South Western CFRAM Study

Preliminary Options Report UoM 18

July 2016

The Office of Public Works

OPW
Oifig na nOibreacha Poiblí
The Office of Public Works

SOUTH WESTERN CFRAM STUDY
CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT

Mott MacDonald

South Western CFRAM Study

Preliminary Options Report UoM 18

July 2016

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South Western RBD CFRAM Study

SEA Options Appraisal Study
Unit of Management 18

June 2016

The Office of Public Works

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South Western RBD CFRAM Study

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Executive Summary

The Office of Public Works (OPW) is undertaking six catchment-based flood risk assessment and management (CFRAM) studies to identify and map areas across Ireland which are at existing and potential future risk of flooding. Mott MacDonald Ireland Ltd. has been appointed by the OPW to assess flood risk and develop flood risk management options in the South Western River Basin District. This SEA Options Appraisal Report is one of a series of reports being produced as part of the South Western Catchment Flood Risk Assessment and Management Study (SW CFRAM Study). As part of the strategic environmental assessment (SEA) process to inform the development of the Flood Risk Management Plans this report has been prepared to assess the options to management flood risk in Unit of Management 18 (The Munster Blackwater Catchment).

The findings from the strategic environmental assessment of the flood risk management options will be integrated into the decision-making process for the selection of the preferred measures and options to manage flood risk in Unit of Management 18 which will form the basis for the Flood Risk Management Plan for this Unit of Management.

The strategic environmental assessment has identified that the preferred alternatives are as set out below.

Table 1.1: Preferred Flood Risk Management Options (UoM 18)

AFA	Preferred Flood Risk Management Option
Kanturk	Option 3 (Flood Defences & Conveyance)
Rathcormac	Option 1 (Storage)
Ballyduff	Option 1 (Flood Defence/Localised Protection Works)
Aglish	Option 1 (Flood Defences)
Youghal	Option 1 (Flood Defences)

The findings from the strategic environmental assessment of the flood risk management options will be integrated into the overall multi-criteria analysis for the identification of the overall preferred flood risk management option in each AFA.

Once the preferred flood risk management option has been identified in each AFA the draft flood risk management plan will be prepared. The next stage (Stage 3) of the strategic environmental assessment process involves the identification of the environmental impacts (including where appropriate mitigation measures) and recommending monitoring for the evaluation of the plan.

1 Introduction

1.1 General

Flood risk management in Ireland has historically focused on land drainage schemes for the improvement of agricultural land. The 1945 Arterial Drainage Act established a national drainage authority (the Office of Public Works) with the remit of implementing a national arterial drainage programme. The Arterial Drainage Act was amended in 1995 to include for the protection of urban areas suffering from flooding.

In 2004, the Irish Government adopted a new National Flood Policy for Ireland which shifted the emphasis in addressing flood risk away from arterial drainage and targeted towards the protection of agriculture and cities /towns liable to serious flooding and towards a waterbody catchment-based flood risk assessment (a similar catchment-based management approach to that already being implemented under the Water Framework Directive 2000/60/EC).

In 2007, the Floods Directive [2007/60/EC] was published which requires the establishment of a framework of measures to reduce the risks of flood damage. The Floods Directive was transposed into Irish law by the European Communities (Assessment and Management of Flood Risks) Regulations, 2010 (S.I. No. 122 of 2010). The Regulations identify the Office of Public Works (OPW) as the lead agency in implementing flood management policy in Ireland.

Catchment Flood Risk Assessment and Management (CFRAM) Studies

For the purpose of delivering on the components of the National Flood Policy and on the requirements of the European Union Floods Directive, the OPW, in conjunction with Local Authorities and stakeholders, is conducting a number of Catchment Flood Risk Assessment and Management (CFRAM) Studies. *These studies are the core activity from which medium to long-term strategies for the reduction and management of flood risk in Ireland will be achieved*.

