. The study area covers part of the urban landscape of Ballina Town Centre centred on The River Moy, along with surrounding suburban and rural areas centred on a number of existing rivers and watercourses which are the subject of the proposed change. These include The River Moy along with rivers Brusna, Tullyegan, Knockanelo and Quignamanger together with a watercourse along Bunree / Behy Road.

The baseline comprises a mix of urban, suburban and rural landscapes within and around the Town of Ballina as follows:

- Urban centre of Ballina centred on The River Moy and featuring a rectilinear pattern of streets and squares dating back to the 19th Century along with street tree planting.
- Suburban residential areas centred around the rivers and watercourses of relevance to the assessment. These areas feature residential development aligned on small and sometimes winding roads which feature tree and hedgerow vegetation.

Key baseline sensitive receptors which would potentially be affected include the following:

- Landscape and landscape character, in particular the historic town centre and 19th century built fabric.
- Street trees, some of which are mature and are focal points in the urban landscape along with hedgerows and scrub vegetation.
- Viewers who may be affected by the proposed development, in particular residents of dwellings and recreational visitors.

6.14.2 Likely Significant Effects

Construction phase

During construction, potential effects on landscape character and visual amenity will arise from the following:

- The removal of existing trees (including street trees in the town centre of Ballina), woodland, hedgerows and scrub.
- The demolition of existing built structures.
- The gradual introduction of proposed flood defence structures.
- The presence of temporary hoarding along parts of the proposed scheme.
- The presence of construction plant and machinery along with construction vehicles and lighting.

Operational Phase

During operation and maintenance phase, the elements and activities which have the potential to result in impacts on landscape and visual amenity are outlined below:

- Absence of trees (including street trees in the town centre of Ballina), woodland, hedgerows and scrub, previously removed during construction.
- Presence of new flood relief structures, including walls and railings some of which will replace the former and some of which will be new additions to the receiving landscape.
- Introduction of replacement planting, including street tree planting.
- Changes or Improvements to the public realm, as a consequence of the project.

6.14.3 Proposed Assessment Methodology

Table 6-15 provides details on the baseline data sources to be used to inform the assessment of effects on Landscape and Visual Amenity. The table summarises baseline data, proposed field surveys, relevant standards and guidance used to inform the assessment methodology and a list of consultees.

The approach to the assessment will be informed primarily by GLVIA 3 (Landscape Institute and Institute of Environmental Management and Assessment (2013)). The assessment will consider effects on landscape elements and landscape character. In this regard, the term ‘landscape’ is understood to mean landscape or townscape in order to provide for both rural and urban areas in the baseline. Effects on visual amenity will also be considered separately albeit linked to effects on landscape. The assessment methodology will consider the sensitivity of the receptor (landscape or viewer / viewpoint) against the magnitude of the change caused by the Proposed Scheme to arrive at a significance of effect.

The assessment will consider the effects of the Proposed Scheme during both construction and operational phases. A tree survey will be undertaken and will be considered against the Proposed Scheme. Design iterations will be undertaken with the retention of trees and wooded vegetation in mind. Recommendations on the colour and finish of built structures will be made in order to be consistent or sympathetic to the baseline urban and rural character.

The assessment of impacts and effects on landscape will address the following:

- Effects on landscape elements, for example, loss of existing trees
- Effects on landscape character (with reference to available data in the County Development Plan and Ballina and Environs Town Plan)
- Effects on national and county landscape designations

The assessment of impacts and effects on visual amenity will address the following:

- Effects on designated scenic routes, views and prospects in the Mayo County Development Plan and Ballina and Environs Town Plan

- Effects on viewers at a range of viewpoint locations specifically selected for the assessment. A range of viewer types will be considered including residents of dwellings, recreational visitors (especially those for whom landscape is an important part of the experience) and road users (including visitors and commuters).

A selection of these viewpoints will be illustrated in photomontage. For each viewpoint, the existing view will be presented along with the proposed view during operation phase.

