

# BALLINA FLOOD RELIEF SCHEME

## Environmental Impact Assessment Report Chapter 5: Project Description



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## Chapter 5: Project Description

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## ACRONYMS

Acronym	Meaning
ACA	Architectural Conservation Area
CEMP	Construction Environmental Management Plan
CIRIA	Construction Industry Research and Information Association
FRS	Flood Relief Scheme
GGBS	Ground Granulated Blast-Furnace Slag
ha	Hectare Area
HEFS	High-End Future Scenario
HGV	Heavy Goods Vehicle
IFI	Inland Fisheries Ireland
LHB	Left-Hand Bank
LHS	Left-Hand Side
MCC	Mayo County Council
MCDP	Mayo County Development Plan
MRFS	Mid-Range Future Scenario
OPW	Office of Public Works
RHB	Right-Hand Bank
RHS	Right-Hand Side
SAC	Special Area of Conservation
SoP	Standard of Protection

## 5 PROJECT DESCRIPTION

### 5.1 Location of the Proposed Scheme

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 tidally influenced. There are several tributaries of the River Moy flowing within the town including the Quignamanger Stream, Bunree Stream (known locally as the Behy Road Stream), Brusna River, Tullyegan Stream and Knockanelo Stream. The current Proposed Scheme includes flood relief measures in Ballina for the River Moy and the following tributaries: Quignamanger Stream, Bunree Stream, Brusna River and the Tullyegan Stream.

The area in which the current Proposed Scheme will be located (red-line boundary area) is shown in **Figure 5-1**. This also includes the predevelopment 1% AEP (Annual Exceedance Probability) flood extents.

The area of the proposed works are also shown in **Figure 5-2** and includes the area where physical works will be undertaken as part of the construction phase of the Proposed Scheme including, the location of areas required for:

- The development of flood defences i.e. flood walls, embankments including adjacent areas required for the construction of such defences.
- The upgrade of existing flood management infrastructure e.g. culverts, including areas to be disturbed during such upgrade activities.
- Compound areas to be used during the construction phase of the Proposed Scheme.
- Road lane closures required to facilitate construction works.

The overall area footprint to be disturbed by the Proposed Scheme including temporary compounds is approximately 12.7 ha.



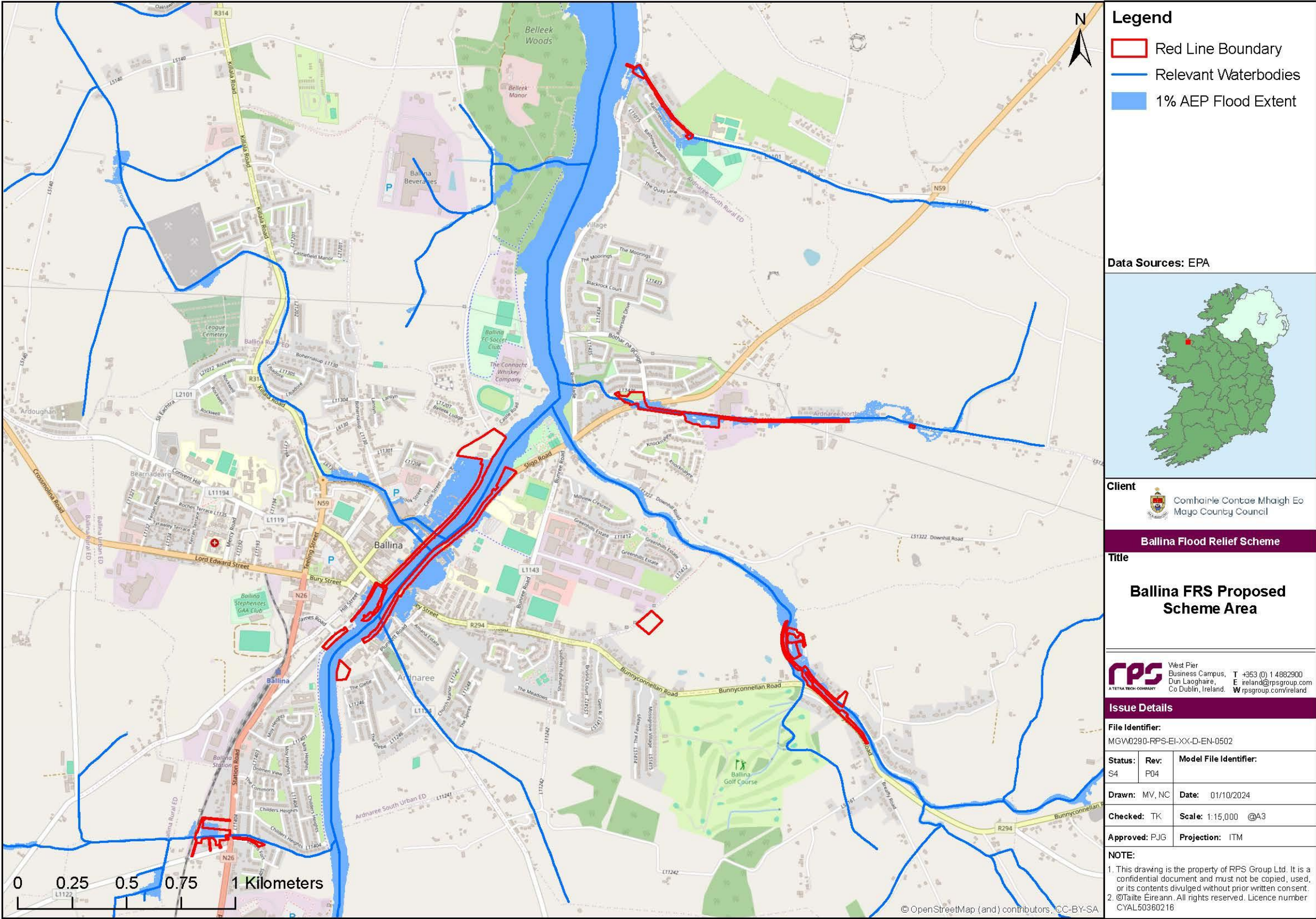


Figure 5-1: Ballina Flood Relief Scheme (FRS) Scheme Area (Including 1 % AEP Flood Risk Areas)



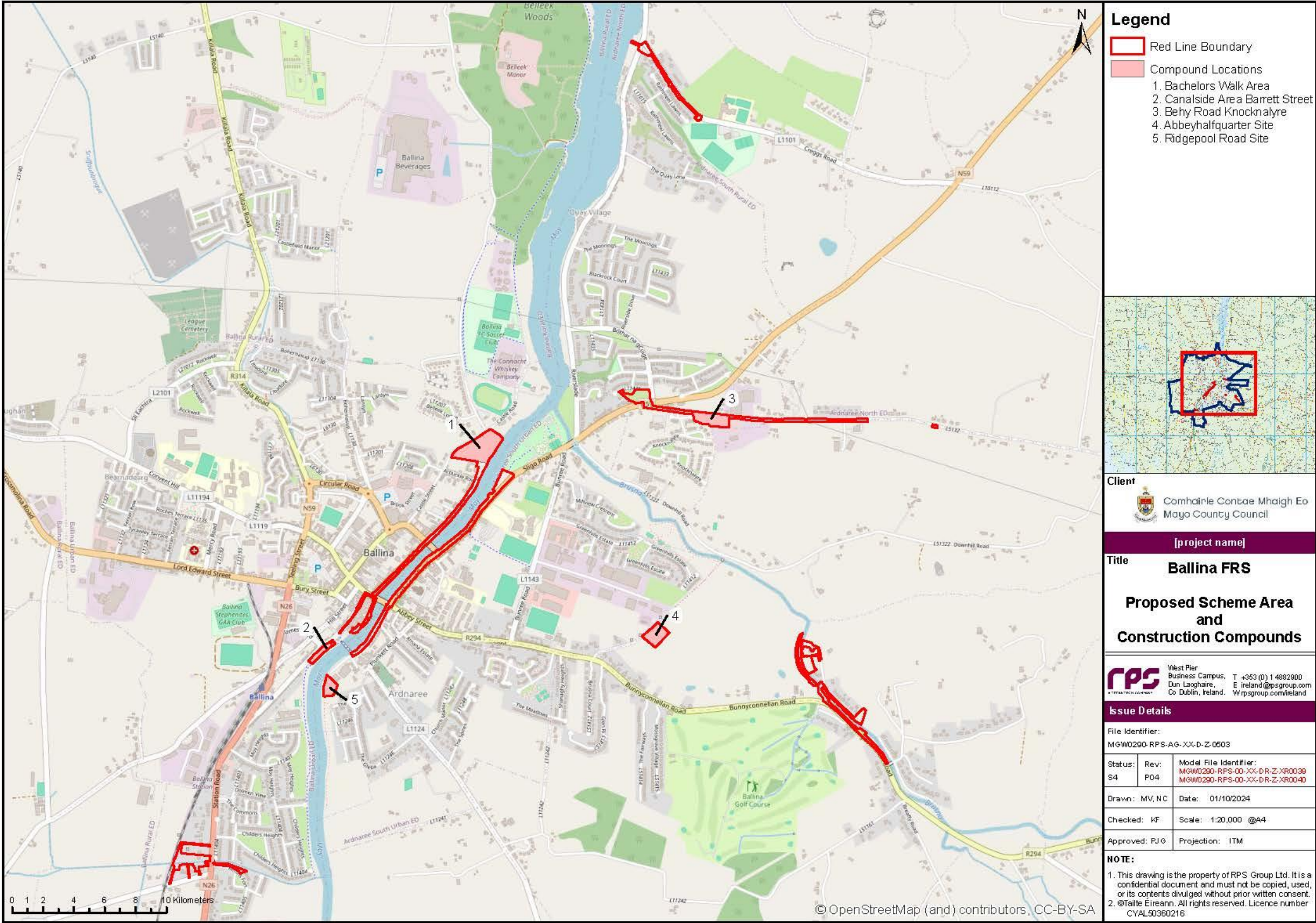


Figure 5-2: Ballina FRS Area of Proposed Works and Construction Compounds



## 5.2 Site Description

Ballina Town is the second-largest town in County Mayo with a population of 10,409. 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 south-westward, entering County Mayo and flowing near Swinford before passing through Foxford then turning north near the village of Kilmore and heading for Ballina Town, 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 tributary the Brusna River which also forms part of the Proposed Scheme (see **Chapters 9: Aquatic Biodiversity** and **Chapter 10: Terrestrial Biodiversity**). The River Moy SAC (Site Code: 002298) contains habitats and species listed in 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 Ridgepool and Cathedral Beat in the centre of the town.

There are two Architectural Conservation Areas (ACAs) within the Scheme Area as follows:

- Crocketstown ACA which includes the Ballina Quay
- Pearse Street ACA located closer to the centre of town which includes the historic commercial core of the town centre and features several historic laneways that run down to Emmet Street and the River Moy.

Of note are the bridges, Salmon Weir on the River Moy and the adjacent Ardnaree Abbey, located along Cathedral Road.

The Lower Bridge (originally New Bridge) is a four-arch road over river bridge built 1833-35 spanning the River Moy. The Upper Bridge (originally Arran Bridge) is a five-arch road over river bridge built 1835-36, spanning the River Moy at the southern end of Ballina town environs. Further south, the Salmon Weir which is recorded by Lewis c. 1837 as extant (and rebuilt) is an important element of the built heritage fabric of Ballina. It has been recently subject to improvement/restoration works in 2010/11.

Sections of reaches along the River Moy are heavily modified. The Salmon Weir footbridge, Salmon Weir, Upper Bridge and Lower Bridge all span the entire width of the river in Ballina town and thus influence the flow regime within the river channel. The Salmon Weir pedestrian bridge is supported by a single pier in the centre of the channel, while the Salmon Weir itself spans 9 piers in total. There are also several bridges and structures to support road and rail routes across the tributaries to the River Moy.

The tributaries which form part of the Proposed Scheme are also heavily modified with culverts, except for the Brusna River. The Quignamanger Stream additionally has an existing diversion culvert operating in the lower reach before discharging into the Moy via a culvert under Quay Road. The Bunree Stream conveys flow via numerous culverts. The Tullyegan Stream incorporates several short culverts.

## 5.3 Scheme Design

### 5.3.1 Objectives

The aim of the Proposed Scheme is to protect the community of Ballina from flooding. The Target Standard of Protection (SoP) for areas at risk of flooding within the community is 1 % of the AEP for fluvial areas and 0.5 % AEP for coastal flood events. The design life of the Proposed Scheme is 50 years. The adaptability of the Proposed Scheme to climate change has also been considered (see **Section 5.3.4**).

Where possible, opportunities for the enhancement of the amenity value of the river have also been identified. The importance of Ballina in terms of natural, built and cultural heritage, the River Moy and Brusna River as SACs, as well as the value of the River Moy in terms of salmon production and the significance of angling for the town of Ballina, have been recognised as part of the development of the Proposed Scheme.

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### 5.3.2 Potential flood risks

Flood modelling undertaken by RPS showed that there is the potential for flooding in Ballina from the River Moy and the following tributaries: Quignamanger Stream, Bunree Stream, Brusna River, Tullyegan Stream and Knockanelo Stream (RPS, 2024). Each area is considered a hydraulically discrete area. The lower reaches of the tributaries may be influenced by flood levels on the River Moy; however, those levels are not expected to change significantly with the application of flood relief measures. The flows into the River Moy from the tributaries are considered small relative to the flows in the River Moy. It is not expected that changes in flows on the tributaries will alter the flood risk and mechanisms on the River Moy.

An overview of the areas where flood risks have been identified in Ballina are shown in **Figure 5-1** and the proposed works for each area are indicated in Figure 5-8 to Figure 5-13.

**Table 5-1** presents the receptors at risk during the design flood event.

**Table 5-1: Receptors at Risk**

	Residential properties	Commercial properties	Other receptors at risk
Moy	198 fluvial (149 coastal) *	65 fluvial (35 coastal) *	N59 Sligo Road, Ridgepool Road, The Brook Road, Abbey Street, Cathedral Road, Cathedral Close, Clare Street, Riversdale Road, Barrett Street, Tolan Street, Pawn Office Lane, Moy Lane Páirc an Easpaig Ballina Quay Play Park (confluence with Brusna) 2 Wastewater Pumping Stations Ashpool car park
Quignamanger	20	1	Playing field Creggs Road, Quay Road Wastewater Pumping Station
Bunree	5	3	Behy Road, N59 Sligo Road, Quignalecka Road Water Pumping Station
Brusna	3	0	R294, Shanaghy Heights road, N59 Sligo Road
Tullyegan	2	0	-
Total	228	69	-

\* Note: 149No. of the same residential properties and 35No. of the same commercial properties will experience flooding during a coastal event. Both a coastal and fluvial event will not happen at the same time.

### 5.3.3 Freeboard

A freeboard assessment was undertaken to determine a suitable freeboard for each reach of flood defence (RPS, 2024). Freeboard is usually applied to compensate for the many unknown factors that could contribute to flood heights greater than the height calculated for a selected size flood, such as uncertainty of the effect of bridges, hydrological uncertainty, uncertainty in model roughness, etc. The Preferred Scheme includes an allowance for freeboard to account for this uncertainty in the analysis. For the 1% AEP flood event, a percentage increase of up to 101 % was applied to the Quignamanger, Bunree, Tullyegan and Knockanelo stream inflows. For the Brusna River, a 37 % increase was applied to the 1 % AEP inflows, and for the River Moy, a 5 % increase was applied to the 1 % AEP inflows. The final design will account for effects of superelevation on bends where required.

In general, a higher freeboard is required than the standard heights used in Ireland (0.3 m for flood walls and 0.5 m for embankments) along the smaller watercourses. Where the freeboard assessment identified reaches of defence with a freeboard of less than the standard freeboard height, the standard heights were retained. Where culverts have been identified as the emerging preferred option, the hydraulic model was used to up-size the culverts to be able to convey the freeboard flows. The freeboard requirements are shown in **Table 5-2**.

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**Table 5-2: Freeboard Requirements**

Watercourse	Emerging preferred option	Freeboard requirements
Moy	Flood walls	Freeboard assessment showed that the nominal freeboard of 0.3 m is adequate
Quignamanger	Culvert upgrade and flood walls	Increase culvert upgrade from 1.2 m diameter to 1.5 m diameter. Freeboard to certain reaches of flood wall increased to 0.4 m
Bunree	New culvert	Increase the lower section of the new culvert from 1.2 m diameter to 1.5 m diameter.
Brusna	Flood walls and embankments	Freeboard to certain reaches of flood wall increased to 0.44 m and flood embankment increased to 0.64 m. The length of defence increased by approximately 20 m.
Tullyegan	Flood walls	Average freeboard increased to 0.62 m. Length of defence increased by approximately 60 m.

### 5.3.4 Scheme Resilience to Climate Change

Under present-day conditions, the River Moy at Ballina is classified as tidally influenced due to its proximity to Killala Bay. Flooding in Ballina primarily occurs due to two main factors: the extremely high tide levels in the River Moy and the combined impact of intense upstream fluvial flows. The main flood mechanisms on the tributaries are short, intense heavy rainfall events. The presence of obstructions or debris in the river channel or at structures leads to water overflow onto the floodplain, and this flow backs up when met with elevated water levels in the River Moy.

Climate change projections have been considered for two potential future scenarios, which can be taken to represent the year 2100:

- The Mid-Range Future Scenario (MRFS) represents the central projections for the impact of climate and other future catchment changes, such as urbanisation and land-use changes, on Flood Risk Management in Ireland. Peak flows are anticipated to increase by 20 % under the MRFS.
- The High-End Future Scenario (HEFS) represents projections at the high end of what could happen if the worst climate and catchment changes are realised. For the HEF Scenarios, peak flows are projected to rise by 30 %.

These predicted increases are anticipated across all tributaries within the catchment.