The overarching objectives of the CFRAM Studies are to:

- Identify and map the existing and potential future flood hazard within the study area;
- Assess and map the existing and potential future flood risk within the study area;
- Identify viable structural and non-structural options and measures for the effective and sustainable management of flood risk within the study area; and
- Prepare Flood Risk Management Plans (FRMPs) setting out recommendations to manage the existing flood risk and also the potential future flood risk which may increase due to climate change, development, and other pressures that may arise in the future. FRMPs will set out policies, strategies, measures and actions that should be pursued by the relevant bodies (including the OPW, Local Authorities and other Stakeholders), to achieve the most cost-effective and sustainable management of existing and potential future flood risk within the study area, taking

account of environmental plans, objectives and legislative requirements and other statutory plans and requirements[1].

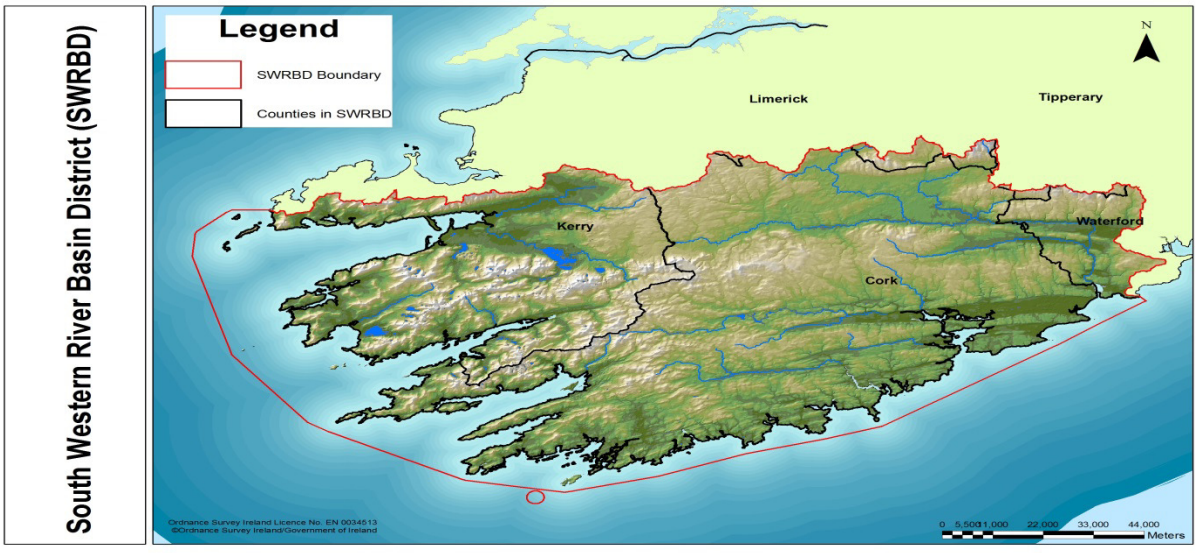
The OPW has commissioned a CFRAM study for each of Ireland's seven River Basin Districts (RBDs)[2].

1.2 Overview of the South Western River Basin District

The South Western River Basin District (SWRBD) covers an area of approximately 11,160 km^2. The study area of the SWRBD includes most of county Cork, large parts of counties Kerry and Waterford along with small parts of the counties of Tipperary and Limerick. The study area contains over 1,800 km of coastline along the Atlantic Ocean and the Celtic Sea.

In total, six Local Authorities administer the regions within the SWRBD: Cork County Council, Cork City Council, Kerry County Council, Waterford City and County Council, Tipperary County Council and Limerick County Council. Much of the SWRBD is rural and the predominant land usage is agriculture. The SWRBD contains Cork City (pop. 119,418) and a number of other large towns such as Killarney (pop. 13,497), Mallow (pop. 7,864) and Bandon (pop. 6,640).

Figure 1-1 South Western River Basin District (SWRBD)



The South Western River Basin District is divided into the following five Units of Management (UoMs)[3]:

[1] The Floods Directive requires that Flood Risk Management Plans should take into account the particular characteristics of the areas they cover and provide for tailored solutions according to the needs and priorities of those areas, whilst promoting the achievement of environmental objectives laid down in Community legislation.