Table 6-15: Landscape and Visual Scope of Assessment

Scope of Assessment	Summary of Scope of Work
Baseline data sources to inform	Policy of relevance to landscape and visual amenity from the Mayo County Development Plan and the Ballina and Environs Development Plan.
	Baseline landscape character, designated landscapes, designated scenic routes, views and prospects from Mayo County Development Plan and Ballina and Environs Development Plan.
	Recreational assets including walking routes and visitor attractions or points of interest.
	GeoDirectory data relating to residential dwellings for onshore elements.
	OSi mapping at varying scales.
	Aerial photography
Baseline survey to inform	A tree survey is proposed in order to obtain an accurate understanding of the likely significant effects on existing trees, hedgerows and wooded vegetation.
	A site visit for the purposes of undertaking the assessment of effects is proposed.
Relevant standards and guidance	Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022)
	Landscape Institute and Institute of Environmental Management and Assessment (2013) Guidelines for Landscape and Visual Impact Assessment. 3rd edition. Routledge. ("GLVIA3")
	Landscape Institute (2019) Technical Guidance Note 06/19, Visual Representation of Development Proposals
Proposed consultation	Consultation on the scope of the landscape and visual impact assessment including selection of viewpoints for illustration as photomontage will be undertaken by email with Mayo County Council along with other stakeholders including: • Heritage Council • Fáilte Ireland • An Taisce

6.15 Major Accidents or Disasters

6.15.1 Scope of Assessment

This assessment will consider the vulnerability of the Proposed Scheme to risks of major accidents and/or disasters and the potential for the Proposed Scheme to cause accidents and disasters and the subsequent risks to human health, cultural heritage or the environment.

Annex IV point 5(d) (information for the EIAR) of the 2014 EIA Directive requires:

> "*A description of the likely significant effects of the project on the environment resulting from, inter alia: (d) the risks to human health, cultural heritage or the environment (for example due to accidents or disasters).*"

Annex IV point 8

"A description of the expected significant adverse effects of the project on the environment deriving from the vulnerability of the project to risks of major accidents and/or disasters which are relevant to the project concerned."

The 2014 Directive also states:

"In order to ensure a high level of protection of the environment, precautionary actions need to be taken for certain projects which, because of their vulnerability to major accidents, and/or natural disasters (such as flooding, sea level rise, or earthquakes) are likely to have significant adverse effects on the environment. For such projects, it is important to consider their vulnerability (exposure and resilience) to major accidents and/or disasters, the risk of those accidents and/or disasters occurring and the implications for the likelihood of significant adverse effects on the environment."

The Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2022) elaborate on risk assessment further:

"To address unforeseen or unplanned effects the Directive further requires that the EIAR takes account of the vulnerability of the project to risk of major accidents and /or disasters relevant to the project concerned and that the EIAR therefore explicitly addresses this issue. The extent to which the effects of major accidents and / or disasters are examined in the EIAR should be guided by an assessment of the likelihood of their occurrence (risk) (section 3.7.3 of EPA, 2022)."

Ireland is less vulnerable to natural disasters due to its geographic location. However, Ireland is vulnerable to naturally occurring extreme weather events (e.g. storm, flood, temperature) with the potential to cause an event or incident. There are two sites with EPA Industrial Emissions Directive Licences located within close proximity to the Proposed Scheme: Archers Ballina located on Bunree Road, and Hollister ULC on Foxford Road. There are two Upper Tier Seveso Sites (sites with activities involving the handling, manufacturing, using or storing of dangerous substances) located within close proximity of the Proposed Scheme: European Refreshments and Brooklands Gas Limited, both located in Ballina Town.

6.15.2 Likely Significant Effects

Likely significant effects will be identified following a risk assessment of plausible scenarios during the construction and operational phases of the Proposed Scheme. At this scoping stage, it is expected that the following scenarios will be considered during construction and operational phases: flooding; extreme weather events, pollution events, structural collapse and traffic collisions.

6.15.3 Proposed Assessment Methodology

Table 6-16 provides details on the baseline data sources to be used to inform the assessment on Major Accidents or Disasters; the surveys proposed to inform the baseline; the relevant standards and guidance that will be used to inform the assessment methodology and a list of organisations that will be contacted regarding the assessment.