The adaptability of the Proposed Scheme to the pressures of climate change conditions has been assessed to determine the additional works which would be required to the preferred option in year one of the construction phase. These additional works will provide for climate change and future proofing following the current design life of 50 years (RPS, 2024):

- **River Moy** – Constructing the wall foundations to accommodate a wall height to the 1 % AEP HEFS SoP in case the walls must be raised to reach the SoP in the future.
- **Quignamanger Stream** – no adaptation required in year 1. The design is cognitive that an additional flood bypass culvert may be required in the future to convey the 1 % AEP HEFS flow. Modelling indicates a second circular culvert of 1.5 m diameter discharging direct to the River Moy is required in the future, but this is subject to detailed design.
- **Bunree Stream** – Upsizing the proposed culvert to convey the 1 %AEP HEFS flow. Modelling indicates a circular culvert of 1.5 m diameter, changing into a 1.8 m diameter is required but this is subject to detailed design.
- **Brusna River** – Constructing the wall foundations to accommodate a wall height to the 1 % AEP HEFS SoP in case the walls must be raised to reach the SoP in the future and securing land to accommodate a larger flood embankment to the 1 % AEP HEFS SoP.
- **Tullyegan Stream** – Constructing the wall foundations to accommodate a wall height to the 1 % AEP HEFS SoP in case the walls must be raised to reach the SOP in the future and securing land to accommodate a larger flood embankment to the 1 % AEP HEFS SoP.



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### 5.4 Overview of the Proposed Scheme

The following sections provide an overview of the works to be carried out on the River Moy and the tributaries. A summary of the Proposed Scheme is provided in **Table 5-3** with a description of the works to be carried out described in the sections that follow. Decommissioning is not envisaged for the Proposed Scheme.

Banks are referred to in terms of Left-Hand Side (LHS) or Right-Hand Side (RHS), which are the true left and true right banks facing downstream.

**Table 5-3: Summary of Proposed Scheme**

Watercourse	Location	Description of Works
River Moy	Pedestrian Bridge to Salmon Weir	New flood walls
	Barrett Street	Proposed storm water pumping station and pipework
	Ridgepool	New flood walls Tanking of the Weir Building Additional access to the river Repairs to quay wall as necessary Proposed storm water pumping station and pipework
	Cathedral Road	Raised plaza to act as flood defence incorporating public realm elements
	Emmet Street	Removal and reconstruction of existing wall using original stone. Replace existing railings with combination of new flood wall and glass wall
	Clare Street/Howley Terrace	New flood walls Accessible access at existing angling area Proposed storm water pumping station and pipework
	Bachelors Walk	New flood walls Proposed storm water pumping station and pipework
	General	Tree removal, cutting, pruning and bankside maintenance
	Existing diversion culvert	New culvert
	Existing open reach	New flood walls Lowering of existing left bank channel wall Baffle/ stepped pool at D/S reach of drainage channel
Quignamanger Stream	Outfall to River Moy	New culvert crossing of Quay Road and replacement of downstream culvert with open channel.
	General	Tree removal, cutting, pruning and bankside maintenance
Bunree Stream	Existing culverts and open reaches along Behy Road to Moyvale Park	New culvert
	Existing culvert in Moyvale Park downstream of N59 within public open space	Replace existing culvert with open channel Regrade channel bank where possible to achieve a stepped/gentler slope
	Field bridge	New culvert
	General	Tree removal, cutting, pruning and bankside maintenance
Brusna River	Rathkip/ Shanaghy Area	Flood walls and embankments
	Bridge Crossing	Beam to act as flood defence Replacement of scour protection and bank retaining walls as required
	General	Tree removal, cutting, pruning and bankside maintenance
Tullyegan Stream	Between N26 and railway crossing	Flood walls and embankment

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Watercourse	Location	Description of Works
	General	Tree removal, cutting, pruning and bankside maintenance

### 5.4.1 River Moy

The River Moy as it flows through Ballina Town is unable to convey the flow during a flood event. Several properties in Ballina Town are thus at risk of flooding. 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 the modelled flooding along with the properties in that area; Ridgpool Road, Barrett Street, Cathedral Road, Emmet Street, Clare Street and Bachelors Walk. Clare Street includes Howley Terrace but will be referred to as Clare Street in this assessment. Refer **Figure 5-3** to **Figure 5-7** for examples of the existing flood defences along the River Moy.



**Figure 5-3 River Moy Existing Infrastructure – Looking D/S from the Salmon Weir Pedestrian Bridge (RHS – Ridgpool Road/ LHS – Ballina Manor/Apartments)**



**Figure 5-4 River Moy Existing Infrastructure – Looking U/S from the Upper Bridge (LHS – Ridgpool Road/ RHS – Ballina Manor/Apartments)**



**Figure 5-5 River Moy Existing Infrastructure – Looking U/S from Cathedral Road Plaza (RHS – Emmet Street/ LHS – Cathedral Road)**



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**Figure 5-6 River Moy Existing Infrastructure – Looking D/S from the Lower Bridge (RHS – Clare Street/ LHS – Bachelors Walk)**



**Figure 5-7 River Moy Existing Infrastructure – Looking U/S from Clare Street (RHS – Bachelors Walk/ LHS – Clare Street)**

The fluvial design event is the dominant cause of flooding from the Salmon Weir to approximately the mid-point between Upper Bridge and Lower Bridge. Downstream of this point, tidal surge is the dominant cause of flooding.

The proposed works on the right-bank of (looking downstream) the River Moy (**Figure 5-8**) include flood walls of up to 1.25 m height. This is an increase of up to 0.5m on the existing walls. The new walls (replacing the existing walls) will start upstream of the Salmon Weir, at the pedestrian bridge and finish at Clare Street at Tom Ruane Park. Where required flood defence heights are lower along the section of Ridgpool Road opposite the Inland Fisheries Ireland (IFI) Building, a lower height (700mm approximately) wall will be constructed with a railing placed above the wall. The existing Weir Building on Ridgpool Road will form part of the flood defence measures and will be waterproofed as necessary. Public access to the religious grotto on Clare Street will also be maintained by placing the wall behind the structure.

Flood defences on the left-bank of the river will begin at the existing flood defence at the Ballina Arts Centre and end at the old Ballina Dairies site north of Bachelors Walk. The proposed works on the left-bank of the river (looking downstream) on the River Moy include flood walls of up to 1.3 m height. This is an increase of up to 0.6m on the existing walls. New walls will be constructed to replace existing walls where required. Glass walls will be used in front of the Ballina Manor Hotel/ apartments and the IFI Building to maintain views from affected properties. At Emmet Street the existing railings will be replaced with a combination of new flood walls and glass walls. In the location of existing historic steps, 900mm glass walls will be installed. The existing walls on Emmet Street will be carefully dismantled and reconstructed with the existing stone due to their historical significance. Along the left bank of the River Moy adjacent to the Salmon Weir and the Ballina Arts Centre, realignment of the temporary groyne, as agreed with IFI, is proposed as a fisheries enhancement measure. Biodiversity enhancement will be provided along the River Moy in the form of bird boxes and bat boxes.

The pavement along these sections will be removed and replaced to accommodate the foundation of the new walls and drainage. The route of the flood walls will generally follow the line of existing walls and will tie into existing walls, bridges and/or high ground. The existing walls will therefore need to be removed to allow



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new flood walls to be constructed. This will be required along the banks of Ridgpool Road, Cathedral Road, Clare Street and Bachelors Walk.

Mayo County Council (MCC) is in the process of developing a Public Realm Scheme for the town of Ballina. The Proposed Scheme provides for a new public open space area on Cathedral Road which will be incorporated into the broader Ballina Public Realm in the future (see **Section 5.5.3**). Further details regarding the public open space area are provided in **Section 5.5.3** and **Chapter 19: Landscape & Visual**.

Existing angling access points along the right bank will be maintained post construction. An additional angling access point will be provided immediately downstream of the Weir Building. A wheelchair accessible angling access point will be provided on Clare Street.

### 5.4.2 Quignamanger Stream

The Quignamanger is a small watercourse with numerous culverted sections with a maximum diameter of 0.7m. It has been modified further with the addition of a storm diversion culvert. The Quignamanger stream is dry under ordinary low flows as the majority of upstream flows are diverted down the 0.9 m diversion culvert, re-joining the Quignamanger Stream just upstream of Quay Road. During a flood event the diversion culvert reaches capacity 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 involve the replacement of the existing 0.9 m piped diameter diversion culvert with a larger 1.5 m diameter piped culvert for part of the upstream section and a 2 m wide by 1 m deep box culvert along the downstream section to minimise the amount of regrading required in the stream. The existing flap valve at the point where the culvert discharges back into the river channel, just before intersection of Creggs and Quay Roads will also be removed.

Flood walls will be installed along the open reach of the channel upstream of Quay Road. The open reach has been planned to allow for the protection of sensitive habitat located in this area (Tufa Spring Habitat, see **Chapter 4: Assessment of Alternatives** and **Chapter 9: Aquatic Biodiversity**). When the lower reach of the Quignamanger channel upstream of the existing Quay Road culvert is graded down into the new enlarged Quay Road culvert, rather than leaving a uniformly sloping channel, the design shall include a series of fixed rock or concrete baffles or step-pools (ensuring a low-flow notch) using natural rock and cobble to create turbulent flow. The flood walls will have a maximum height of 1.1 m. The culvert under Quay Road which conveys water to the River Moy will also be upgraded to a 2 x 1 m box culvert. The existing culvert downstream of Quay Road will be removed to allow for an open channel discharge to the River Moy. The proposed works to be carried out on the Quignamanger Stream are shown on Figure 5-9.

### 5.4.3 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 Behy Road.

The proposed works (see **Figure 5-10**) include the installation of a new culvert which would replace the existing culverted and open channel sections. The culvert will follow the existing stream channel. A 1.5 m diameter piped culvert will be installed at the upstream section of the works to upgrade an existing field culvert access. A new 1.5 m culvert will be installed from Behy Business Park to the Knocknalyre housing estate. Downstream of this, the culvert will increase to a 1.8 m diameter culvert. The culvert will further increase to a 2m x 1.25m square culvert where it crosses the N59. Local road raising will be required at this culvert location. A culverted section downstream of the N59 at Moyvale Park, which causes a constriction to flood flows, will be removed and the open channel reinstated. Localised regrading will be required to ensure stream invert levels are maintained. The banks of this open channel will be regraded to form a gentle/stepped slope.

The works will require removal of existing boundaries and reinstatement of same. In some areas it is proposed to amend the alignment of the boundary to provide for future access and maintenance of the proposed culvert.

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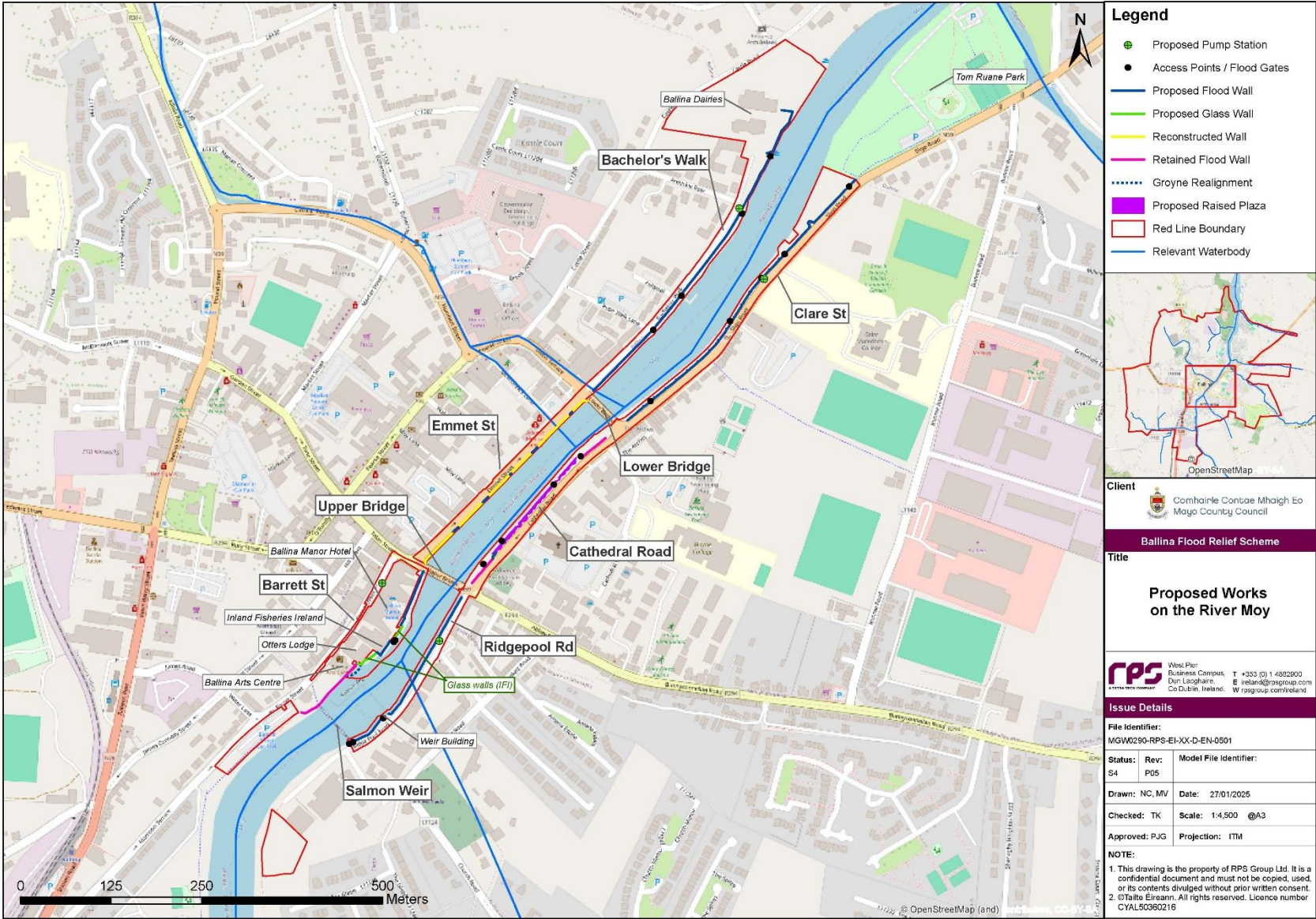


Figure 5-8: Proposed Works to be Carried out on the River Moy



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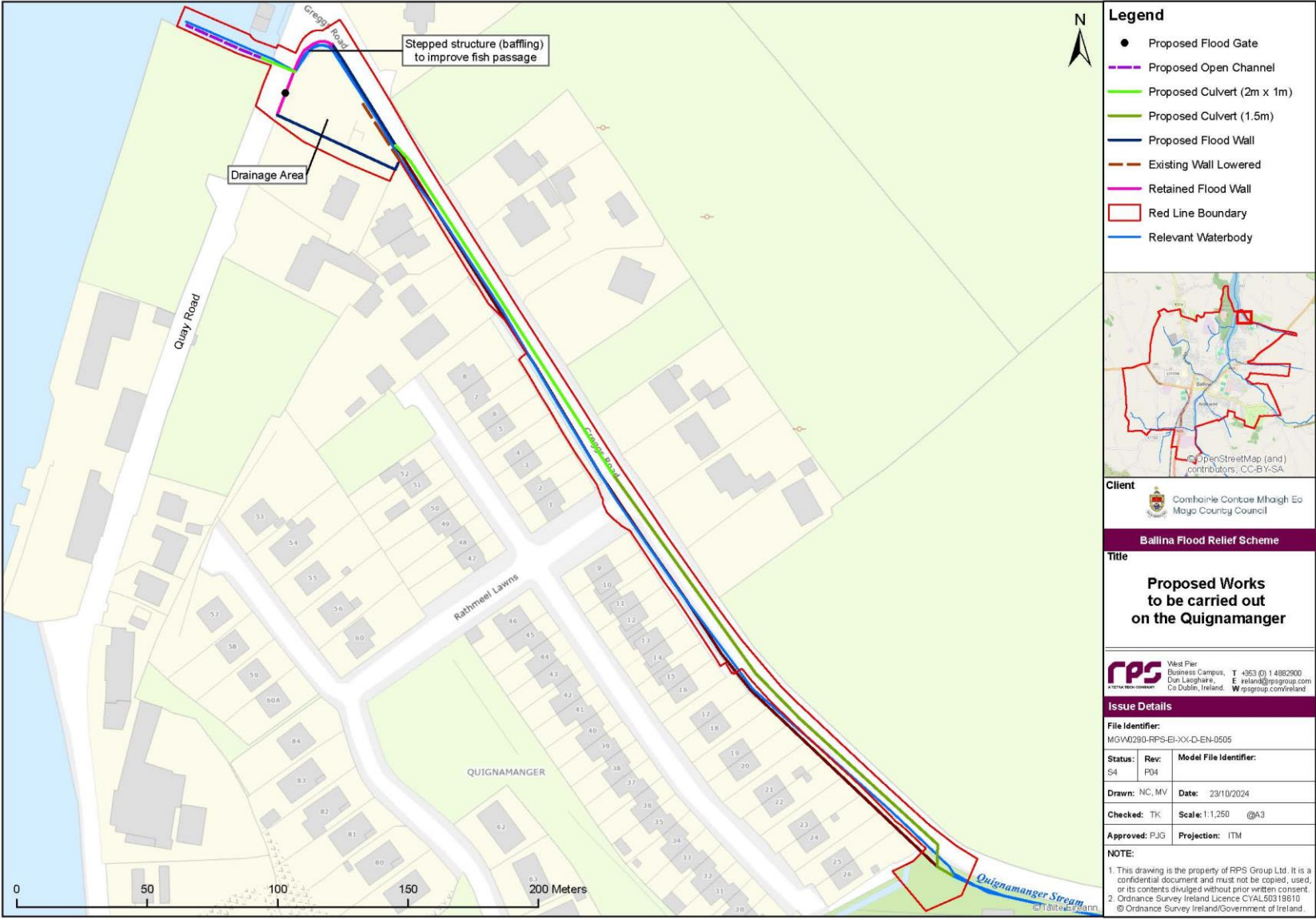


