River Deel (Crossmolina)
Flood Relief Project
EIA Scoping Document

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1. Introduction and Background

1.1. Brief History

The River Deel and Crossmolina Town have a long history of flooding. The two most recent flood events in 1989 and 2006, resulted in flooding of three main streets in Crossmolina Town.

At the request of Mayo County Council, the Office of Public Works (OPW) carried out a Feasibility Study in 2012, which established the potential viability of a Flood Relief Scheme for the River Deel.

1.2. River Deel Flood Relief Scheme

In order to further develop a Flood Relief Scheme, the OPW engaged Engineering and Environmental Teams as follows:

- Ryan Hanley in association with JBA Consulting has been commissioned by the OPW to provide engineering services in relation to the proposed River Deel (Crossmolina) Flood Relief Scheme.
- Ryan Hanley in association with McCarthy Keville O'Sullivan has been commissioned to provide the environmental services required for the same project.

Progress to date has included:

- Literature Review and Site Surveys
- A Public Information Day (14 September 2013 and 13 June 2014) attended by OPW, Mayo County Council and the Engineering and Environmental Teams
- An Constraints Study by the Environmental Team in advance of an Environmental Impact Statement at Stage 2
- Screening for Appropriate Assessment by the Environmental Team
- Hydrological Analysis and Hydraulic Modelling, culminating in submission by the Engineering Team of a Hydrology and Modelling Report to the OPW in March 2014
- Preparation of a Potential Flood Risk Management Options Report, submitted to the OPW in July 2014

A number of options were considered under their technical, social, environmental and economic viability. On the basis of the preliminary assessment, four options were shortlisted for further consideration. These included those outlined below:

Option	Brief Description
A	Flood Defences (standalone solution)
B	Combination of Flood Defences and Increased Conveyance (Dredging)
C	Combination of Flood Defences and Increased Conveyance (Bridge Replacement)
D	Diversion Channel

Table 1.1 Options Shortlisted for Detailed Consideration

Option A – Flood Defences as a standalone option has been chosen as the preferred option following consideration of the Flood Risk Management Strategy Options. The Environmental Impacts associated with this option are currently being assessed.

The following information with regard to the preferred option has been supplied to statutory and non-statutory consultees as part of the EIA Scoping process.

2. Preferred Flood Option – Flood Defences

In the preferred option, flood defences will be required along both banks of the River Deel, up and downstream of Jack Garrett Bridge. It will also be necessary to raise the existing bridge parapets and modify the existing surface water collection network.

Critical parameters of the preferred option are set out in the table below. Outline drawings are provided in Appendix A.

Parameter	Quantity
Flood Defences	
Length of Flood Defences: Right Bank	1,023m
Length of Flood Defences: Left Bank	448m
Range of Flood Defence Crest Levels	20.58m O.D. – 18.82m O.D.
Range of Flood Defence Heights above existing ground levels	0.6 – 3.6m
Flood Defence Crest Level at Jack Garrett Bridge (u/s)	19.96m O.D.
Surface Water Pumping Stations	4 No.

Table 2.1 Preferred Option: Critical Parameters

General Requirements

Bridge Parapet

It will be necessary to raise the bridge parapets at both up and downstream bridge faces to defend against overtopping of the bridge in the Q100 flood event. A minimum bridge parapet height of 1.2m would be required in order to comply with safety legislation and other statutory requirements.

The bridge parapet may be raised by constructing flood defences at the locations of the existing railings on the bridge. Alternatively, the flood defences could be constructed in the form of independent free standing structures. The option selected would be subject to a structural assessment of the bridge prior to detailed design stage.

Right Bank

Predicted 1% AEP (Q100) flood levels exceed the existing right river bank, verge and road levels for a distance of c670m upstream and 350m downstream of Jack Garrett Bridge.