Table 6-16: Major Accidents or Disasters and Visual Scope of Assessment

Scope of Assessment	Summary of Scope of Work
Baseline data sources to inform	Environmental Protection Agency Licensing & Permitting Database
	Major Emergency Plan (Mayo County Council, 2021)
	Mayo County Development Plan 2022-2028
	Google Maps and Google Earth
Baseline survey to inform	Desktop study using risk assessment methodology in order to identify and screen risks, classify the risks (extremely unlikely to very likely) and evaluate the risks (low risk to high risk). Mitigation measures will then be outlined where appropriate
Relevant standards and guidance	Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022)

	National Risk Assessment 2017 Overview of Strategic Risks (Department of the Taoiseach, 2017)
	Guidance on Assessing and Costing Environmental Liabilities (EPA, 2014)
	A Guide to Risk Assessment in Major Emergency Management (Department of Environment, Heritage and Local Government (DEHLG, 2010)
	A National Risk Assessment for Ireland 2017 (Department of Defence, 2017)
	Major Accidents and Disasters in EIA: A Primer (IEAM and ARUP, 2020)
	Government frameworks: • A Framework for Major Emergency Management Multi-Agency Protocol (7) Land based Response to Marine Emergencies (2011) • A Framework for Major Emergency Management (2006)
Proposed consultation	Mayo County Council
	Environmental Protection Agency

6.16 Interactions and Cumulative Effects

Article 3(1) of the 2014 EIA Directive requires that the interactions between the environmental factors is identified, described and assessed in the EIAR. Each of the specialists will consider the interactions between environmental factors in their assessment. A summary of these effects will be outlined in a separate chapter in Volume B (see Table 1-1 which outlines the proposed structure of the EIAR).

The EPA (2022) defines cumulative effects as “the addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects”. This includes the impact of other relevant developments that were not present at the time of baseline data collection or survey. The EIAR will consider the likely cumulative impacts arising from the proposed scheme alongside the likely impacts of other development activities in the area, based on publicly available information.

7 NEXT STEPS

Using this scoping report as the basis, Mayo County Council is seeking feedback from the stakeholders outlined in Appendix A on the following:

- The key issues to be addressed in the EIAR.
- The proposed content of the EIAR and the likely significant effects that have been scoped in/out.
- The proposed assessment methodologies to assess the likely significant effects.
- Any other data that the environmental assessments should consider and address in the EIAR.

The EIA scoping report will be made available for stakeholder review and comment. An email and postal address have been provided below to receive scoping consultation submissions. Stakeholders will then have four weeks to respond with their submissions. Submissions made in relation to this scoping report will be considered in the preparation of the EIAR. General Data Protection Regulations will apply to all feedback.

Scoping responses are to be sent to the details below:

Contact:	Tatiana Kelley
Email Address:	ballinafrs@rpsgroup.com
Telephone:	091 400 200

Further information regarding the Proposed Scheme is available on the project website (www.floodinfo.ie/frs/en/ballina). The website will be updated regularly.

RPS will continue to scope the EIAR as further assessment is undertaken on the Proposed Scheme and in consultation with the design team. Scoping will be ongoing through the preparation of the EIAR.

All feedback received during the scoping process will be considered by Mayo County Council and the EIAR scope updated as required. The EIAR will record all issues raised during the scoping process and how they have been addressed in the EIAR.