Figure 5-9 Proposed Works to be Carried out on the Quignamanger



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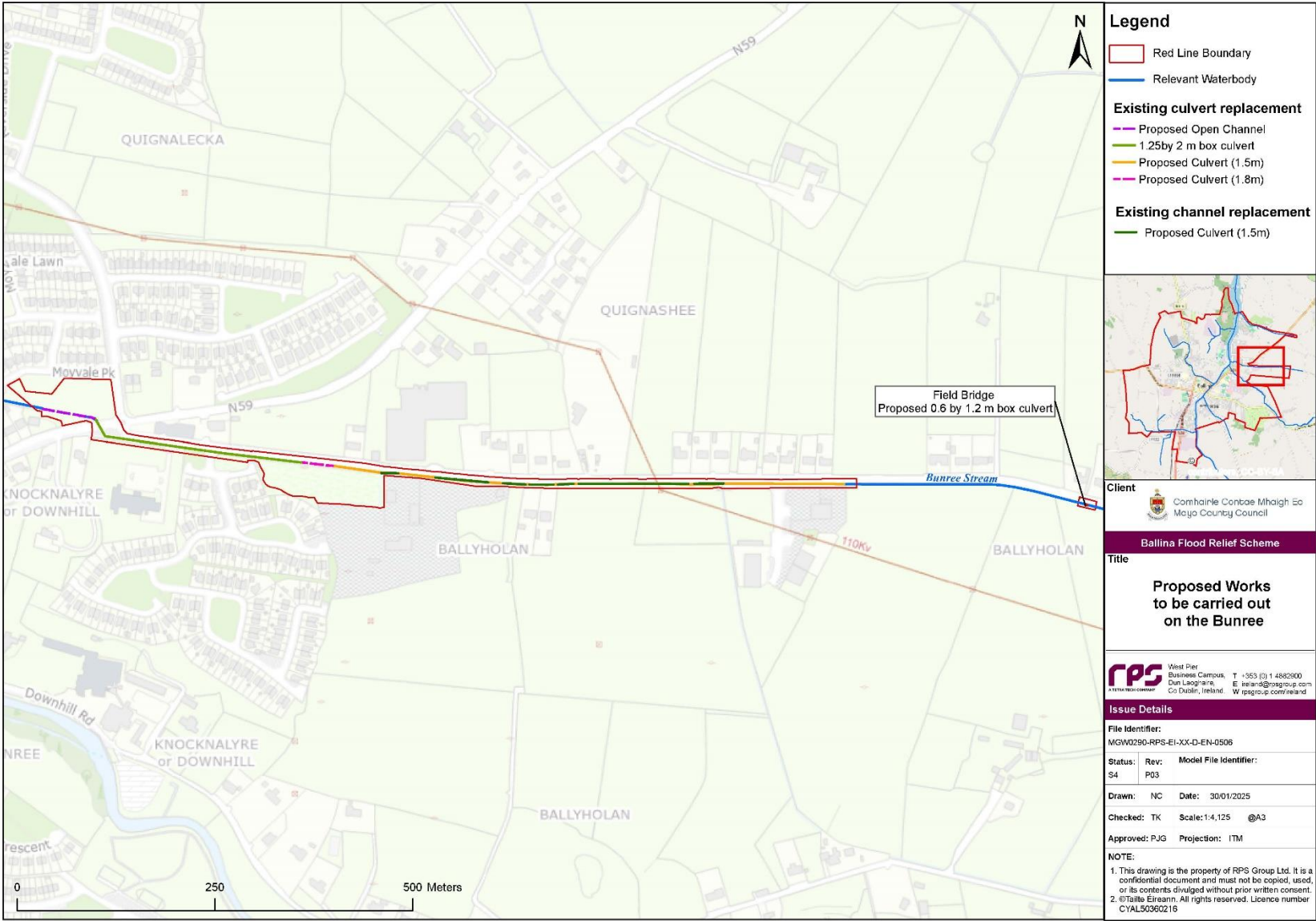


Figure 5-10 Proposed Works to be Carried out on the Bunree Stream

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### 5.4.4 Brusna (Glenree) River

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

The proposed works on the Brusna (Glenree) River (Figure 5-11) include hard defences consisting of flood walls and embankments. Flood walls and embankments are required on both sides of the river upstream of the access bridge to Rathkip/Shanaghy. Flood walls and embankments are required on the right bank of the river downstream of the bridge. The maximum height of flood walls and embankment is approximately 1.7 m. There are no existing walls in the locations of proposed flood walls, it is predominately fenced or hedgerows. Flood walls and embankments have been set back from the river to minimise the removal of trees and protect the riparian zone. Two otter holts are proposed to be constructed downstream of the bridge crossing on the left bank as outlined in **Chapter 10 – Terrestrial Biodiversity**. An example of an artificial otter holt is illustrated on **Figure 5-12** below. Embankments will allow for access/habitat for wildlife. Bat and bird boxes are being provided to enhance biodiversity.

Flood levels would be higher than deck level of the bridge to Rathkip/Shanaghy area, therefore a reinforced concrete beam spanning the river on the upstream side of the bridge is required to prevent overtopping and remove any additional loading to the bridge. The beam will be connected to the upstream side of the bridge. The beam will be installed using a crane located on the southern left bank of the river. The beam will be supported on 2 proposed reinforced concrete piers. The piers will tie into the proposed flood walls on either side of the bridge. The existing railing will be reinstalled to ensure fall protection height is provided. Construction of the beam will not block access across the bridge and access to the houses on the other side of the river will be maintained. Scour protection is proposed along the riverbed in the vicinity of the river. Replacement bank retaining walls are also required in the vicinity of the bridge. Replacement bank retaining walls are also required in the vicinity of the bridge. The beam, scour protection, and proposed replacement bank retaining walls is shown in **Figure 5-27** in **Section 5.7.8**.

### 5.4.5 Tullyegan Stream

The Tullyegan is a small, mainly open watercourse located at the southern end of Ballina. Hydraulic modelling showed that during the 1 % AEP flood event out of bank flooding occurs. This is due to a downstream constriction at the N26 road bridge resulting in flows backing up increasing water levels upstream.

Flood walls on the north bank are to be constructed to the same height as the existing walls which range from 1.4 to 2.96m. The embankment on the north bank has a maximum height of 1.5m. Flood walls on the southern bank of the stream have a maximum height of 1m (see Figure 5-13) to prevent the removal of trees which line the riverbank. An embankment will be installed on the left bank where the flood defence ties in with the Iarnród Éireann/Irish Rail embankment. The embankment is proposed to facilitate the movement of otters, as suitable habitat was identified at this location (see **Chapter 4: Assessment of Alternatives**).

New gated construction and emergency access points will be provided from the N26 and L1122 roads.

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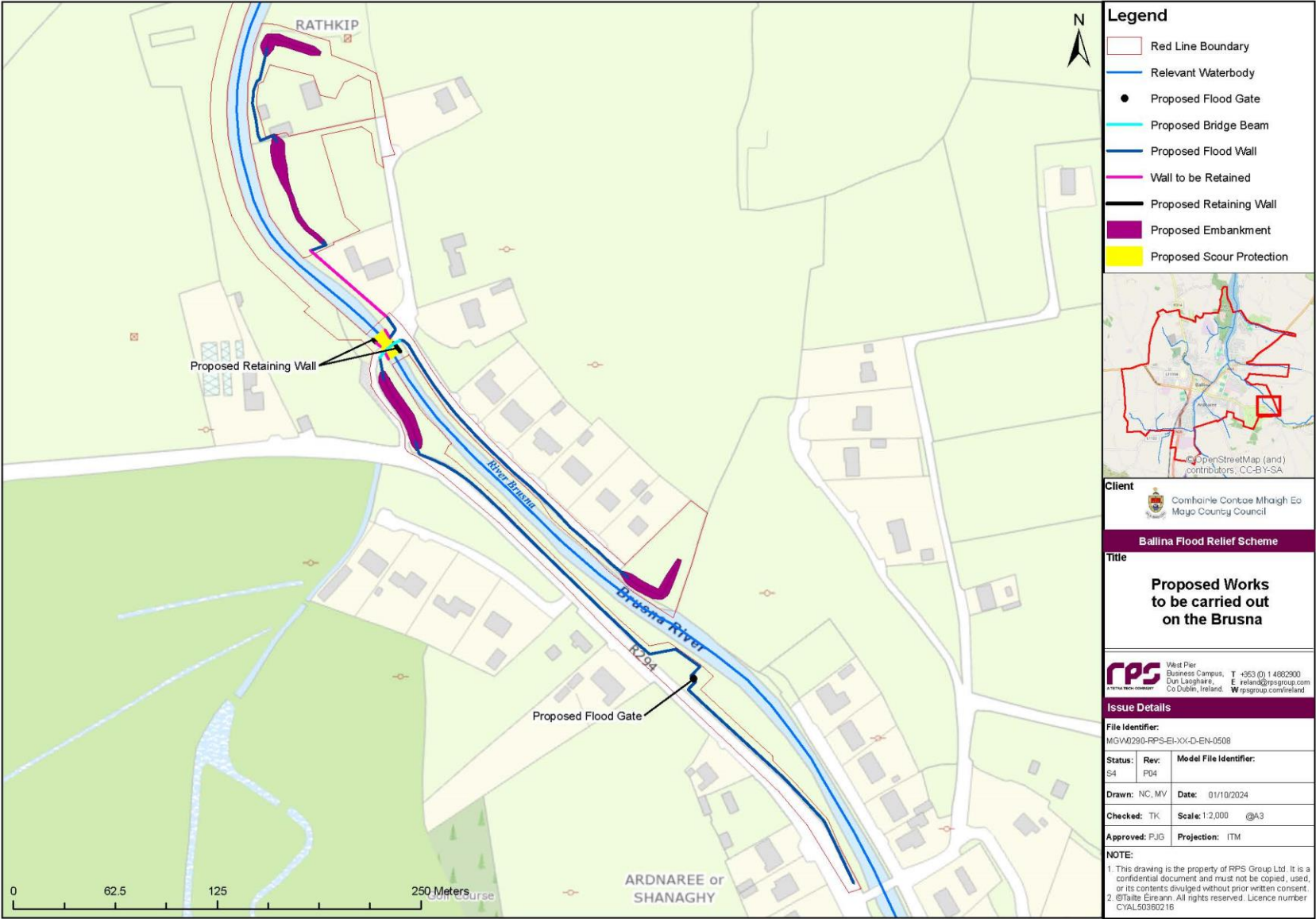


Figure 5-11 Proposed Works to be Carried out on the River Brusna



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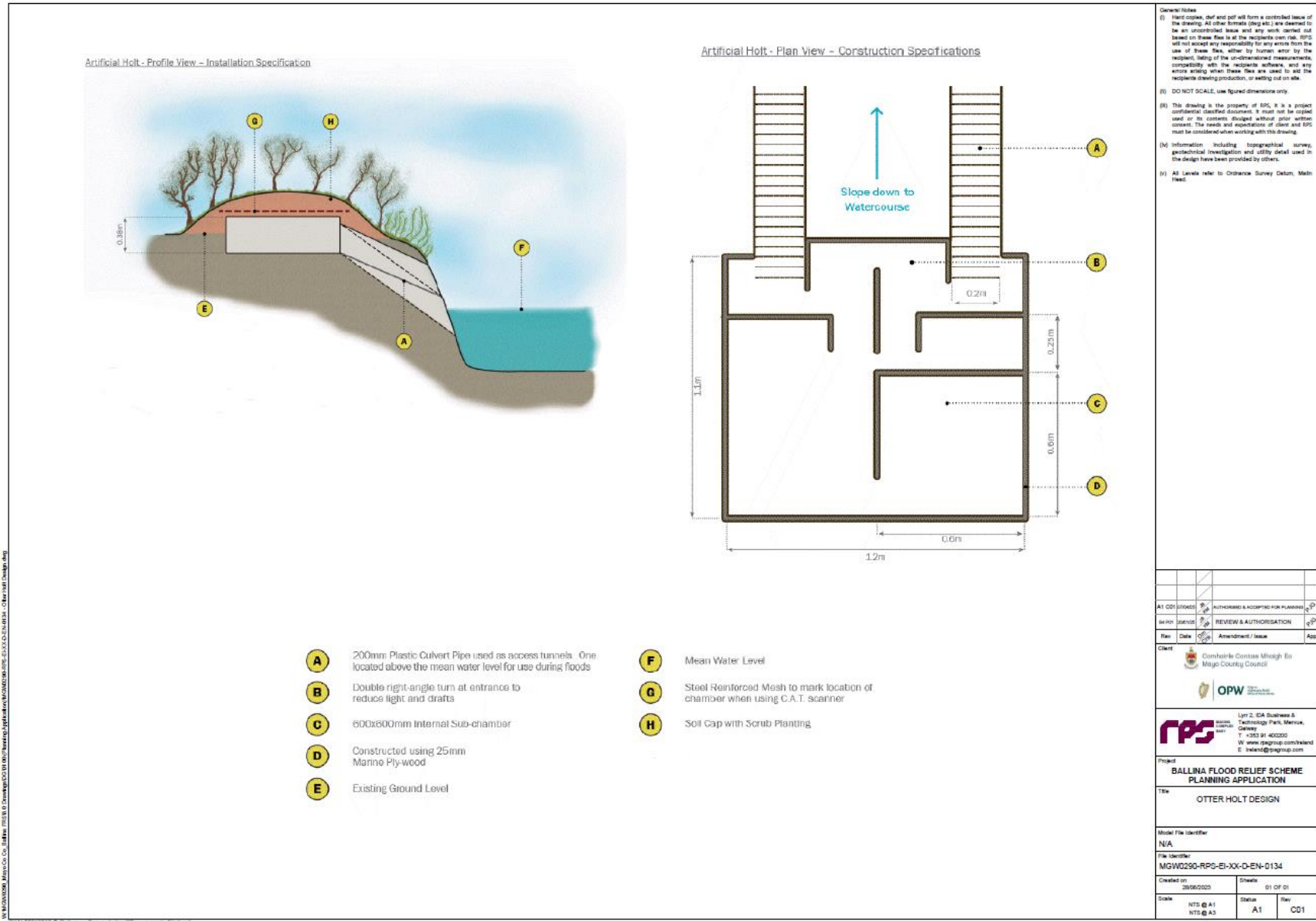


Figure 5-12: Artificial Otter Holt Design

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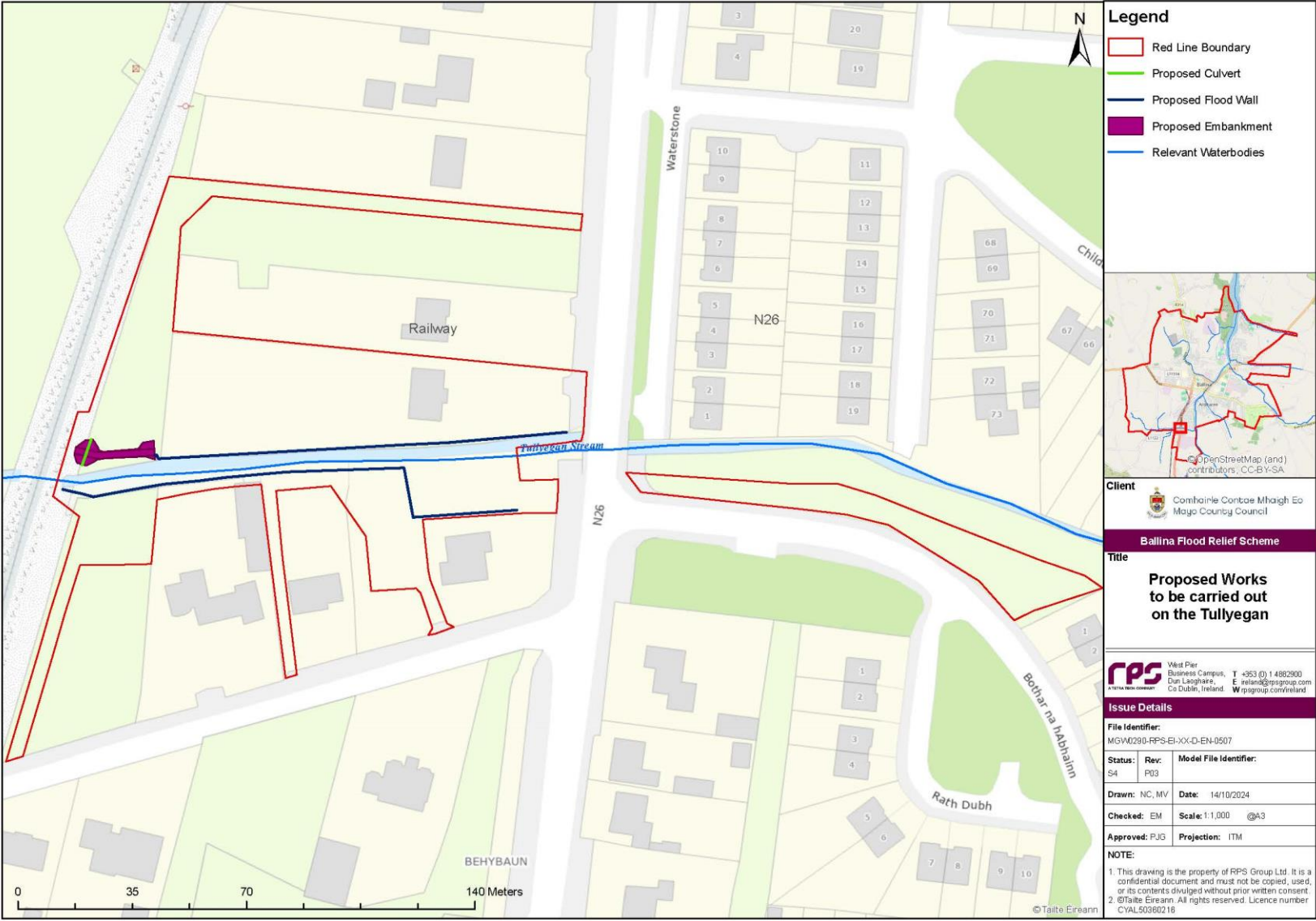