Immediately upstream of the bridge, flood depths reach 2.8m in the 1% AEP event. This low lying section of river bank stretches for approximately 114m upstream of the bridge along a row of terraced houses which front onto Chapel Street. Flood Defences of c3m in height would therefore be required at this location. The walls of these buildings function as existing flood defences, although in their current condition, they would not be capable of withstanding the Q100 flood levels, taking into account the likely masonry construction of the walls and the presence of windows facing the river channel which would be mostly under the flood level.

The road rises slightly above the predicted Q100 flood levels for a c100m long stretch upstream of this terrace, however minor flood defences will be required to allow a 380mm freeboard above predicted flood levels.

The road dips to a lower level over a c500m stretch further upstream. Modelled Q100 flood waters reach depths of up to 1.5m at various locations along the road upstream of the Church. There is a c0.5m high wall separating the road from the river bank along this section with at least two gaps, one of which allows access to a narrow public amenity area between the river channel and the road. Flood Defences ranging in height from 1.3 – 2.1m would be required along this section. The road rises further upstream. The existing wall does not have the potential to form any part of new flood defences and would likely be demolished to make way for new defences.

Immediately downstream of the bridge is car park followed by a supermarket. Modelled Q100 flood levels marginally exceed the level of the car park retaining wall. They also rise above the finished flood level (18.75 mO.D.) of the supermarket (via overland flow through the car park) and the sill level of the two river facing windows. The walls of this building currently function as flood defences. This wall and the retaining wall of the car park have potential to form part of new flood defences.

Further downstream, the river bank level drops over a distance of c200m. The back gardens of residential and commercial properties back onto an access track which runs alongside the river at this location. The access track currently functions as a flood berm and is separated from the river by a. An 80m long row of stone gabions forms part of this berm. The private properties are separated from the track by walls and, in some instances, fencing. Modelled Q100 flood levels exceed the ground level along the access track at these boundaries by over 1.8 m in some instances. Flood defences ranging in height up to 2m will be required along this section of river bank.

Left Bank

Predicted Q100 flood levels exceed the existing left river bank levels for a distance of c220m upstream and c250m downstream of Jack Garrett Bridge.

Immediately upstream of the bridge the river bank adjoins a terrace of buildings, boundary walls and the retaining wall of a car park. Modelled Q100 flood levels exceed the bank levels by over 3m at a localised low point at the bridge. Flood defences ranging in height from c3.6 – c1.5m would be required upstream of the bridge along this section.

The walls of the terrace and the boundary walls function as existing flood defences. As with the terrace on the opposite river bank, the walls of these buildings function as existing flood defences, and would not be capable of withstanding the Q100 flood levels.

A further complicating factor is the presence of a pedestrian walkway which joins the car park to Bridge Street and overhangs the river channel. There are three main options for dealing with this walkway as follows:

- Remove it entirely,
- Allow the walkway to flood in the Q100 event and provide demountable flood defences either end of the walkway at Bridge Street and the car park, or
- Maintain a walkway with raised flood defences.

Plate 4.1 Existing Pedestrian Bridge on Left Bank (from below)

The existing walkway is a steel structure with light decking founded on concrete piers. It has not been designed to withstand flood waters. The height of flood defence required above the existing walkway decking level is 1.4m.

There are significant concerns regarding the structural capacity of the existing structure to support the weight of potential additional flood defences, the porosity of the decking, the feasibility of sealing the existing structure, and the structure's ability to withstand uplift resulting from rising flood levels, a scenario for which it has not likely been designed. If it is decided to maintain a walkway at this location, it would be necessary to replace the existing walkway with a new structure. Alternatively, if it is preferred to replace the walkway at its current location, a full structural assessment of the concrete piers of the existing walkway would be required.

If following site investigation stage, a reinforced concrete retaining wall is considered the optimum flood defence at this location, it is envisaged that a new walkway could be constructed and cantilevered off the retaining wall. This will

also counteract the potential overturning moment on the wall as a result of flood waters and reduce the width of the heel extending out towards the river channel.