Appendix A

Stakeholder Consultations

Table 1 Stakeholder List

Stakeholders
Department of Agriculture, Food, and the Marine
Department of the Environment, Climate and Communications[7]
Department of Tourism, Culture, Arts, Gaeltacht, Sport and Media[8]
Department of Public Expenditure and Reform
Department of Housing, Local Government and Heritage[9]
Department of Transport, Tourism and Sport
Department of Defence
Department of Enterprise, Trade and Employment
Environment Department
Heritage Department
Planning Department
Mayo National Road Design Office
Climate Action Regional Office
Office of Public Works Head Office
An Taisce
Ballina Chamber of Commerce
Birdwatch Ireland
BT Ireland
Bus Eireann
Coillte
Eir
Enet
ESB
Fáilte Ireland
Gas Networks Ireland
Geological Survey of Ireland
Inland Fisheries Ireland
Irish Farmers Association (IFA) Galway & Mayo Office
Irish Rail
Irish Water
Local Authority Waters and Communities Office
Mayo Local Enterprise Office
National Monument Service
National Museum of Ireland
Northern & Western Regional Assembly
Public Lighting

[7] Department name changed 29th September 2020 from Department of Communications, Climate Action & Environment
[8] Department name changed 30th September 2020 from Department of Culture, Heritage and the Gaeltacht
[9] Department name changed 2nd October 2020 from Department of Housing Planning and Local Government

Road Safety Authority
Royal Irish Academy; Committee for Historical Studies
Siro
Teagasc
The Arts Council
The Heritage Council
Three
TII
Virgin Media
Vodafone
Mayo County Council - Sanitary & Water Section
Ballina Angling Club
Moy Boat Club
Bord Gáis
Bord na Mona
River Moy Trust
Irish Creamery Milk Suppliers Association (ICMSA)
Irish Environmental Network
Landscape Alliance Ireland
Marine Institute
Sustainable Water Network Ireland (SWAN)
The National Water Forum (An Forám Uisce)
Water Policy Advisory Committee
Met Eireann
St. Muredach's Cathedral
Bishop of Killala
Ballina Development Community Group
The Traditional Anglers
Private Moorings
Ballina Salmon Anglers Association

Table 2 Notes from Collaborative Stakeholder Workshop

Stakeholders	Summary
General	Factors to Consider: Local area plan in the process of being updated. Several objectives could impact FRS. Landscaping on Cathedral Rd. Irelands Greenest Town Potential Opportunities for Project and Wider Catchment
	No response at this time
	Feasibility study will show potential floodplain sites within the River Moy and potential for nature-based solutions (NBS). Surveys will be more focused when a potential option is chosen.
	Potential opportunities for the project within wider catchment. Looking at offline storage, attenuation, etc. Be aware of potential seasonal constraints. Also look at combination development- works being done at the same time that may have cumulative impacts
	National Water retention measures. Multi-benefits approach, like Wild-Atlantic, pollinator scheme, identify areas with farmers for biodiversity
	CARO are making an app to document issue around climate change. Local flooding and draught, etc.
	Knockanelo embankment should be reconsiders as a NBS. Also, possibility of rewetting of NPW boglands along the banks.
	Joint approach for NPWS, option to lead to other funding that local groups can't normally access but government bodies can.
Irish Water	Is looking at SuDs and lowering surface water flows.
	There are a lot of outlets going into the Moy, how will they be impacted by raised water levels due to the screen.
Office of Public Works	Second collaborative workshop would be appreciated.
Ballina Boat Club	Current access for the Boat Club could be improved, can only get in at high tide.
Mayo County Council Tourism Section	Can make a feature of the walkways around the Moy.
National Parks & Wildlife Services	Positive that we had surveyed and looked at non-native species. Make sure to consider Water quality as the Moy is known for good water. Council plans for a quey area on the River Moy will come up later
	Welcomed the natural water retention measures mapping and potential for nature based solutions for flood attenuation. However, raised concerns regarding the conflicts with Arterial Drainage works that were ongoing in the upper catchment removing habitats which were already contributing to flood attenuation. It was acknowledged that it was an issue with legislation which need to be addressed at a higher level. However, the arterial drainage works will need to be assessed in-combination with the proposed works.
	Welcomed the natural water retention measures mapping and potential for nature based solutions for flood attenuation. However, raised concerns regarding the conflicts with Arterial Drainage works that were ongoing in the upper catchment removing habitats which were already contributing to flood attenuation. It was acknowledged that it was an issue with legislation which need to be addressed at a higher level. However, the arterial drainage works will need to be assessed in-combination with the proposed works.