Figure 5-13 Proposed Works to be Carried out on the Tullyegan Stream

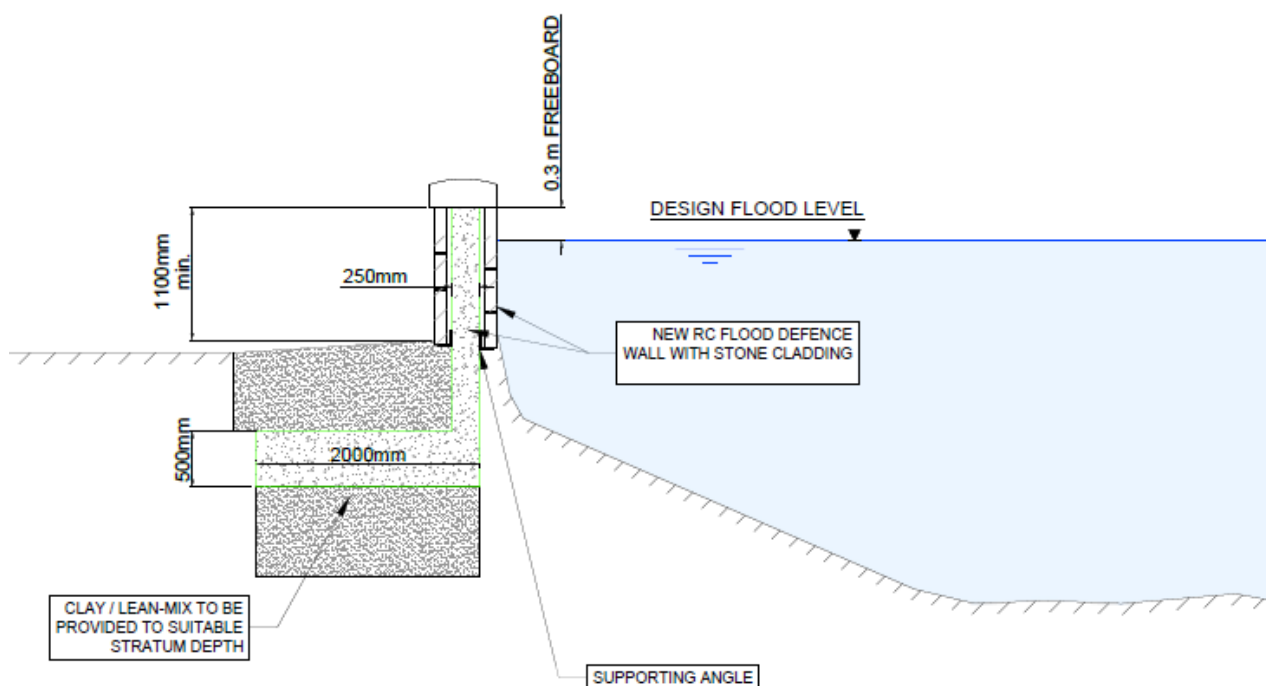
## 5.5 Proposed Scheme Elements

### 5.5.1 Flood Walls

A typical flood wall detail to be used on the River Moy and other areas is shown in **Figure 5-14**. The majority of flood walls will consist of reinforced concrete with a suitable foundation, stone cladding along the face and of varying height.

The existing flood walls located along the River Moy will be removed and disposed offsite. Suitable demolished flood wall material will be reused for the likes of stone cladding of the new flood wall. The walls will be constructed from cast in-situ reinforced concrete typically by the following methodology:

- Stripping and storage of topsoil for reuse (where there is no existing wall, i.e. along the Tullyegan, Brusna and Quignamanger river channels).
- Removing existing footpaths and some trees will be required along the River Moy.
- Excavation to the required depth will be undertaken typically up to 2 m below existing ground level.
- Installation of a cut off lean mix or clay core beneath the wall foundation.
- Blinding concrete will be placed to enable the fixing of steel reinforcement for the base of the wall.
- Shuttering will be placed to enable pouring of the base of the wall.
- The wall reinforcement steel will then be fixed and shuttered before pouring the walls.
- It may be necessary to utilise a crane and excavator to ‘skip’ the concrete into some of the higher sections of wall or use a concrete pump.
- Cladding of the walls in stone.
- In-situ reinforced concrete will be designed to account for the saline environment (increased cover etc.) and consideration of Ground Granulated Blast-Furnace Slag (GGBS) to increase technical performance and minimise environmental impact.



**Figure 5-14: Standard Cross Section Detail of Flood Wall— River Moy**



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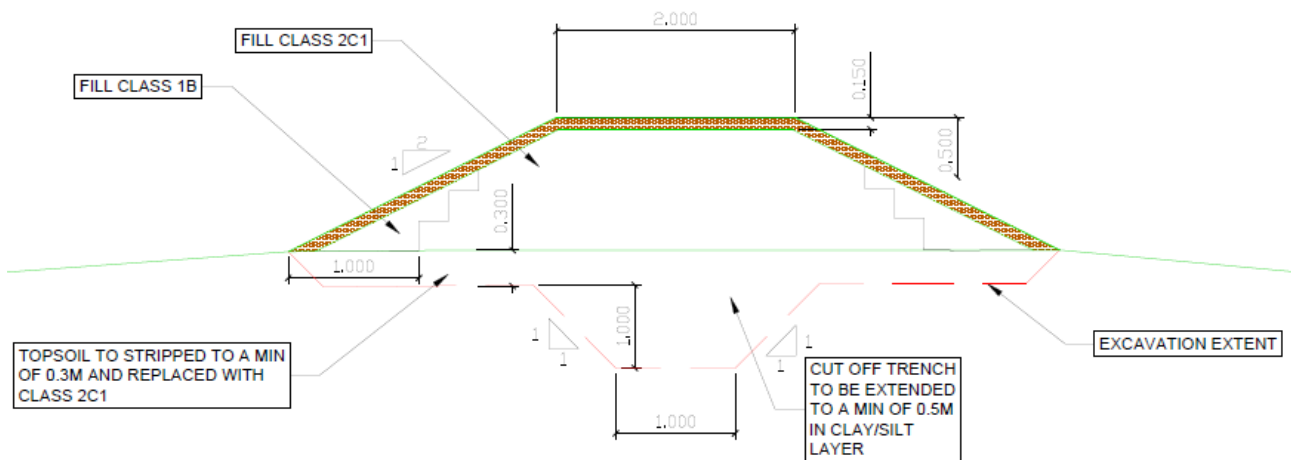
### 5.5.2 Embankments

Embankments are proposed on the River Brusna and on the Tullyegan Stream.

Embankments will be constructed of impermeable clay with a capping of topsoil of approximately 150 mm depth to allow for landscaping.

The construction of the flood embankments will involve the following construction methodology:

- Stripping and storage of topsoil for reuse.
- Import and storage of suitable clay material to form the core of the embankment by lorry and road. This will be stored within the working area and brought to required locations using an excavator and dumper.
- Excavate cut off trench approximately 1m below the embankment and fill with impermeable clay to prevent seepage.
- Place and compact impermeable clay until the defences have reached the necessary height. Embankment front and back slopes will be profiled to meet the required gradient of up to 1 in 3. The embankment will then be topsoiled with a suitable, biodegradable geotextile and sown in grass. The geotextile will protect the embankment from erosion until such times as the vegetation has been established.
- A back drain will be required at the rear toe of the embankment. A trench will be excavated to facilitate the laying of typically a 100 mm diameter perforated drainage pipe in clean stone. Manholes will be required at 90 m intervals or at changes of direction of the back drains. Outfalls from this rear drain, passing beneath the earth embankment and discharging to the river will be required. These will need to be fitted to prevent backflow during times of flood.
- A typical embankment structure is shown in **Figure 5-15**.



**Figure 5-15: Typical Embankment Details**

### 5.5.3 Public Open Space

The plaza opposite Muredach's Cathedral along Cathedral Road will be modified for incorporation into the future planned Ballina Public Realm. This will involve the development of a raised platform to a height of approximately 0.8 m. Existing pedestrian access to the river will be maintained, including provision for accessible access and access for boats. The proposed design of the public open space at Cathedral Road is shown in **Figure 5-16**.

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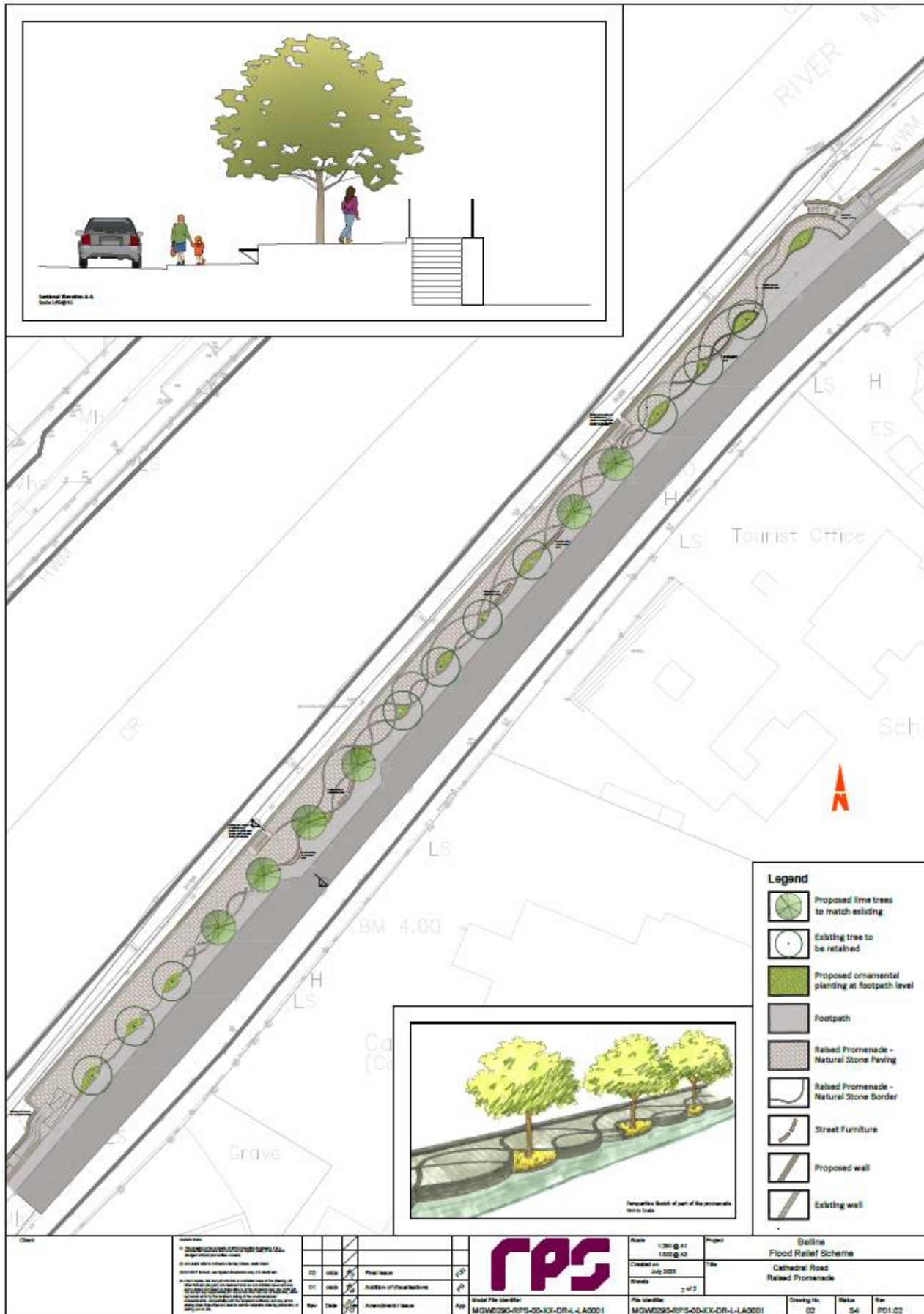


Figure 5-16: Proposed Public Open Space on Cathedral Road

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### 5.5.4 Surface Water Drainage

New surface water sewers will be installed along all road sections adjacent to new flood walls on the River Moy. This includes Ridgepool Road, Barrett Street, Cathedral Road, Emmet Street, Bachelors Walk and Clare Street. New outfalls to the River Moy will be installed with petrol interceptors. Flap valves would be required on all discharge points into the rivers.

Surface water pumping stations will be installed at strategic points to manage excess water during flood events. The pumping stations will be submersible in nature with a valve chamber and kiosk. Surface water flows from the pumping station will be pumped directly to the river. Hydrocarbon interceptors will be installed upstream of the pumping stations.

Pumping stations will be installed at the following locations:

- Bachelors Walk
- Clare Street
- Ridgepool Road
- Barrett Street

Pump stations are to have a minimum of two submersible pumps. At a minimum the pump will be designed to accommodate the 1 hr 2-year return storm event. It is not proposed to provide permanent backup power at the pumping stations but the facility to connect a mobile generator will be provided. The locations of the pumping stations are given in **Figure 5-8**. Existing surface water discharges will be retained along the remainder of the Proposed Scheme.

### 5.5.5 Bridge Works

Along the River Moy, new flood walls will tie into the existing bridges. The Proposed Scheme will not result in any alterations to the Upper, Lower and Pedestrian bridges or the Salmon Weir.

The access bridge to Rathkip/Shanaghy area on the Brusna River will be reinforced to protect the bridge during flood events.

### 5.5.6 Diversion of Utilities

A review of existing utilities and associated infrastructure was undertaken as part of the design development process. The utility providers identified within, or adjacent to, the footprint of the Proposed Scheme include:

- **Electricity Supply:** ESB Networks
- **Water Mains and Foul Sewers:** Uisce Éireann
- **Telecommunications:** Eir, Virgin Media, E-Net
- **Gas Networks:** Gas Networks Ireland

The interactions of the Proposed Scheme with utilities linked to each of the providers are provided in **Chapter 16: Material Assets Utilities and Waste**. Interactions will be considered on an individual basis, and each conflict location will be discussed with the relevant utility provider.

### 5.5.7 Amenity Access to the River Moy

Access to the River Moy for recreational activities and anglers along the Proposed Scheme is required. Access types include vehicular, pedestrian and accessible entry. Current access points are shown in **Figure 5-17**. Such access points to the River Moy will be maintained through ramps, stiles or flood gates. It is intended to retain all existing access points with access to be improved where practical. Public access to the religious grotto on Clare Street will also be maintained by placing the wall behind the structure.



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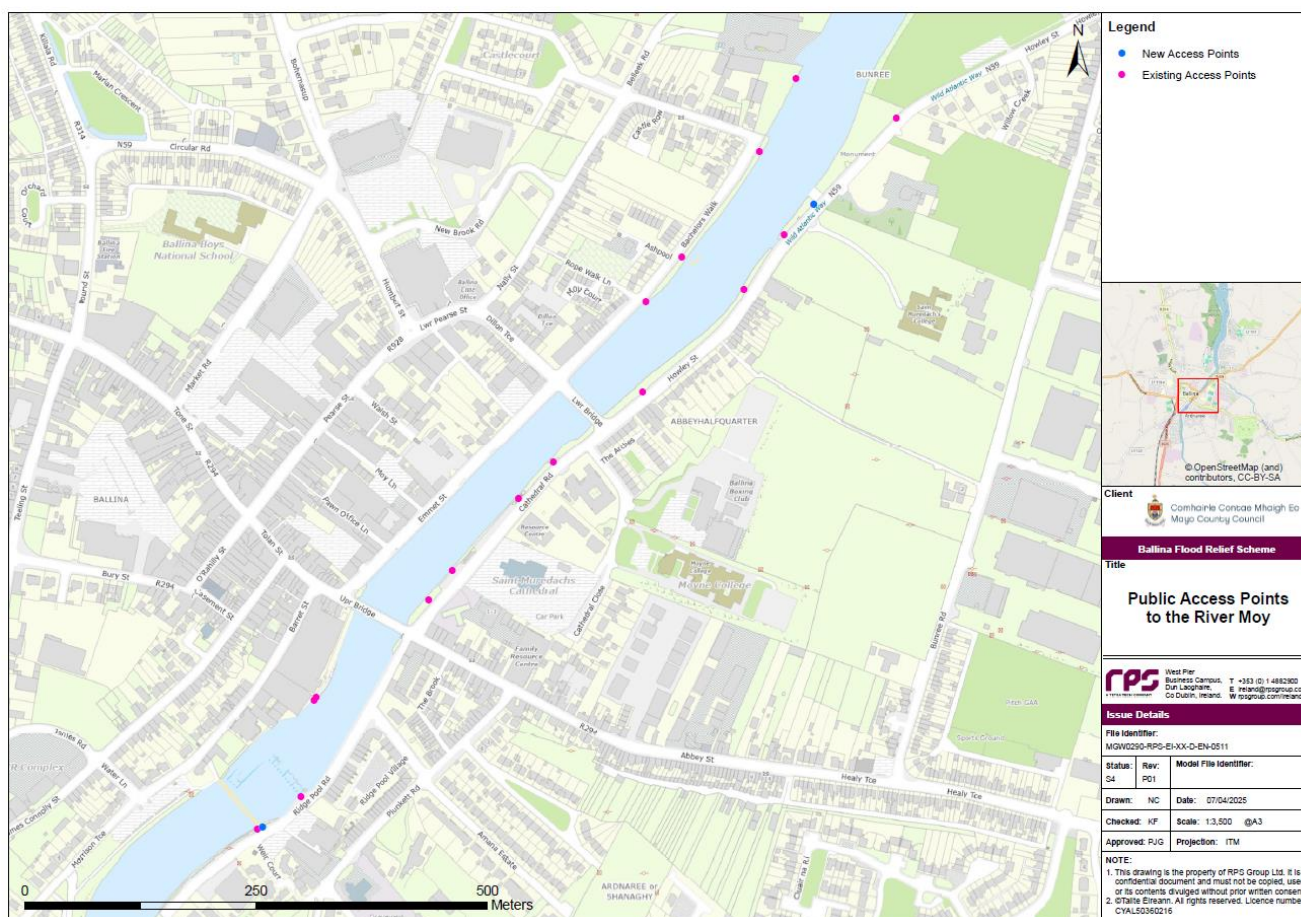


Figure 5-17: Public Access Points to the River Moy

### 5.5.8 Lighting Design

Existing lighting will be replaced where disturbed along the River Moy and all other areas of work. There are currently no proposals to change the nature of the lighting except for making a change to LED lighting where lights have not already been upgraded.