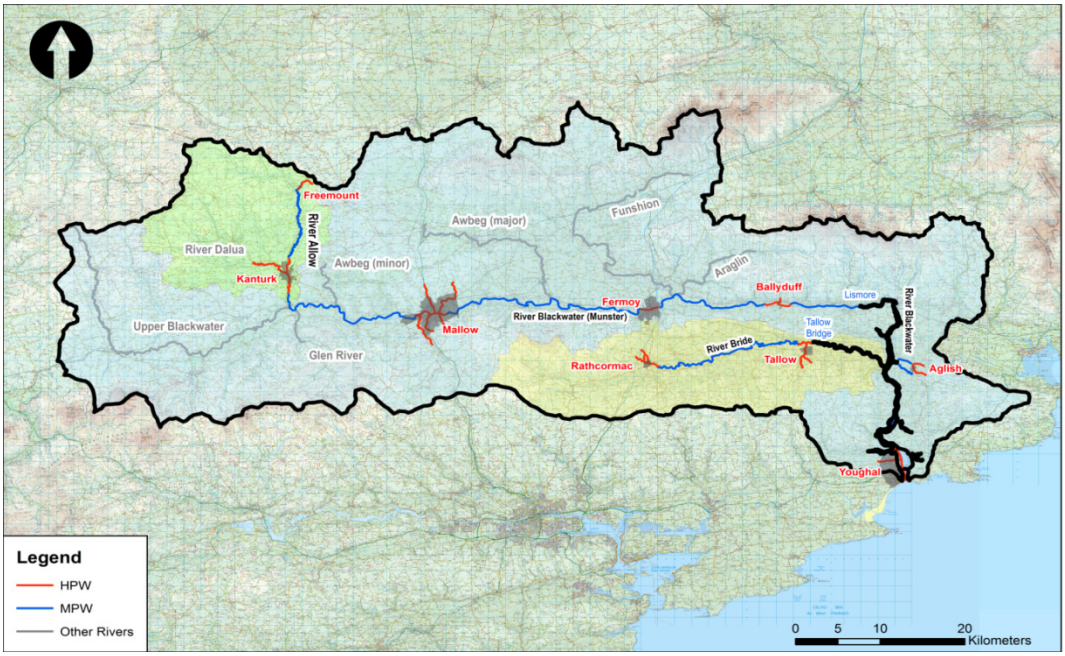
[2] River Basin Districts (RBDs) are the main units for the management of river basins and have been delineated by Member States under Article 3 of the Water Framework Directive (2000/60/EC). RBDs are areas of land and sea, made up of one or more neighbouring river basins together with their associated groundwaters and coastal waters.

- The Munster Blackwater Catchment (UoM18);
- The Lee / Cork Harbour Catchment (UoM19);
- The Bandon / Skibbereen Catchment (UoM20);
- The Dunmanus / Bantry / Kenmare Bay Catchment (UoM21); and
- The Laune / Maine / Dingle Bay Catchment (UoM22).

Unit of Management 18, which forms part of the SWRBD, covers an area of approximately 3,295 km^2. The large majority of the area is in North County Cork with parts in County Waterford. UoM 18 also includes small parts of Limerick, Kerry and Tipperary and has only a few kilometres of coastline at Youghal Bay. UoM 18 comprises three major river catchments: the Blackwater and its tributaries the Allow and the Bride.

Unit of Management 18 contains nine Areas for Further Assessment (AFAs). Associated with the AFAs are 80km of high priority watercourses and 158km of medium priority watercourses. For the purpose of this SEA Options Appraisal report, the viable structural options for the following AFA's are considered, Rathcormac, Kanturk, Ballyduff, Aglish and Youghal.

Figure 1-2 UoM 18



[3] UoMs are representative of Hydrometric Area boundaries.

1.3 Purpose and Structure of this Report

1.3.1 Purpose

The CFRAM studies and Flood Risk Management Plans will be informed by a Strategic Environmental Assessment completed in accordance with the requirements of the SEA Directive (2001/42/EC), as transposed into Irish law through S.I. No. 435 and 436 of 2004 and S.I. No. 200 and 201 of 2011.

This report is a Strategic Environmental Assessment Options Appraisal Report and pertains to Unit of Management 18 (Munster Blackwater Catchment) the South Western River Basin District.