	It was that there is a tufa spring near the Moy Boat club opposite Belleek Woods. Tufa springs are an Annex I Priority habitat Petrifying springs with tufa formation (*Cratoneurion*) [7220]. Changes to the hydrological regime may have an effect on the hydrogeological regime of this groundwater-dependent terrestrial ecosystems.
	Requested that if there are any changes in velocity, need to assess the potential impacts to European site downstream.
	Advised to look at enhancing existing habitats instead of replacing habitats to provide biodiversity gain and nature based solutions for flooding. Semi natural grasslands and wet grasslands within the flood plain or on the banks of the river contribute to the structure and function of the River. Any impacts to these habitats need to be assessed.
Mayo County Council - Planning	Mayo County Council are currently revising the Ballina Town & Environs Local Area Plan and is at the public consultation phase. However, it will be published prior to the approvals for the FRS. Therefore, it would be difficult to reflect the Ballina FRS in this iteration of the Local Area Plan. However, MCC planners will work closely with FRS to ensure that there are no conflicts but opportunities.
Killala Diocese	Want to make sure current access to the river in front of the cathedral will be enhanced and maintained.

Appendix B

Human Health Scoping Assessment

Table 7-3: Wider determinants of health scoping exercise

Categories	Wider determinants of health	In/Out	Justification
Health related behaviours	Physical activity	Out	Assessed under open space/transport
	Risk taking behaviour	Out	During construction risk taking behaviour associated with the construction workforce has been considered. Due to the nature and scale of the project significant construction workforce numbers are not expected. The Proposed Scheme will implement, through a Construction Environmental Management Plan (CEMP), best practice health and safety management measures, including health promotion measures, to manage and avoid workforce risk taking behaviour. There is not considered to be the potential for a likely significant population health effect, this issue is scoped out. During operation potential changes to risk-taking behaviours have been considered in terms of whether flood defences enable land-use and commercial outlets (e.g. associated with use of alcohol, cigarettes, gambling, communicable disease risk). However, the types and numbers of commercial outlets are not expected to significantly change as a result of the Proposed Scheme, this issue is scoped out.
	Diet and Nutrition	Out	The construction phase of the Proposed Scheme is unlikely to lead to changes in availability or quality of agricultural land, or changes in commercial or retail outlets that may change access to certain food groups, this issue is scoped out. During operation, the Proposed Scheme will ensure that existing commercial outlets are safeguarded by flood defences (see Built Environment category). However, the types and numbers of commercial outlets are not likely to significantly change. The Proposed Scheme's operational phase is also not likely to lead to significant changes to land use, e.g. new floodplains on existing farmland, that would affect the availability or quality of existing agricultural land, this issue is scoped out.
Social environment	Relocation	Out	Construction of the Proposed Scheme will not involve temporary or permanent population relocation or the temporary or permanent relocation of community/education facilities, this issue is scoped out. During operation the Proposed Scheme would mitigate against future relocations due to flood risk, as it increases the protection of residential and commercial units against flood risk. This potential beneficial effect is considered in the wider determinant of health: Housing.
	Community Safety	Out	Construction activities may lead to an increase in health and safety (H&S) risks (to construction workers and the general public, e.g. risk of drowning); however, the Proposed Scheme will comply with all H&S regulations and the CEMP will secure standard best practice procedures in H&S management, including site fencing. As such no likely significant population health effects of the Proposed Scheme on community H&S are predicted, this issue is scoped out. During operation, the Proposed Scheme is expected to reduce the risk of injury due to drowning/road accidents as it will reduce flood risk thus leading to potential benefits to community safety. There may also be some changes in risk associated with new culverts, but these are unlikely to have the potential to be significant population health effects. These issues area addressed under the health determinants of 'Housing' and 'Transport modes, access and connection'.
	Community Identity, Culture, Resilience and Influence	Out	Due to the nature and scale of the Proposed Scheme, a significant influx of construction workers is not predicted and as such large demographic changes that would affect community identity are not anticipated; transient impacts of the Proposed Scheme, such as the use of construction barriers, lighting or signage, are not expected to disrupt community identity or community gatherings. These issues are scoped out.