The exception to this would be the proposed public realm areas where further lighting may be added as part of detailed design. Further lighting will require input from a qualified ecologist to ensure there is no further impact to the surrounding habitat.

## 5.6 Separate Consents/Licences

The following additional consents/licences are required:

- A Maritime Area Consent (MAC) in accordance with the Maritime Area Planning (MAP) Act 2021.
- Derogation licences from National Parks and Wildlife Service.
- Section 50 consent from the Office of Public Works (OPW)

## 5.7 Construction Phase

### 5.7.1 Construction Programme and Phasing

Construction activities are envisaged to take place during a single construction campaign lasting 36 months but could extend beyond this should unforeseen circumstances arise. All applicable constraints and mitigations will apply to any extended programme. This will be followed by a 15-month handover period. The activities planned for each of the areas within the Proposed Scheme are yet to be scheduled, but it is assumed that activities will run simultaneously within 3 to 4 different areas of the Proposed Scheme.

There will be restrictions on the construction programme to accommodate angling activities and fishing rights on the River Moy with construction activities to take place outside of angling season in some areas. There are also restrictions as a result of fish spawning season. Refer to **Figure 5-18** for details.

The following restrictions are to be in place to accommodate fish breeding, angling and spawning seasons:

- Freshwater River Moy (Ridgepool and Salmon Weir):
  - **Year 1 (Y1)** – No instream works from January until the IFI peak angling season finishes at the end of July of Y1.
  - Instream works cannot occur until the end of Week 2 of August of Y1 in relation to sea lamprey habitat protection at specific points within the Ridgepool (Sites RP2A, RP8-RP8A, see **Appendix 9.6 of this EIAR** for locations).
  - **Year 2 (Y2)** – The access ramp / cofferdam work areas on the LHS in front of Ballina Manor Hotel / IFI Building will remain in place for the remainder of Y1 and through Y2 until those works are completed. IFI have agreed that the works can continue through the angling season of Y2 so that the instream low flow period can be utilised to expedite the work schedule.
  - Instream works may continue on the Ridgepool Roadside (RHS) of Ridgepool through Y2 subject to the restrictions set out in **Section 9.5.1.3 of Chapter 9 Aquatic Biodiversity** relating to sea lamprey habitat protection regarding the timing of placement of cofferdams that cover the reach that includes Sites RP8 to RP8A (see **Appendix 9.6 of this EIAR** for locations).
- Estuarine River Moy (main channel downstream of Upper Bridge, including Cathedral pool):
  - **Year 1 (Y1)** – No near-bankside works that could disturb the fishing amenity of Cathedral pool until at earliest **August 1<sup>st</sup> of Y1** of the work programme, i.e., no scaffolding or flood wall works along Emmet Street. This is to allow for the peak angling season to be undisturbed until the end of July.
  - **Year 2 (Y2)** – **No timing restrictions** for works in the estuarine River Moy (Cathedral Pool and downstream of Lower Bridge) as it is a transitional water and is not subject to timing restrictions for fish spawning waters.
- Quignamanger
  - No restrictions for the diversion culvert and flood walls along existing open section.
  - Instream works restricted to **May to September inclusive**.
- Bunree Stream
  - Instream works restricted to **May to September inclusive**.
- Brusna River –
  - Instream works (Bridge Upgrade) restricted to **July to September inclusive**.
  - Instream works (All works over or near water set back floodwall and embankment) restricted to **May to September inclusive**.
- Tullyegan Stream
  - Instream works (floodwalls) restricted to **May to September inclusive**.

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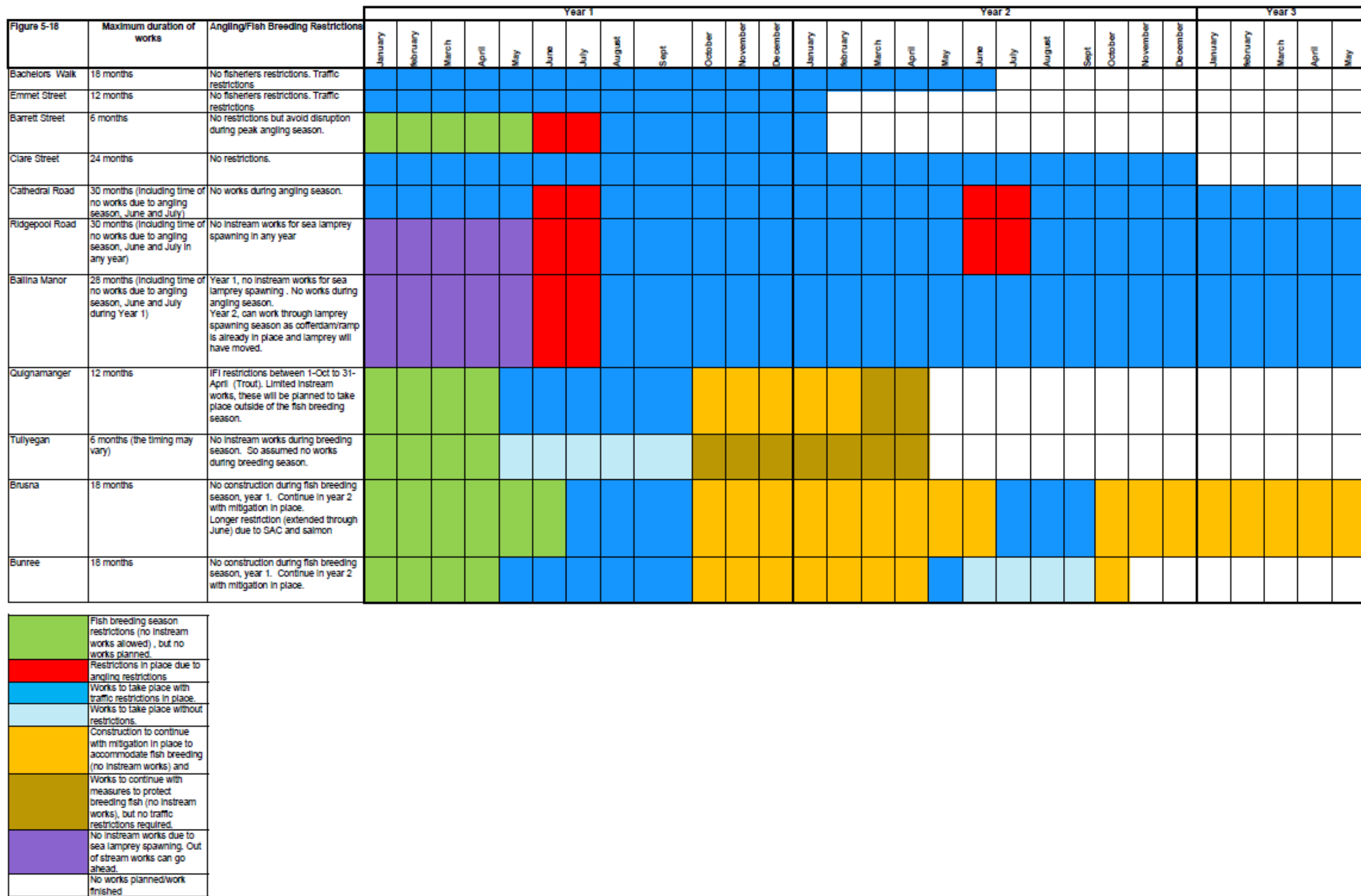


Figure 5-18: Indicative Construction Programme for the Proposed Scheme



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### 5.7.2 Construction Compounds

The appointed contractor will set up the temporary construction compounds. Compounds will include site offices, welfare facilities, bunded fuel storage areas, designated storage area and construction parking. Wastewater will connect to foul sewer networks where available. Where not available, the contractor will have to provide welfare facilities in accordance with best practice.

The locations of potential temporary compounds are shown in **Figure 5-2** and listed below:

- Ballina Dairies site and adjacent boat club site.
- MCC lands on Barrett Street.
- Sites located on private lands:
  - Ridgepool Road.
  - Behy Road.
  - Bonniconlon Road

The majority of material will be imported and stockpiled in the compound locations.

### 5.7.3 Site/Ground Investigation Works

**Table 5-4** lists the required ground investigation (GI) locations along the River Brusna that will be investigated during detailed design stage. These GI locations are also illustrated on **Figure 5-19**. These site investigation works are required to inform the detailed design phase of the project and prior to the commencement of the construction works.

**Table 5-4 Proposed GI Locations**

GI Point	Location
BH44	Within 15 m of IAPS
BH45	Within 150 m of otter holt (approximately 36 m)
BH46	Within 150 m of otter holt (approximately 44 m)
BH47	Within 150 m of otter holt (approximately 95 m)
ST37	Within 150 m of otter holt (approximately 10 m) Within 25 m of IAPS
ST38	Within 150 m of otter holt (approximately 23 m)
ST39	Within 150 m of otter holt (approximately 88 m) Within 10 m of IAPS
ST40	Within 150 m of otter holt (approximately 88 m)
ST42	Within 12 m of IAPS
ST41	Within 28 m of IAPS
TP23	Within 150 m of otter couch (approximately 95 m)
TP24	Within 150 m of otter holt (approximately 125 m)
TP25	Within 150 m of otter holt (approximately 29 m) Within 15 m of IAPS
TP26	Within 150m of otter holt (approximately 22 m)
TP27	Within 150 m of otter holt (approximately 80 m) Within 5 m of IAPS
TP28	Within 10 m of IAPS
TP29	Within 16 m of IAPS
TP30	Within 29 m of IAPS
TP31	Within 19 m of IAPS
TP32	Within 22 m of IAPS

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Figure 5-19: Proposed GI Locations

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### 5.7.4 Site Preparation

Tree removal, cutting, pruning and bankside maintenance along the River Moy, the Brusna River, the Quignamanger Stream, Bunree Stream and the Tullyegan Stream will be required in each section to facilitate construction works. Details regarding compensatory planting areas is provided in **Chapter 19: Landscape & Visual**.

### 5.7.5 Demolition Works

The demolition requirements for the implementation of the Proposed Scheme are detailed in **Chapter 16: Material Assets- Waste/Utilities**. This includes the demolition of the existing flood walls to allow for the installation of new flood walls as well as the removal of existing culverts to allow for the installation of new culverts. Where possible material will be reused in the construction of new infrastructure i.e., for cladding of new flood walls. Material that cannot be reused will be disposed at a licenced waste disposal facility.

### 5.7.6 Advance Works

It is proposed that advance works may be undertaken on both Bachelor's Walk and Clare Street. The works will include demolition and reconstruction of approx. 10 linear metres of existing quay wall along both streets to create sample sections of finished wall to determine extent of existing stone that could be reused in the final design.

The 10m section of wall on both Bachelor's Walk and Clare Street form part of the aforementioned walls to be upgraded. As such, these advance works will be subject to the same constraints and mitigation measures identified for the permanent works in these areas.

### 5.7.7 Excavations

Excavation requirements for the implementation of the Proposed Scheme are summarised in **Chapter 16: Material Assets- Waste/Utilities**. Excavated material will be used for backfilling or for the development of embankments where practicable. Excess material will be disposed of at a licenced waste disposal facility.

### 5.7.8 Sediment and Erosion Control

A robust sediment control system will be provided in all works areas, including appropriate erosion and silt controls (e.g. settling ponds/tanks, silt fence, silt curtains) to prevent any flow of surface water from the site into the River Moy and its tributaries.

Silt fences, sandbags and/or silt curtains will be used to keep dust and debris out of the river when demolishing existing walls.

A site-specific Construction Environmental Management Plan (CEMP) will be prepared by the contractor prior to the commencement of any works in order to ensure all works are carried out in a manner designed to avoid and minimise any adverse impacts on the receiving environment. Further details regarding erosion and sediment control are provided in the CEMP and as mitigation in **Chapter 9: Aquatic Biodiversity**.

### 5.7.9 Instream Works

Instream works will be required to facilitate construction activities in certain parts of the Proposed Scheme. Works will be undertaken during low level conditions as far as practicable and within the seasonal restrictions placed on the programme (**Section 5.7.1**). Works on the River Moy and Brusna Stream are within the boundary of the River Moy SAC and Killala Bay/Moy Estuary SAC. Historical fishing access to the river will be maintained where possible.

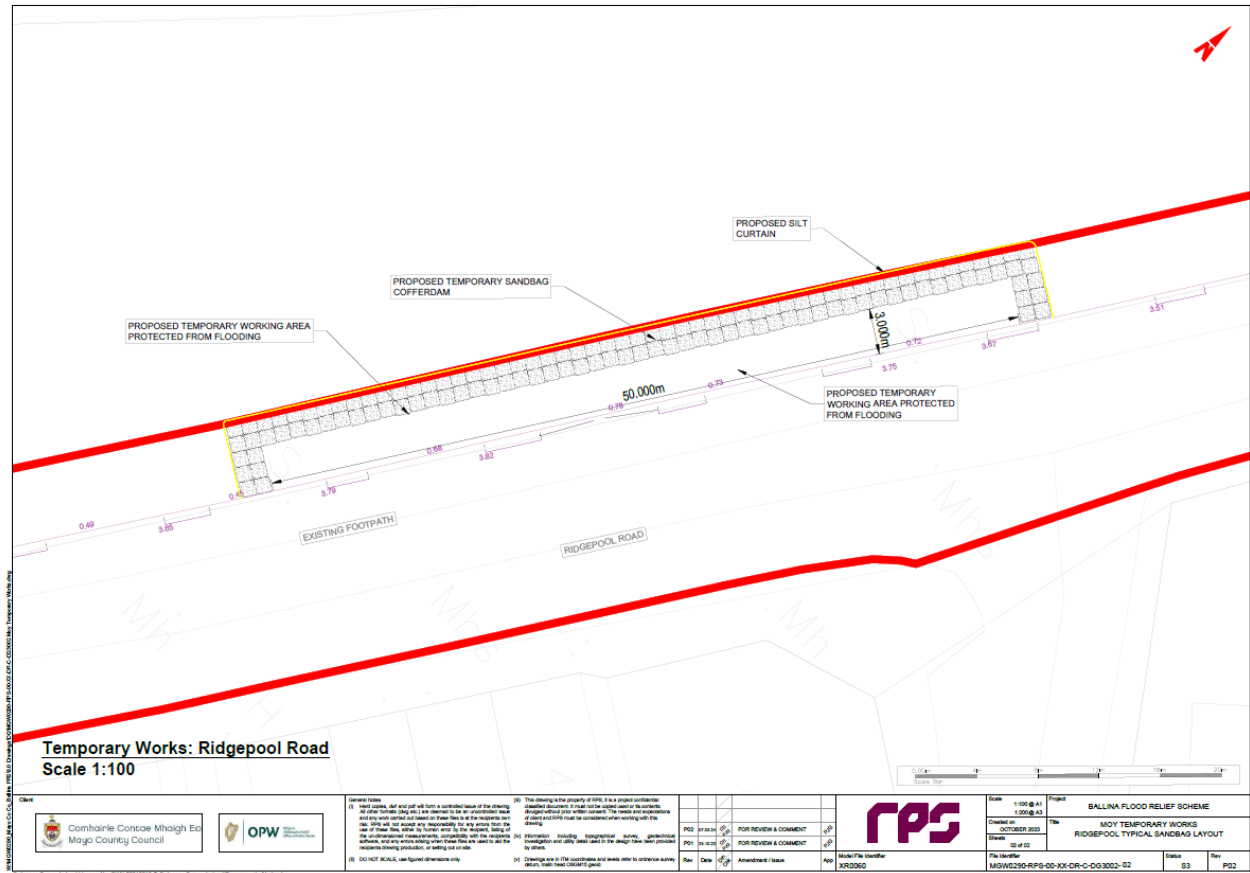
#### 5.7.9.1 River Moy – Ridgepool Road (RB) and Bank at Ballina Hotel/Apartments (LB)

Instream works may be required to allow for the replacement of the quay walls that run parallel to Ridgepool Road. This will be accomplished by the installation of cofferdams constructed using 1-tonne sandbags or similar. If used, the 1-tonne sandbags will be filled with smaller sandbags. This will reduce the risk of



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sediment entering the river and allow for the sandbags to be filled on site. The instream works footprint will extend approximately 5 m from the existing quay wall on Ridgepool Road. Instream working areas will be limited to 50 m lengths at any one time in this area. The maximum instream works footprint along Ridgepool Road is approximately 1,320 m<sup>2</sup>. The majority of works should be able to be completed from the roadside, limiting the need for instream works. Detail on the River Moy Temporary Works (Ridgepool Road) is illustrated in **Figure 5-20**.



**Figure 5-20: River Moy Temporary Works (Ridgepool Road)**

The walls along Ridgepool Road will need to be cleaned to complete a detailed structural assessment of the walls. These works will be completed in advance of detailed design. A typical repair detail is indicated in **Figure 5-21**.