The purpose of this report is to:

a) Review the environmental aspects associated with the alternative flood risk management options under consideration. Flood risk management options consist(s) of one or, more commonly, a combination of flood risk management (FRM) methods;

b) Determine the benefits and impacts of the alternative options assessed and mitigation/environmental enhancement measures where considered appropriate;

c) Evaluate and rank the alternative options against the Strategic Environmental Assessment (SEA) Objectives, Indicators and Targets identified during the SEA Scoping Stage; and

d) Identify the preferred flood risk management option from a strategic environmental assessment perspective.

1.3.2 Report Structure

Table 1.2: Report Structure

Chapter	Title	Purpose
1	Introduction	This chapter provides a broad background to the CFRAM Studies in the context of National Flood Policy and legislation. This section also sets out the purpose of the SEA Options Appraisal Study
2	Flood Risk Management Options	This chapter provides an overview of the processes associated with the identification of the preliminary flood risk management options and multi-criteria analysis.
3	Strategic Environmental Assessment	This chapter provides an overview of the SEA process and the relationship between CFRAM and SEA with a particular emphasis on the flood risk management options evaluation stage.
4	Appropriate Assessment	This chapter provides a brief overview of the AA process and the relationship between CFRAM and AA with a particular emphasis on the flood risk management options evaluation stage.

Chapter	Title	Purpose
5	Kanturk	This chapter describes the flood risk management options for Kanturk and the identification of the preferred option from an SEA perspective.
6	Rathcormac	This chapter describes the flood risk management options for Rathcormac and the identification of the preferred option from an SEA perspective.
7	Ballyduff	This chapter describes the flood risk management options for Ballyduff and the identification of the preferred option from an SEA perspective.
8	Aglish	This chapter describes the flood risk management options for Aglish and the identification of the preferred option from an SEA perspective
9	Youghal	This chapter describes the flood risk management options for Youghal and the identification of the preferred option from an SEA perspective
10	Conclusions and Next Steps	This chapter summarises the conclusion from the SEA Option Appraisal Study and the next steps in the SEA process.

2 Flood Risk Management Options

2.1 Introduction

A flood risk management option consists of one or, more commonly, a combination of flood risk management methods / measures. These methods/measures can be structural or non-structural in nature. The suitability of specific methods/measures needs to be reviewed on a case by case basis to ensure their appropriateness as all methods/measures may not be suitable in all circumstances.

2.1.1 Non Structural Measures

Non-structural measures can include one or a combination of some of the following;

Table 2.1: Non-Structural Measures

Measure	Description
Planning Control	This can include land-use development restrictions in statutory land-use plans (e.g. County/City Development Plans or Local Area Plans
Building Regulations/Planning Conditions	This can involve requiring certain development/structures to be flood resilient through specified construction methods, building fabrics and uses (e.g. regulations relating to floor levels, flood-proofing, flood resilience, sustainable drainage systems, prevention of reconstruction or redevelopment in flood-risk areas, etc.
Flood Forecasting	Flood forecasting is a means of providing advanced warning of an impending flood event. A reliable advance warning system allows protective measures to be put in place and protective actions to be carried out in advance of a flood event. These actions and measures can reduce the damage caused in a flood event
Public Awareness	Public awareness measures include, for example; • Identification and disclosure of areas prone to flooding • Provision of information on the measures in place to provide advance warning of flooding • Establishment of methods to interface with the public and owners of vulnerable properties
Land-Use Management	Land Use Management includes strategies to control overland flow, such as improving agricultural and forestry practices in key catchment areas. Local natural flood management measures such as the creation of wetlands or forestry to retain overland flow could also be adopted
Emergency Response Planning	Measures include strategic planning for the integrated response of the emergency services for flood risk and flood events

2.1.2 Structural Measures

Structural measures for flood risk management can include one or a combination of some of the following;

Table 2.2: Structural Measures

Measure	Description
Flood Storage	Measures could include provision of flood storage/retardation system
Flow Diversion	This could include full diversion of provision of a by-pass channel/flood relief

Measure	Description
	channel
Increased Conveyance	Measures could include in-channel works, floodplain earthworks, removal of constraints/constrictions or channel floodplain clearance.
Flood Defences	Flood defences can include such measures as walls, embankments or demountable defences
Improve Existing Defences	Existing defences could be repaired or gaps infilled.
Relocation of Properties	Existing properties could be relocated outside areas of flood risk
Localised Protection Works	This could involve such actions as minor raising of existing flood defences.