			Visual impacts **(Section 6.14)** of the Proposed Scheme during operation are expected to be limited, however there is the potential that the design and materials used in the Proposed Scheme may result in a change to the character and identity of Ballina (e.g. the removal of existing stone walls or the use of steel/concrete adjacent to stone walls). It is also noted that, if undertaken sensitively, the new flood relief scheme may contribute to preserving community identity through the protection of the town centre and existing assets from flooding. This issue is scope out on the basis of anticipated sensitive design, but the human health assessment will keep a watching brief on the landscape and visual assessment, including changes introduced by new culverts. Only if widespread significant adverse effects on landscape and visual receptors are identified in the draft landscape and visual assessment will this issue be included in discussion within the human health assessment.
	Social Participation, Interaction and Support	Out	Construction activities as part of the Proposed Scheme may lead to temporary disruption of access to indoor or outdoor community spaces or spaces for voluntary, social, cultural or spiritual participation. These are, however, considered in the wider determinant of health “Transport modes, access and connection”. Benefits of the Proposed Scheme during operation, namely in ensuring accesses (bridge crossings, pedestrian walkways) are safeguarded from flooding, is also considered in the wider determinant of health “Transport modes, access and connection”. Whilst project wide consultation for the Proposed Scheme is likely to support community empowerment and voice, this is not considered to be of a scale that would result in significant population health effects. This issue is scoped out.
Economic environment	Education and Training	Out	The Proposed Scheme may provide opportunities for construction workforce education and training for local people, including opportunities for local apprenticeships and employment schemes; however due to the nature and scale of the Proposed Scheme, this is unlikely to result in significant population health benefit. Due to the temporary nature of the construction works and focus on local employment, an influx of workers and their families that could affect the capacity of educational establishments is considered unlikely, this issue is scoped out. During operation, the Proposed Scheme will have a limited number of maintenance roles and would safeguard future access to educational establishments from flooding, however, significant population health benefits are also scoped out from further assessment.
Bio-physical environment	Climate Change and Adaptation	Out	Construction emissions as a result of the Proposed Scheme are unlikely to result in population level health effects and are scoped out. Effects on climate change are covered in **Section 6.9**. During operation the Proposed Scheme will provide positive climate adaptation, protecting the town of Ballina and other communities against flood risk. This is considered within wider determinant of health “wider societal infrastructure and resources”.
	Air Quality	Out	Construction works are likely to lead to localised dust and emissions. Effects on individual receptors will be addressed in the Air Quality chapter of the EIAR **(Section 6.8).** Operational effects on air quality are scoped out.
	Water Quality or Availability	Out	Construction works may have an effect on local river water quality, from construction runoff or spillages (see **Section 6.7**). It is assumed that the Proposed Scheme will implement best practice on-site runoff and spill prevention measures secured through the construction management plan. As such, population health effects of changes to local water quality are considered unlikely, this issue is scoped out. A watching brief will be kept over the water environment impact assessment and only if significant adverse effects are identified in the draft ES will water quality be included within the health assessment. Operational effects on water quality or availability are scoped out.