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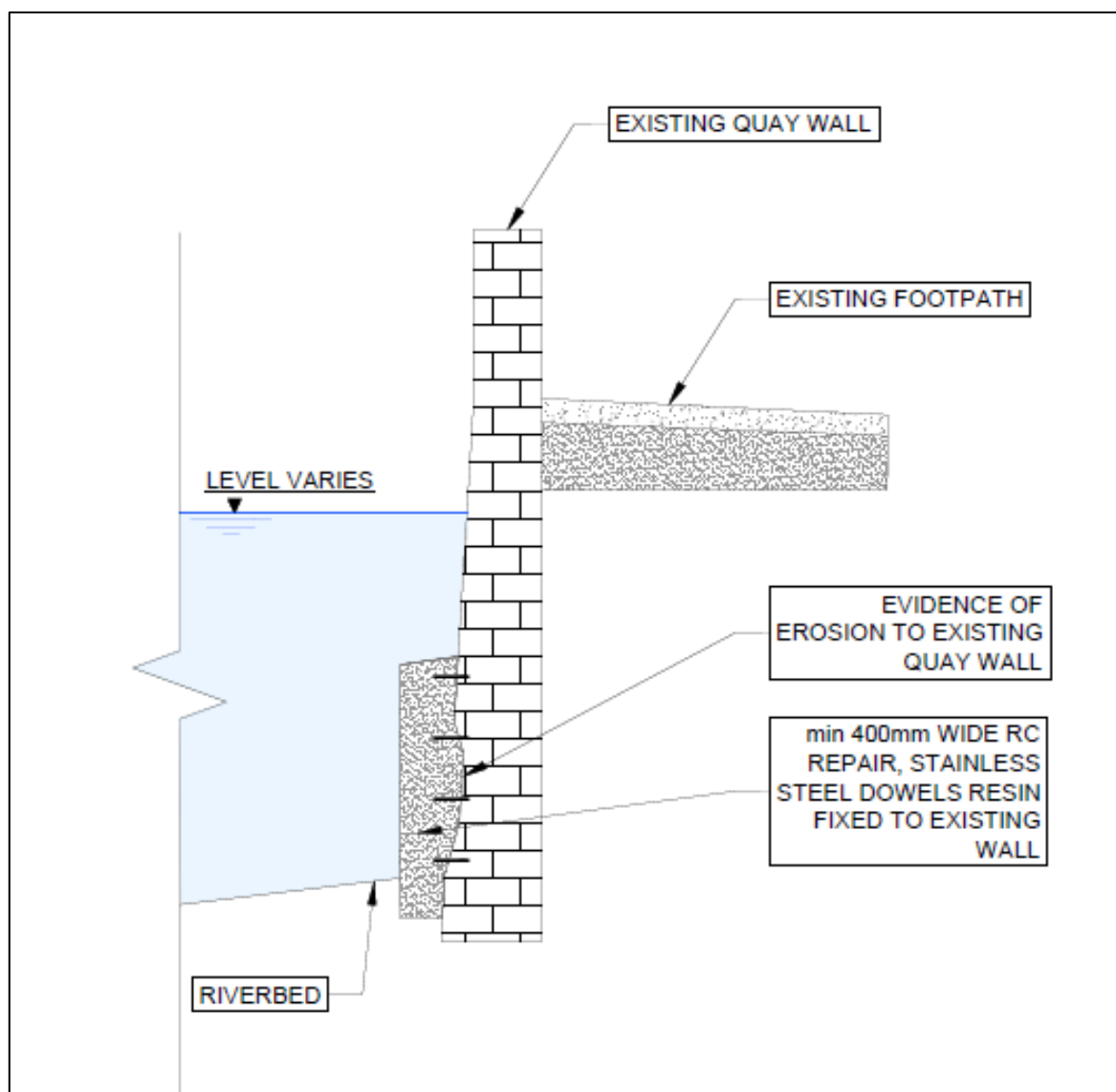


Figure 5-21: Typical Erosion Repair Detail

Instream works will be required on the left bank of the river (in front of Ballina Manor Hotel/Apartments) to allow for the installation of flood walls. This will be accomplished by the installation of a stone ramp in front of the IFI building and warehouse to provide access to the Otters Lodge apartment building upstream of the warehouse. A cofferdam will also be constructed upstream of the ramp to allow for safe working conditions in this area. The stone ramp will be constructed from large rock or rock filled bags (filled with washed stone). Access to this area will be via the area in front of the Ballina Manor Hotel/Apartments and through to the front of the IFI building (see **Figure 5-22**). Machinery and materials will need to be craned in from the Upper Bridge. The maximum instream works footprint along on the left bank of the river (in front of Ballina Manor Hotel/Apartments) is approximately 2,300m<sup>2</sup>.

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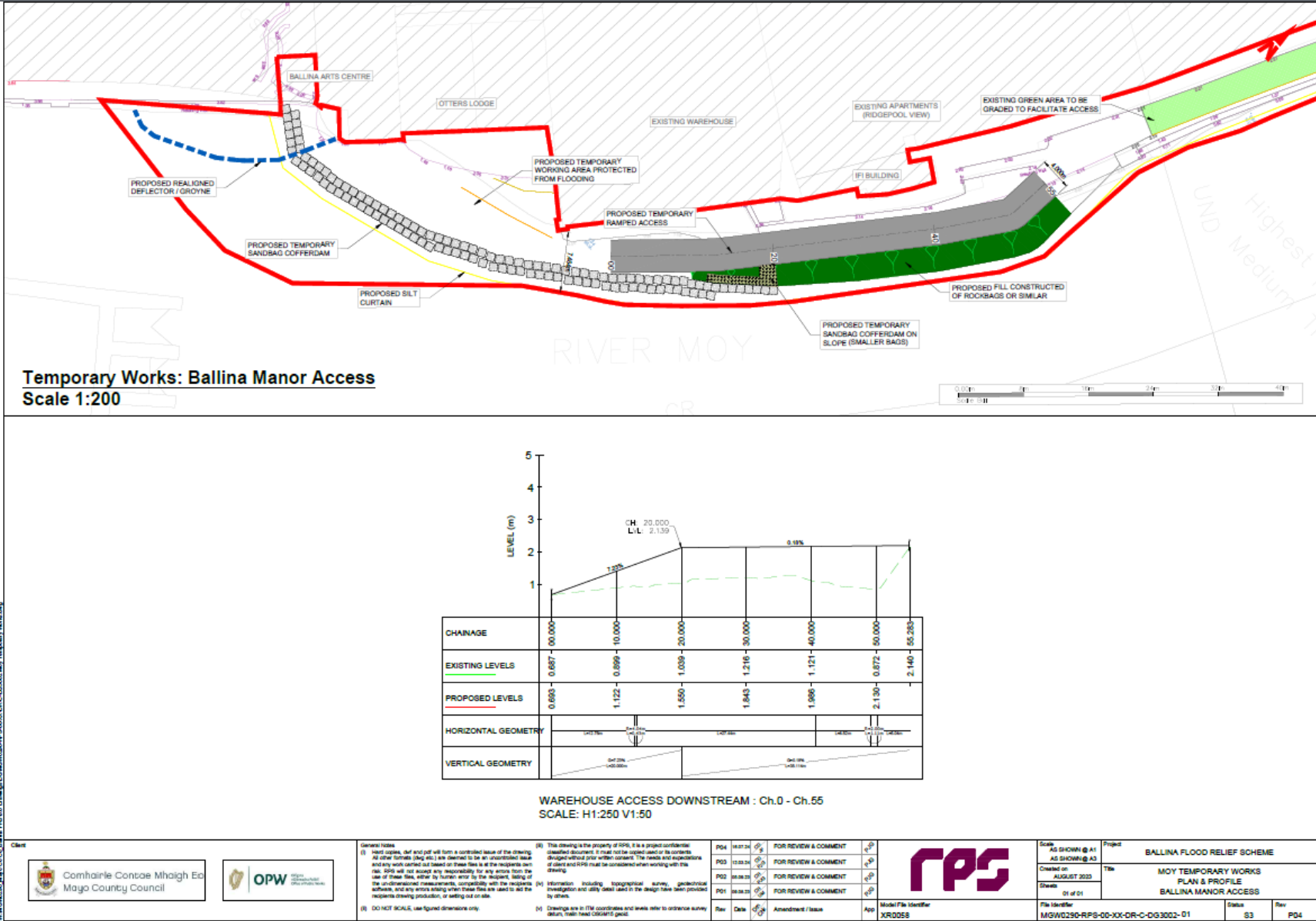
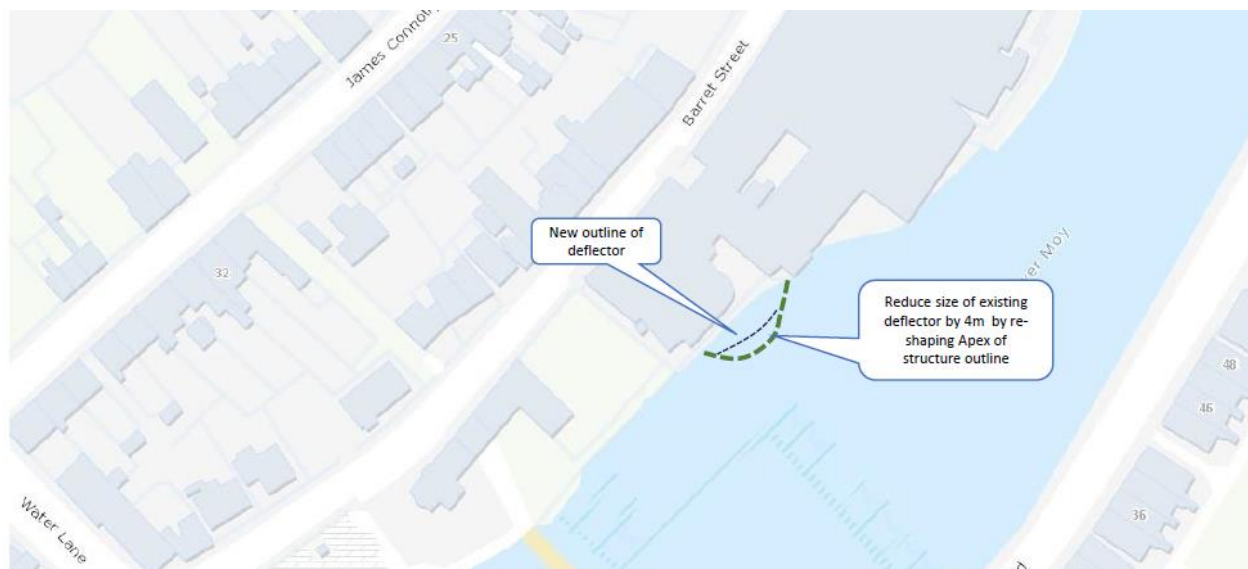


Figure 5-22: River Moy Temporary Works (Ballina Manor Hotel/Apartments)



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Additional channel improvements were identified through consultation with IFI. IFI habitat specialists provided a preliminary proposed plan for the instream enhancement within Ridgepool, as detailed in **Figure 5-23**. This will involve the reshaping of the existing deflector (or 'groyne') (See **Figure 5-24**) located near the Ballina Arts Centre to promote habitat improvement in this area. These works are in the proximity of the proposed construction access ramp and thus it was agreed that they can be incorporated into the Proposed Scheme development.



**Figure 5-23: IFI Preliminary Plan for Instream Enhancement of Ridgepool**



**Figure 5-24: View of Deflector ('Groyne') to be Realigned**

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### 5.7.9.2 River Moy— Emmet Street

There are no instream works proposed along Emmet Street. All works will be done from the roadside with appropriate sediment control measures in place to avoid material entering the river. A containment area by way of hanging or standing scaffold will be placed along the river side of the existing wall during the works.

### 5.7.9.3 River Moy-Bachelors Walk

The majority of works along Bachelors Walk will be completed without the need for instream works, with exception of the section from the Lower Bridge to Rope Walk Lane (approximately 100 m). However, there is no lamprey habitat or significant fisheries habitat in this initial reach. Historical modifications have resulted in a line of large boulder rip-rap reinforcement, set a distance up to 2.5-3.5 m out from the wall, which has developed into a wild riparian flood berm (see **Figure 5-25**). This berm area will be utilised for construction works with a cofferdam installed outside the berm to facilitate works. The instream works footprint will be a maximum of 500 m<sup>2</sup>. Appropriate sediment control measures will be in place to avoid material entering the river.

Temporary sandbag cofferdams may be used to dry out the berm area for flood wall construction on the berms.

Further along the riparian area widens and as such, no instream works are anticipated to be required for works in the section from Rope Walk Lane to Arbuckle Row.



**Figure 5-25: View of the Area of Proposed Bachelors Walk Instream Works**

### 5.7.9.4 River Moy— Cathedral Road

There are no instream works proposed along Cathedral Road. All works will be done within the riverbank and appropriate sediment control measures will be in place to avoid material entering the river.

There are rock “deflectors” installed along both sides of the river at Cathedral Rd and Emmet St. IFI have indicated that they may consider removal of some of these deflectors in the future. As there are no instream works proposed at this location, these works have not been captured as part of the Proposed Scheme and are instead captured as a project with potential cumulative effects in **Chapter 20: Interactions & Cumulative Effects**.



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### 5.7.9.5 River Moy— Clare Street

There are no instream works proposed along Clare Street. All works will be done within the riverbank and appropriate sediment control measures will be in place to avoid material entering the river.

### 5.7.9.6 Quignamanger Stream

The majority of works on the Quignamanger consist of the replacement of the existing diversion culvert and as such are not instream works. Any instream works will be undertaken during low flow conditions and water will either be diverted, or over-pumped.

The lower section of the Quignamanger stream before the bridge has been designed with an open channel and allowed to flood to support existing habitat including Tufa Spring habitat within the river channel. Potential impact to the ecology of the Tufa Spring habitat is assessed in **Chapter 9: Aquatic Biodiversity**.

Some regrading of the existing stream bed will be required to allow the installation of the diversion culvert and the upgraded culvert crossing the Quay Road. The instream works footprint is approximately 200 m<sup>2</sup>.

The proposed instream works for the Quignamanger Stream are as follows:

- In stream works at the head of the diversion culvert to facilitate tie into the Quignamanger Stream and existing main channel culvert.
- Instream works to facilitate the tie in of the upgraded diversion culvert to the drainage area. Instream works will be minimal to facilitate the tie-in and will include minimal regrading of the stream bed.
- Lowering of the inner wall running along the open channel within the drainage area to facilitate flooding along the left bank of the stream. Works can be done during the diversion culvert tie-in and can be accessed from the left bank to avoid instream works.
- Replacement of culvert under Quay Rd to a box culvert, including some regrading to accommodate a stepped structure (baffling) to improve fish passage.
- Existing culvert downstream of Quay Rd will be removed to allow for open channel discharge to River Moy.

The proposed instream works upstream will be at the head of the diversion culvert where it will tie into the main culvert and the Quignamanger stream. The proposed instream works downstream of the Quignamanger are shown in **Figure 5-26**.



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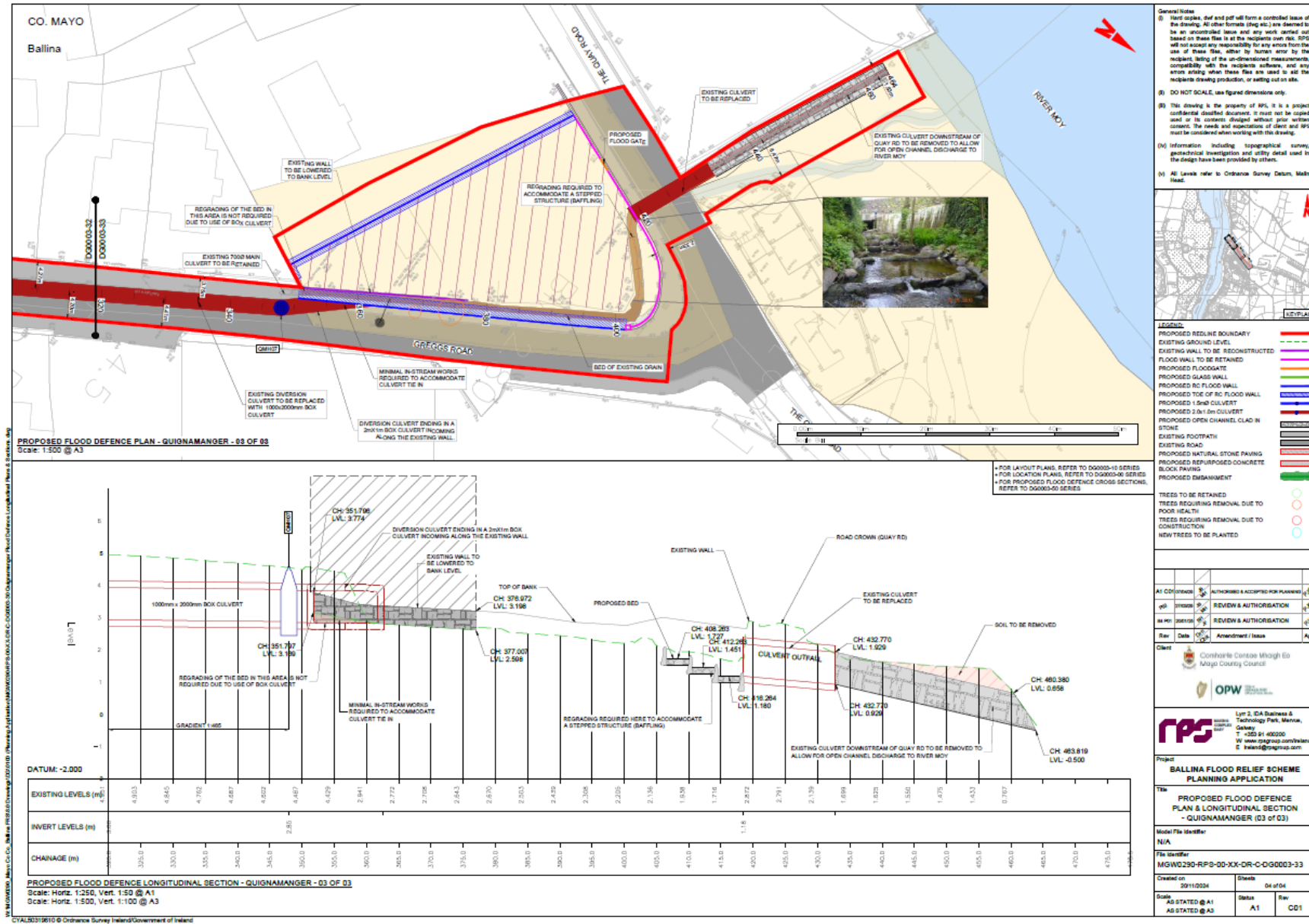


Figure 5-26: Quignamanger Instream Works

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### 5.7.9.7 Bunree/Behy Rd

Along the Bunree/Behy Road Stream existing open channels will be culverted as part of the Proposed Scheme. The culvert downstream of the N59 at Moyvale Park, which causes a constriction to flood flows, will be removed and the open channel in this section reinstated. Instream works will be undertaken during low flow conditions and water will either be diverted, or over-pumped. The instream works footprint is approximately 900 m<sup>2</sup>.