Immediately upstream, the retaining wall of the car park has potential to form part of new flood defences, pending further investigation prior to detailed design stage. Further upstream, flood defences would be required in agricultural land.

The left river bank is higher downstream of the bridge, however it is still exceeded by the Q100 modelled flood levels, by up to 1.9m in places. Flood defences would be required along a 250m stretch, ranging in height from 0.4 – 2.3. Due to the presence of a public walkway along the river bank, there is more space available along this section for the construction of flood defences, however there are a number of locations where there is private access to the bank, which may need to be accommodated in a final design solution. At the southern end of the 250m long stretch, the ground level rises and there is no further requirement for flood defences.

Non Structural Measures

Non-structural measures associated with Option A include regular inspections of flood walls and attendances at submersible pumping stations, regular scheduled maintenance of the river channel and pruning of trees, planning and control measures and building regulations regarding flood-proofing of buildings.

Types of Flood Defences Considered

Reinforced Concrete Flood Walls

Generally, given the space constraints involved, there is little alternative to narrow permanent (reinforced concrete) flood walls at most locations. Walls would be faced with stone where exposed to public view.

Earthen Embankments

In the following exceptions, embankments offer an alternative flood defence solution:

- Upstream of Jack Garrett Bridge
    - Right Bank: The public amenity area between the road and the river, however this would result in loss of public amenity space, of which there is little in Crossmolina.
    - Left Bank: The open area upstream of the car park
- Downstream of Jack Garrett Bridge
    - Left Bank: The open area downstream of the bridge subject to facilitating access to individual properties

Piled Defences

Interlocking sheet piles offer an alternative to reinforced concrete retaining walls. The following factors may effect how applicable sheet piles are for a particular application:

- Soil type and permeability
- Space available (a sheet piled wall will occupy a smaller area on plan that alternatives such as a reinforced concrete retaining wall, which requires a foundation)
- Proximity of existing structures (piles are driven using a hammer or vibrated depending on ground conditions)
- Environmental sensitivity of area concerned
- other

The use of sheet piles will be considered as an alternative to reinforced concrete walls subject to detailed site investigation.

Surface Water Drainage

Flooding in Crossmolina is primarily fluvial, however restricting the river channel by constructing hard flood defences will also restrict pluvial flow - surface water run off during rainfall events which under normal circumstances would drain to the bank of the River Deel along the sections for which flood defences are being proposed. There is an existing surface water collection network in Crossmolina, which was upgraded in 2002.

In order to prevent pluvial flooding, particularly during flood events, it will be necessary to upgrade the surface water drainage network in the town. Initially, existing outfalls will need to be sealed against backflow from rising flood waters.

Pumping stations will be required so that pluvial flood flows can be pumped to the river channel during flood events and on occasions when the new non-return valves malfunction. New surface water sewers will be required to connect the new and old collection networks.

Surface water drainage will form a considerable part of flood defences for the town. Four main pumping stations will be required, one either side of Jack Garrett Bridge on both banks of the river. Ancillary works such as petrol interceptors will also be required.

Operational Requirements

Operations requirements of flood defences include an inspection regime to ensure than there is no deterioration in the structural integrity of the defences which may occur as a result of a collision for example. It is expected that the flood defences will be relatively maintenance free otherwise.

The surface water pumping stations will require regular maintenance and it will be necessary to jet the surface water sewers to maintain hydraulic capacity to drain flood waters.

Future Adaptability

Flood defences are adaptable for the Mid Range Future Scenario (MRFS), but may be supplemented with another solution, such as dredging, bridge replacement or a diversion channel in the High End Future Scenario (HEFS).

3. Preferred Flood Option – Draft Scheme Drawings

A selection figures showing the draft preferred scheme option have been provided below. These are indicative and subject to change associated with environmental assessment and detailed design and assessment.