	Land Quality	Out	Construction works may mobilise historic or any new land contaminants. However, it is assumed that best practice measures with regard to contaminated land management and remediation will be implemented and secured through the construction management plan. This risk is scoped out of the health assessment. A watching brief will be kept over the Contaminated Land impact assessment and only if significant adverse effects are identified in the draft ES will land quality be included within the health assessment. Operational effects on land quality are scoped out.
	Radiation	Out	The Proposed Scheme will not include changes to major electrical infrastructure producing non-ionising electromagnetic field radiation. Relevant occupational safeguards will be followed. Any radiation or electromagnetic frequency risks to human health are therefore considered unlikely. Construction and operational EMF effects, including any public perception of risk issues, are scoped out.
Institutional and built environment	Health and Social Care services	Out	It is expected that the great majority of construction workers will be employed locally and the proportion of workers and their families moving to the area and requiring health and social care services would be minor. Relevant occupational practices and emergency planning procedures would be required by law and do not require further assessment. Construction health and social care service implications are scoped out. Whilst operation of the Proposed Scheme would provide relevant safeguards that would avoid or reduce burdens on health and social care services, e.g. through avoiding adverse physical and mental health effects of flooding, as well as safeguarded business and access, this issue is scoped out in line with proportionate assessment.
	Built Environment	Out	The Proposed Scheme may lead to temporary disruptions to utilities during construction, such as water, sewer systems and electricity (**Section 6.11**). In addition, there may be temporary disruption of access to local businesses and services. Disruption to such services on a scale that could affect population health is unlikely. During the operational phase, changes to land use patterns or built features are not expected to have impacts on a sale that would affect population health, such effects are scoped out. The flood defences themselves as features of the built environment are discussed elsewhere, e.g. under ‘Housing’.

Appendix C

Description of Effects (EPA, 2022)

Quality of Effects It is important to inform the non-specialist reader whether an effect is positive, negative or neutral.	**Positive Effects** A change which improves the quality of the environment (for example, by increasing species diversity, or improving the reproductive capacity of an ecosystem, or by removing nuisances or improving amenities).
	Neutral Effects No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.
	Negative/Adverse Effects A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem, or damaging health or property or by causing nuisance).
Describing the Significance of Effects 'Significance' is a concept that can have different meanings for different topics – in the absence of specific definitions for different topics the following definitions may be useful (also see *Determining Significance*).	**Imperceptible** An effect capable of measurement but without significant consequences.
	Not Significant An effect which causes noticeable changes in the character of the environment but without significant consequences.
	Slight Effects An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
	Moderate Effects An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
	Significant Effects An effect which, by its character, magnitude, duration or intensity, alters a sensitive aspect of the environment.
	Very Significant An effect which, by its character, magnitude, duration or intensity, significantly alters most of a sensitive aspect of the environment.
	Profound Effects An effect which obliterates sensitive characteristics.
Describing the Extent and Context of Effects Context can affect the perception of significance. It is important to establish if the effect is unique or, perhaps, commonly or increasingly experienced.	**Extent** Describe the size of the area, the number of sites and the proportion of a population affected by an effect.
	Context Describe whether the extent, duration or frequency will conform or contrast with established (baseline) conditions (is it the biggest, longest effect ever?)

Describing the Probability of Effects Descriptions of effects should establish how likely it is that the predicted effects will occur so that the CA can take a view of the balance of risk over advantage when making a decision.	**Likely Effects** The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.
	Unlikely Effects The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.
Describing the Duration and Frequency of Effects 'Duration' is a concept that can have different meanings for different topics – in the absence of specific definitions for different topics the following definitions may be useful.	**Momentary Effects** Effects lasting from seconds to minutes.
	Brief Effects Effects lasting less than a day.
	Temporary Effects Effects lasting less than a year.
	Short-term Effects Effects lasting one to seven years.
	Medium-term Effects Effects lasting seven to fifteen years.
	Long-term Effects Effects lasting fifteen to sixty years.
	Permanent Effects Effects lasting over sixty years.
	Reversible Effects Effects that can be undone, for example through remediation or restoration.
	Frequency of Effects Describe how often the effect will occur (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually).

Describing the Types of Effects	**Indirect Effects (a.k.a. Secondary or Off-site Effects)** Effects on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway.
	Cumulative Effects The addition of many minor or insignificant effects, including effects of other projects, to create larger, more significant effects.
	'Do-nothing Effects' The environment as it would be in the future should the subject project not be carried out.
	'Worst-case' Effects The effects arising from a project in the case where mitigation measures substantially fail.
	Indeterminable Effects When the full consequences of a change in the environment cannot be described.
	Irreversible Effects When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost.
	Residual Effects The degree of environmental change that will occur after the proposed mitigation measures have taken effect.
	Synergistic Effects Where the resultant effect is of greater significance than the sum of its constituents (e.g. combination of SOx and NOx to produce smog).