### 5.7.9.8 Brusna River

The majority of works along the Brusna River will be completed without the need for instream works.

The existing bridge has bank and bed scour protection extending 6 m upstream and downstream of the respective bridge parapet faces. The existing bed scour protection is comprised of a conglomerate of concrete and cobble/gravel, which has eroded in the mid-channel. This existing scour protection will be replaced in a like for like manner to ensure no change in habitat. In stream works will be restricted to July through September. Water management measures will be put in place to avoid sediment and construction waste entering the water. The instream works footprint is approximately 300 m<sup>2</sup>. The proposed instream works for the Brusna River are shown in **Figure 5-27**.

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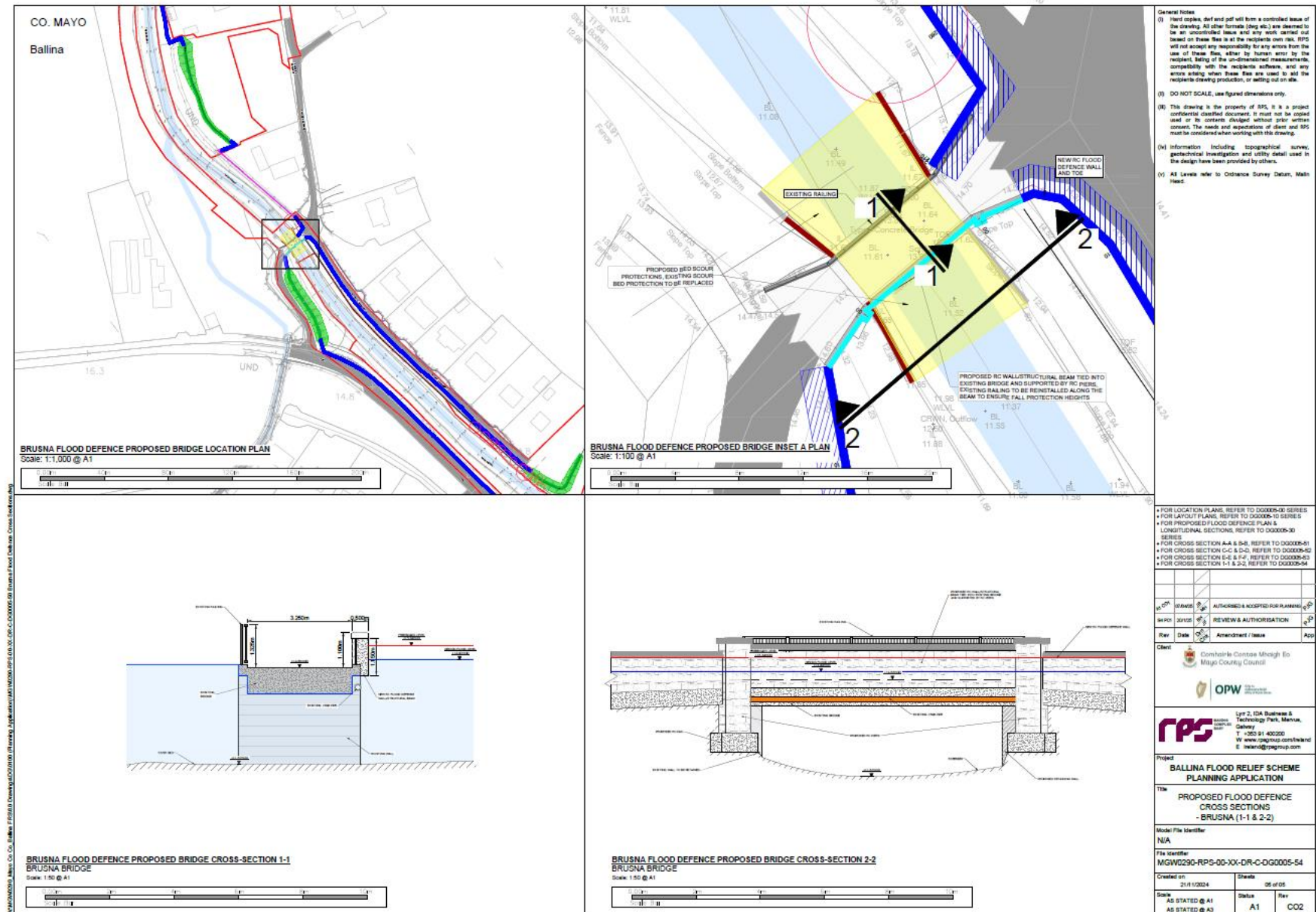


Figure 5-27 Proposed Instream Works for the Brusna River





Figure 5-28: View of the Area of the Proposed Brusna Instream Works (looking NW)

### 5.7.9.9 Tullyegan Stream

Construction of the walls along the Tullyegan Stream will require some instream works. A temporary cofferdam or piped flume may be required. The proposed instream works for the Tullyegan Stream are shown in **Figure 5-29**. The instream works footprint is 900 m<sup>2</sup>.

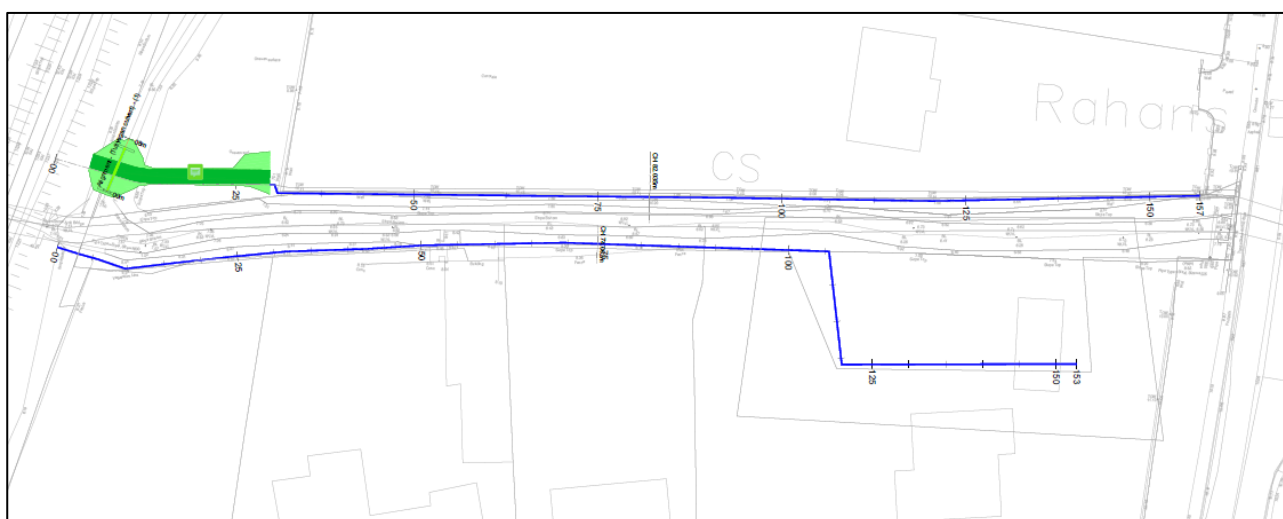


Figure 5-29: Tullyegan Instream Works

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### 5.7.10 Construction Materials

The possible materials to be used during construction are captured in the Carbon Assessment in **Chapter 14: Climate**. This information is based on the quantities assumed in the Option Development Report (RPS, 2024) and the materials and quantities will be updated as part of the detailed design.

### 5.7.11 Risk of Flooding During Construction

There is a possibility that a flood will occur on the River Moy or its tributaries during the construction phase, as the duration of construction is approximately 36 months. Low lying areas along the River Moy (e.g. Bachelors Walk) are typically subject to flooding on roadways during high winter tides. Measures will need to be put in place to ensure these areas do not become more vulnerable to flooding during construction. This will include some or all of the following measures:

- Monitoring of tides and weather events.
- Phasing of the works to ensure existing defences are not removed in areas at risk during high-tide events.
- Use of temporary flood defence measures in areas of works (e.g. sandbags, water dam structures or similar).
- Removal of existing flood defences in discrete sections to minimise flood risk.

Along the tributaries flood risk will be managed by:

- Monitoring of weather events to ensure works do not proceed when excessive rainfall is forecast.
- Phasing of the works to ensure existing defences are not removed in areas at risk during high-tide and/or rainfall events (e.g. Quignamanger Stream).
- Completion of the works in short sections to minimise flood risk.

## 5.8 Construction Management

The EIAR is supported by the development of a CEMP. The CEMP will provide detail on the mitigation measures for the protection of the environment and human health as identified in the EIAR and to be implemented by the appointed contractor.

The CEMP will be updated to address the requirements of any relevant planning conditions, including any additional mitigation measures.

### 5.8.1 Construction Hours

It is proposed that standard construction working hours will apply as follows: Monday to Friday: 07:00 to 19:00; Saturdays: 08:00 to 14:00; and no work on Sundays and Bank Holidays. Deviation from these times will only be allowed where prior written approval has been received from the local authority.

### 5.8.2 Traffic Management

#### 5.8.2.1 Construction Traffic

Detailed information on anticipated traffic movements is not available. Indicative daily movements for one construction team operating on site are provided below:

- Six vehicles (cars/vans) will arrive on site in the morning (07:00 – 08:00) and depart in the evening (18:00 – 19:00)
- Up to two Heavy Goods Vehicle (HGV) will arrive and depart the site per hour throughout the typical working day (07:00 – 19:00)

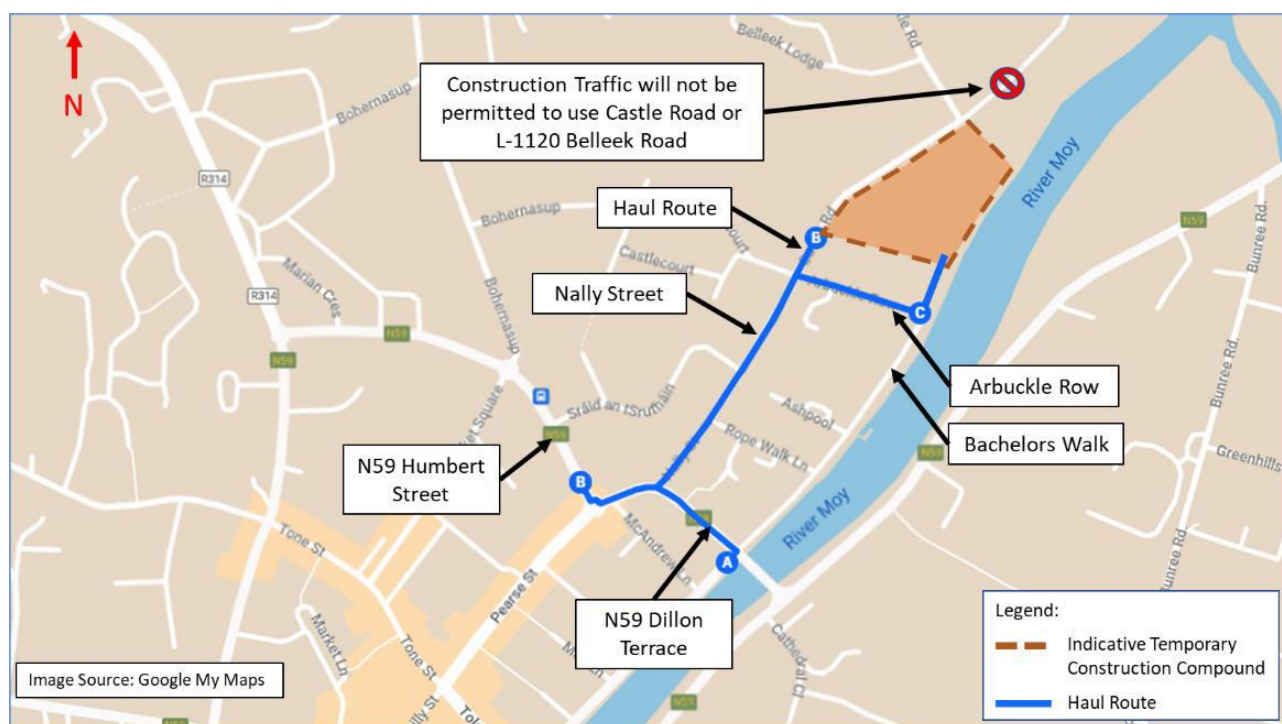
## Chapter 5: Project Description

For the purpose of the traffic assessment, a total of 3-4 crews operating at all times has been assumed. Total traffic movements will depend on construction methodology and actual number of crews during construction stage.

### 5.8.2.2 Haul/Access Routes

Haul routes have been identified for the 5 no. number construction compounds. Delivery of materials and other infrastructure associated with the Proposed Scheme will be carried out using HGVs. Deliveries to the site will adhere to the hierarchy of roads where possible utilising the National Primary and Secondary Roads, Regional Roads then Local Roads.

Access routes for implementing the construction works associated with the River Moy in Ballina have been identified and illustrated in **Figure 5-30** to **Figure 5-32**. Construction traffic will access the temporary construction compound via the N59 National Road. Additionally, construction traffic will be prohibited from travelling on Castle Road or L-1120 Belleek Road.

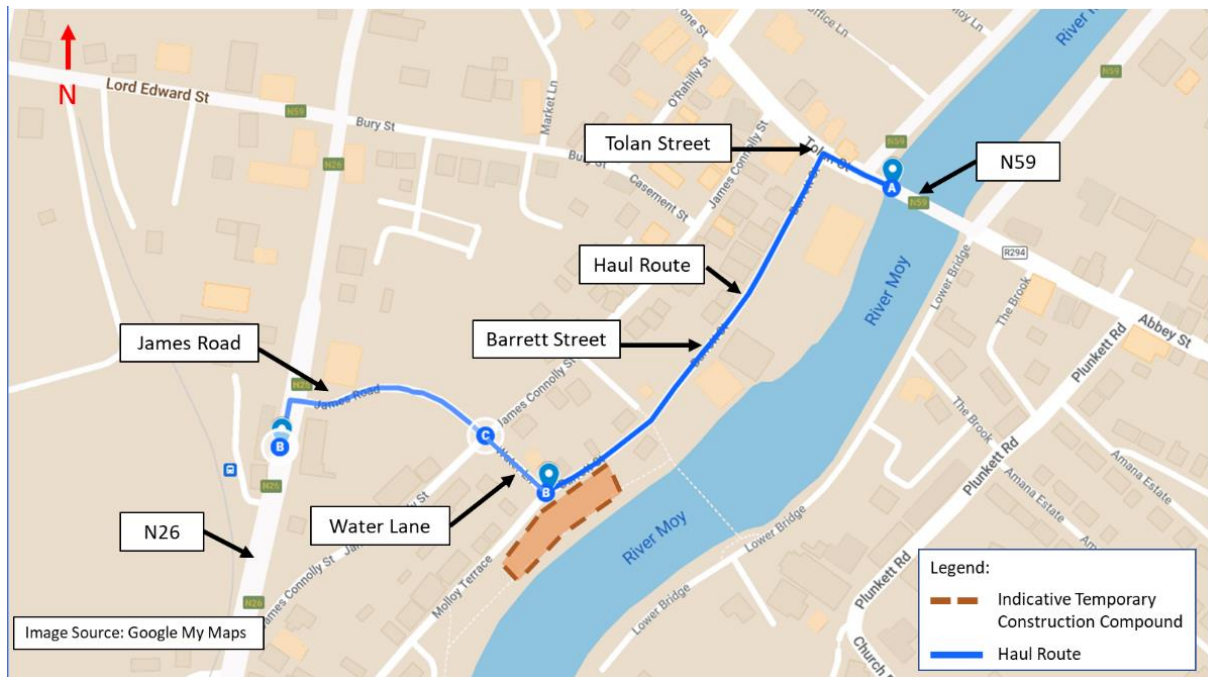


**Figure 5-30 Construction traffic haul route (River Moy works) – (1 of 3)**

Construction traffic will access the Barrett Street temporary construction compound either via the N26 National Road (James Road and Water Lane) or the N59 National Road (Tolan Street and Barrett Street).