Preferred Option – shown on Aerial Photograph (Figure 3.1)

Preferred Option – Section through Right Bank

Preferred Option – Section through Left Bank

Preferred Option – Cross Sections

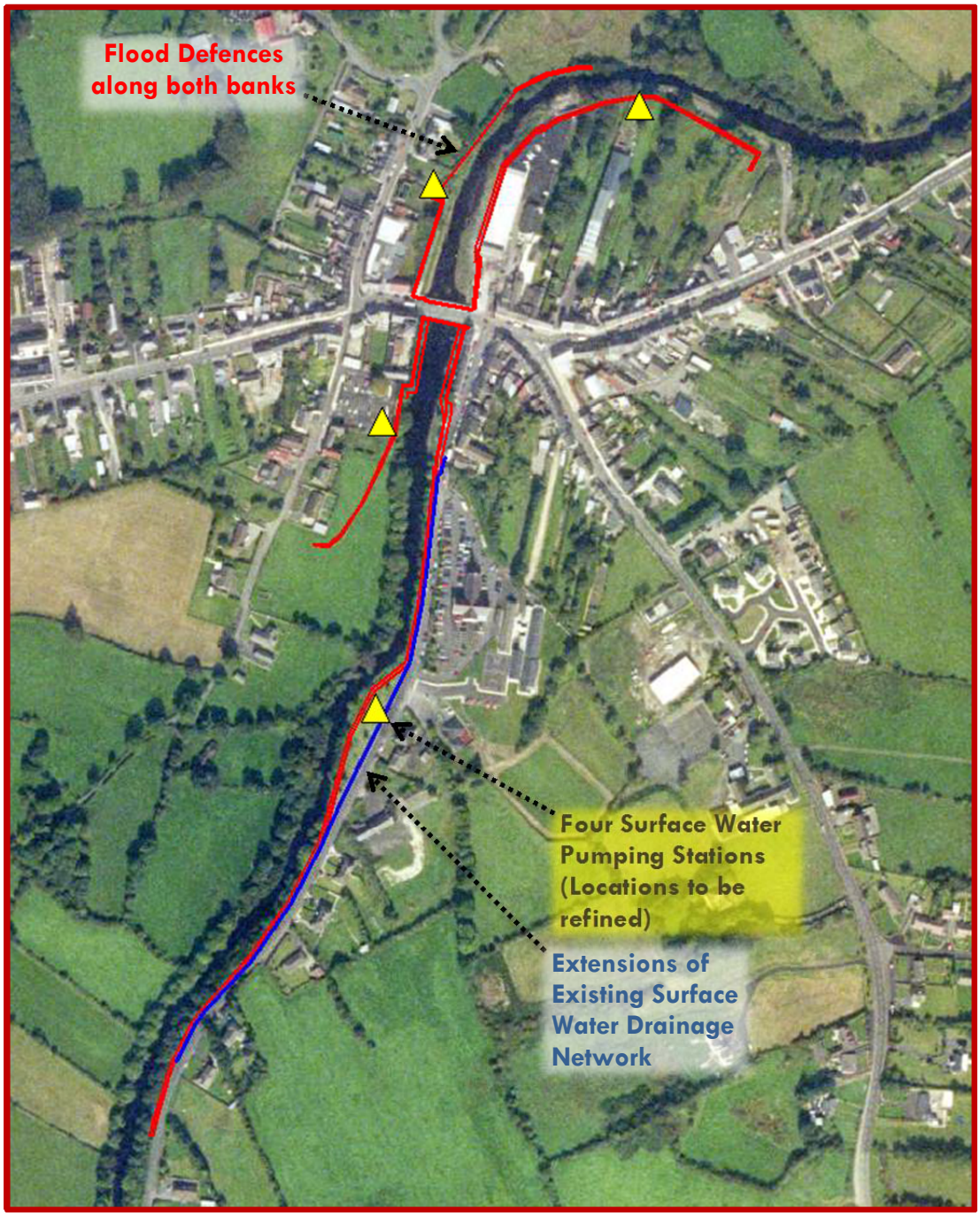

Figure 3.1 Option A: Most Appropriate Flood Relief Scheme