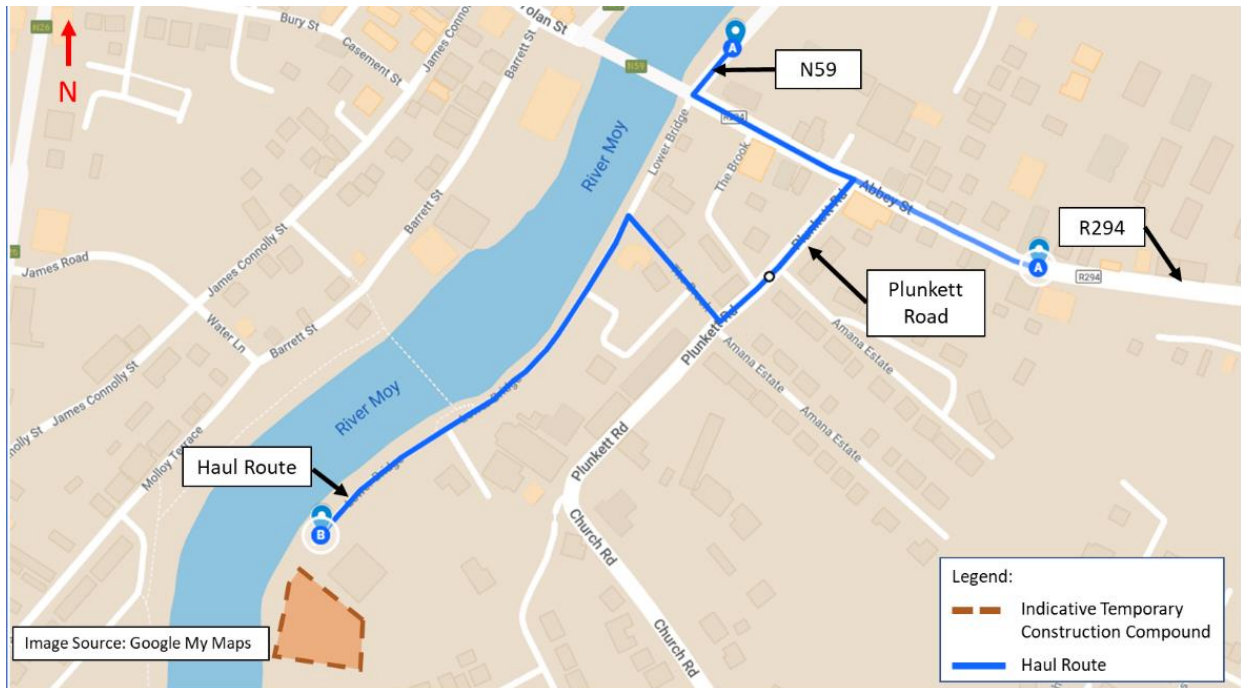


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**Figure 5-31 Construction traffic haul route (River Moy works) – (2 of 3)**

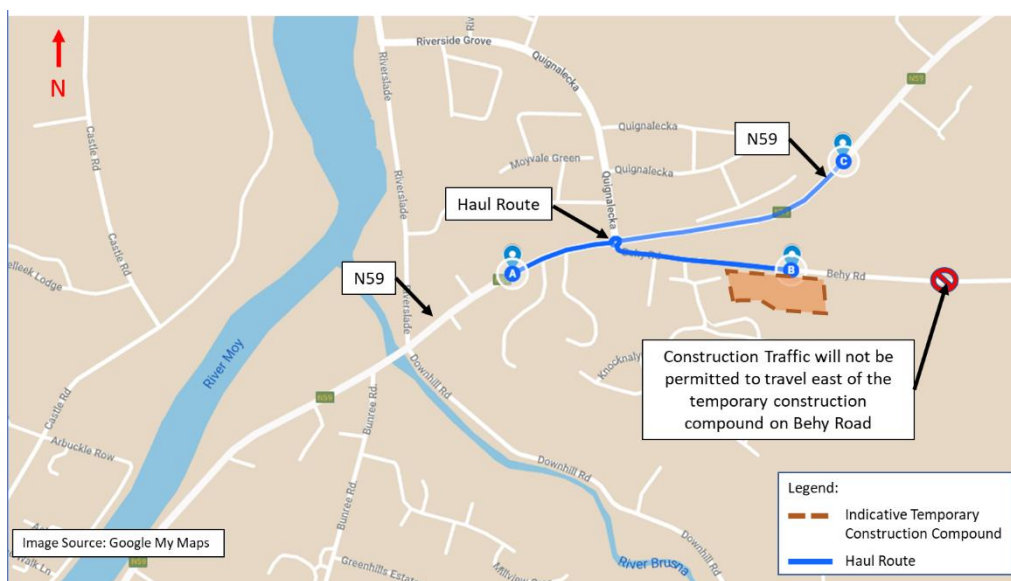
Construction traffic will access the temporary construction compound on Ridgpool Road via the R294 Regional Road and Plunkett Road.



**Figure 5-32 Construction traffic haul route (River Moy works) – (3 of 3)**

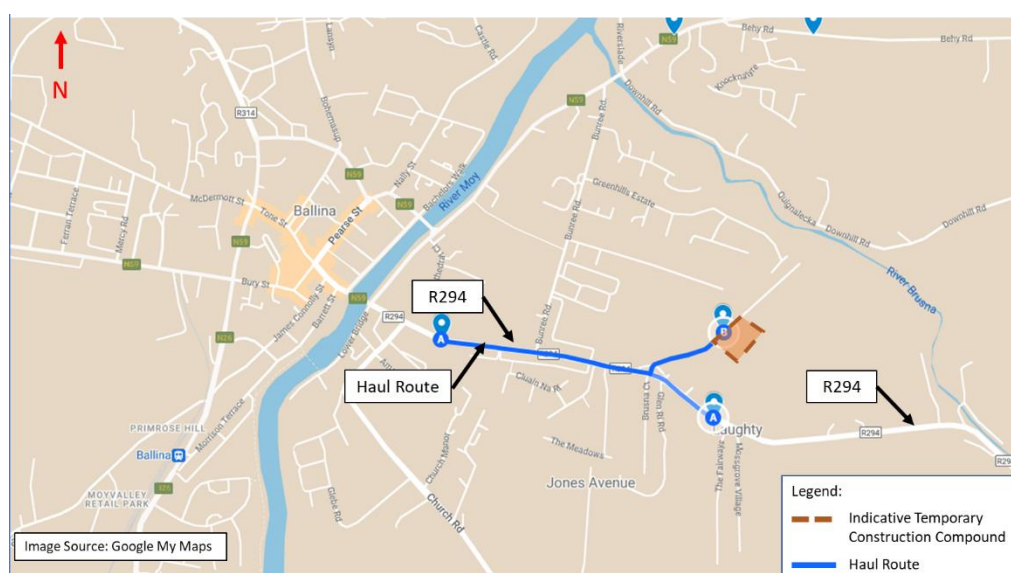
Construction traffic will access the temporary construction compound on Behy Road via the N59 National Road as per **Figure 5-33**. Additionally, construction traffic will be prohibited from travelling east of the temporary construction compound on Behy Road.

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**Figure 5-33: Construction traffic haul route (Bunree Stream Works Area)**

Construction traffic will access temporary construction compound on Bonniconlon Road for works on the River Brusna via the R294 Regional Road as shown in **Figure 5-34**.



**Figure 5-34: Construction traffic haul route (River Brusna Works Area)**

Haul routes to the construction site at Tullyegan will be via the N26 and L1122 Commons roads.

### 5.8.2.3 Road/Lane Closures

The proposed road/lane closures and diversions required for the construction activities to be undertaken are detailed in **Chapter 6: Traffic & Transportation**.

### 5.8.3 Construction Plant

As indicated in **Section 5.7.1**, activities will run simultaneously within 3 to 4 different areas of the Proposed Scheme. The following plant could be required (to be confirmed by appointed contractor) for the purposes of construction activities. **Table 5-5** outlines the equipment required within the construction plant.

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**Table 5-5: Construction Plant List**

Equipment	Description
Mobile telescopic crane	Used for installation/removal of 1-ton sandbags for cofferdams
Chain saw	Tree felling, likely only in use for 2 or 3 days
Mini excavator with hydraulic breaker	Breaking out footpaths etc., 1 day or less at any given location
Mini tracked excavator	Trench excavation for foundations
Articulated dump truck (tipping fill)	Loading/unloading of truck with rubble/fill
Concrete pump + cement mixer truck (discharging)	Concrete pours at construction stage
Dumper (idling)	General use
Vibratory roller	Only to be used for 1 or 2 weeks (not in tandem w/ excavator or concrete truck)
Mini planer	May not be required
Articulated dump truck	1 per hour
Hand-held circular saw (petrol)	Cutting footpaths, road surface etc., 1 day or less at any given location, stone cladding of walls

### 5.8.4 Construction Personnel

It is anticipated that 20 to 25 persons will be involved in the construction activities with 5 to 6 persons working in different areas simultaneously.

All project personnel and contractors will be required to be fully compliant with their responsibilities as defined by:

- Safety, Health and Welfare at Work Act 2005 (No. 10 of 2005).
- Safety, Health and Welfare at Work (General Application) (Amendment) Regulations 2023 (S.I. No.255 of 2023).
- Safety, Health and Welfare at Work (Construction) (Amendment) Regulations 2021(S.I. No. 528/2021).
- The Safety, Health and Welfare at Work (Diving) Regulations 2018
- All other appropriate legislation in force at the time of their deployment
- All applicable Code of Practices to the works

### 5.8.5 Water Management

During construction, water management measures will be implemented as outlined further in **Chapter 12: Water** and the CEMP.



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All works will be completed in accordance with the following guidance, which the contractor is required to adhere to during construction phase:

- Construction Industry Research and Information Association (CIRIA) guidance – Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors (CIRIA, 2001)
- Control of Water Pollution from Linear Construction Project: Technical Guidance (CIRIA, 2006)
- Control of Water Pollution from Linear Construction Projects. Site Guide (CIRIA, 2006)
- Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (IFI, 2016)

There will be no direct discharge of water from any element of the works without suitable attenuation and treatment. Treated water will be discharged back into the watercourse. Where over pumping is proposed (e.g. Bunree) treatment and/or settlement of water may be required prior to discharging back to the watercourse.

### 5.8.6 Construction Lighting

During construction, lighting will be minimised and will be designed to avoid any ecological impacts. Lighting will be required during hours of darkness. Low-energy LED options will be utilised where feasible. Emergency back-up lighting will be provided.

Security lighting will be required at night-time in designated areas such as compounds. Directional lighting will be used to ensure minimal disturbance to bats by avoiding light spill onto boundary features (hedgerows, scrub, and trees) and by avoiding uplighting.

Mitigation measures to avoid ecological impacts due to lighting is detailed in **Chapter 9: Aquatic Biodiversity** and **Chapter 10: Terrestrial Biodiversity**.

### 5.8.7 Construction Waste Management

The EIA Directive requires a description of the expected residues and emissions and wastes arising from the Proposed Scheme and a description of the likely significant effects resulting from the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste. **Table 5-6** sets out where in this EIAR the potential impacts arising from residues and emissions during construction and operational phases are addressed.

During construction, emissions and residues will arise from the following:

- Construction dust
- Exhaust emissions from construction traffic and machinery
- Construction noise and vibration
- Security lighting
- Treated surface water drainage discharge
- Residue, emissions, and waste from any construction stage pumping
- Material wastes

The potential impacts associated with heat is not applicable to the Proposed Scheme and is therefore not considered within the EIAR.

**Table 5-6: Residues and Emissions Arising the Construction Phase**

EIAR Requirement	How and where considered in the EIAR
<b>Annex IV 1(d)</b> Description of the project, including in particular: an estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation) and quantities and types of waste produced during the construction and operation phases; and	<p>The potential impacts associated with emissions to air during construction (including construction dust, emissions from construction traffic and machinery) are addressed in:</p> <ul style="list-style-type: none"> <li>• <b>Chapter 13: Air Quality</b> and <b>Chapter 14: Climate</b></li> </ul> <p>The potential impacts associated with the emission of noise and vibration during construction are assessed in:</p>

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EIAR Requirement	How and where considered in the EIAR
<b>Annex IV 5(c)</b> description of the likely significant effects of the project on the environment resulting from, the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste.	<ul style="list-style-type: none"> <li>• <b>Chapter 15: Noise &amp; Vibration</b> The potential impacts associated with the emissions of pollutants from surface water run-off during construction are assessed in:</li> <li>• <b>Chapter 11: Land and Soils</b></li> <li>• <b>Chapter 12: Water</b></li> <li>• <b>Chapter 9: Aquatic Biodiversity</b></li> <li>• <b>Chapter 10: Terrestrial Biodiversity</b></li> </ul> <p>The potential impacts associated with the emission of nighttime lighting are assessed in:</p> <ul style="list-style-type: none"> <li>• <b>Chapter 10: Terrestrial Biodiversity</b></li> <li>• <b>Chapter 19: Landscape and Visual.</b></li> </ul> <p>The potential impacts associated with electromagnetic fields and radiation are not applicable to the Proposed Scheme and is there not considered in the EIAR.</p> <p>The disposal and recovery of waste is considered in:</p> <ul style="list-style-type: none"> <li>• <b>Chapter 16: Material Assets Waste/Utilities</b></li> <li>• <b>Supplementary report: Construction Environment management Plan (CEMP).</b></li> </ul>

### 5.8.8 Resource Management

The principal objective of sustainable resource and waste management is to use material resources more efficiently, to reuse, recycle and recover material and reduce the amount of waste requiring final disposal.

**Chapter 16: Material Assets Waste/Utilities** provides details on the anticipated quantities of materials that will arise during site clearance, demolition and excavations. One of the key objectives is to ensure the reuse of material generated by the construction of the Proposed Scheme where feasible and fit for purpose.

The main types of materials that will be brought to site during the construction phase include granular material, earthworks, concrete, steel reinforcement, pipework and stone.

As outlined in **Chapter 14: Climate**, materials with a reduced environmental impact will be incorporated into the design through either the re-use of materials or incorporation of recycled materials in place of conventional building materials. The following materials will be considered for the construction phase:

- GGBS and Pulverised Fuel Ash - Used as replacements for Portland cements to increase sustainability and reduce carbon footprint of civil and structural works.
- Reuse of stone from the demolition of existing walls.
- Locally sourced and supplied, where possible, stone, bricks, pavers, coping etc.

### 5.8.9 Commitments Register

A register of the environmental commitments (i.e. the mitigation measures and monitoring to be undertaken during the construction phase, operational and maintenance phase of the Proposed Scheme) is provided in **Chapter 22: Schedule of Environmental Commitments**.

This summary (along with the complete EIAR) will be used to inform the commitments register in the CEMP, which will be developed by the appointed contractor. Any conditions of planning (should consent be granted) and any commitments made during the consent application process will also be added to the commitments register. The contractor will be required to implement the schedule of commitments during the construction phase under supervision from MCC and an Environmental Monitoring Group will be set up to ensure adequate implementation of the Schedule of Environmental Commitments which will include representatives from MCC and OPW.

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### 5.9 Operation and Maintenance Phase

The operational and maintenance phase of the Proposed Scheme will not require any additional dedicated employees. It is expected that the operation and maintenance activities required will be undertaken by existing MCC maintenance personnel.

The following sections provides a description of the operations associated with the maintenance of the Proposed Scheme.

An operation and maintenance programme will be prepared for the Proposed Scheme. **Table 5-7** provides a description of the expected maintenance activities required for the Proposed Scheme.

**Table 5-7: Operational and Maintenance Activities**

Element	Activity	Frequency
Flood walls (including glass)	Inspections	Annually
	Window cleaning	Annually
	Repairs	As req
	Vegetation control	Annually
Pumping stations	Inspections	Bi-annually
	Repairs	As req
Open space	Inspections	Monthly
	Repairs	As req
	Replanting and landscaping	As req
Stormwater drains	Inspections	Bi-annually
	Repairs	As Req
	Petrol interceptor emptying and cleaning	Quarterly
Open Channel <sup>1</sup>	Channel maintenance	Annually
	Vegetation control	Annually
	Removal of trash	As req
Culverts	Inspections	Annually
	Repairs	As required
	Removal of trash and vegetation	Quarterly
Embankments	Inspections and maintenance	Annually
	Vegetation control	Annually
	Vermin control	Bi-annually
	Back drainage improvements	Bi-annually
Flood Gates	Inspections	Bi-annually
	Repairs	As required
Sour Protection (River Brusna)	Inspections	Annually
	Repairs	As required

<sup>1</sup> There is no proposed channel maintenance and vegetation control within SAC channels. The River Moy and Brusna/Glenree are self-maintaining owing to channel morphology (swift flows / depth) that do not facilitate algal growth and sediment deposition) and will not require channel maintenance. In the unlikely event that instream channel maintenance on SAC channels is required, this would be subject to a site-specific Appropriate Assessment, as per OPW protocols.



### 5.9.1 Waste Arisings and Management

**Chapter 16: Material Assets- Waste/Utilities** outlines the waste materials that will arise during operation.

### 5.9.2 Emissions

Surface water will be discharged to the River Moy and petrol interceptors will be added to all outfalls discharging to the River Moy. There will be no point source of emissions to air resulting from the operation of the Proposed Scheme. During flood events surface water will be pumped to the River Moy.

## 5.10 References

- IFI, 2016. *Guidelines on protection of fisheries during construction works in and adjacent to waters*. s.l.:Inland Fisheries Ireland .
- Masters-William, e. a., 2001. *Control of Water Pollution from Construction Sites. Guidance for Consultants and Contractors (C532)*. s.l.:CIRIA.
- MCC, 2021. *Mayo County Development Plan (MCDP) 2022-2028*, s.l.: s.n.
- Murnane, E., Heap, A. & Swain, A., 2006. *Control of water pollution from linear construction projects. Site guide (C649)*, s.l.: CIRIA.
- RPS, 2023. *Ballina Flood Relief Scheme Hydrology Report*, s.l.: s.n.
- RPS, 2024. *Ballina Flood Relief Scheme Options Report*, s.l.: s.n.
- RPS, 2024. *Climate Change Adaptation Plan Report*, s.l.: s.n.