2.2 Evaluating the Effectiveness of Flood Risk Management Options

2.2.1 Overview

The effectiveness of each of the viable flood risk management option (FRM) is measured in terms of how it achieves a set of Flood Risk Management Objectives through a process of multi-criteria analysis (MCA). The objectives are split into a number of categories. These are;

- Technical;
- Economic;
- Social; and
- Environmental.

Some of the objectives within a particular category are further split into sub-objectives to provide clarity, particularly where individual objectives have multiple aspects associated with same.

2.2.2 Multi-Criteria Analysis Allocating Scores

Each sub objective has a basic requirement and an aspirational target associated with it. The basic requirement for each sub objective equates to a no change scenario. That is the status quo before the FRM option is adopted. The aspirational target in most cases is set to the highest achievement that is reasonably possible against the sub-objective in implementing the FRM option. The performance of each FRM option is measured against the basic and aspirational targets for each sub objective and assigned a score in accordance with the principles set out below.

Table 2.3: MCA Scoring

Option Performance	Score
Meets Aspirational Target	5
Partially Achieving Aspirational Target	Score in proportion to performance

Option Performance	Score
Meeting Basic Requirement (No Change)	0
Just Failing Basic Requirement	Score in proportion to performance
Fully Failing Basic Requirement	-5
Totally Failing Basic Requirement (Option Illegal or Totally Unacceptable)	-999

In the MCA the technical objectives measure if an option is robust in terms of operation. Higher scores are allocated to options that do not rely on mechanical, electrical or human intervention to operate effectively. Examples of such interventions include sluice gates, storm water over pumping, or erection of demountable barriers. The technical objectives also consider if the options can be constructed safely and if they can be managed effectively into the future.

The measurement of the performance of the options against the objective to avoid economic damage is measured in terms of the percentage of economic damage avoided by that option. When calculating the percentage reduction in damage for a particular option this is calculated relative to the total potential damages in the town. The economic objectives also measure the performance of the option in terms of reducing the risk to transportation routes, utility infrastructure and agricultural land.

The social objectives in the MCA include the reduction of flood risk to people, high vulnerability properties such as hospitals and fire stations and to social infrastructure and amenities. Under social objectives the MCA also measures the performance of the option to reduce the risk to local employment in relation to the number of non-residential properties at risk.

Under the environmental objectives the MCA measures the performance of the option as described below in accordance with the methodology as described in Chapter 3. This report has been prepared to describe the assessment of the FRM options against the environmental objectives.

Once all of the options have been analysed with reference to their performance against each of the sub-objectives the MCA score for each criteria can be calculated. This is done by multiplying the score for each sub objective by the Global and the Local Weighting and then by summing the weighted scores for all the sub objectives under that criterion.

Global and Local Weightings

In order to take account of the relative importance of some objectives in comparison other objectives, each sub-objective is given a Global Weighting. These global weightings are set at a national level and are the same across all of the CFRAM Studies. These weightings vary in value from 5 points to 30 points depending on their importance from a national perspective.

In order to take cognisance of the local perspective on the relative importance of objectives, each sub objective is also given a local weighting. Local weightings vary from 0 for not locally important to 5 for very important locally.

2.2.3 Multi-Criteria Analysis Overall Score

The **MCA Benefit Score** is calculated by adding the weighted score for the Economic, Social and Environmental Criteria together. This score represents the net benefits of the option.

The **Option Selection MCA Score** is calculated by adding the weighted scores of all the criteria together. This score includes the technical score and therefore includes all of the aspects that should be taken into account in considering the preferred option for a given location.

The **Total Construction Cost €** is the cost of the FRM option as outlined in Section 6.

The **MCA Benefit – Cost Ratio** is calculated by dividing the **MCA Benefit Score** by the cost of the option. This is a numerical but non monetised ratio that indicates the overall benefits that can be delivered per euro of investment.

The **Economic Benefit €** is the cost of the damage avoided for the FRM Option

The **Economic Benefit – Cost Ratio** is calculated by dividing the cost of the damage avoided by adopting the FRM Option by the cost of the option. This is the traditional method used by OPW in assessing the economic case for proceeding with a flood relief scheme. In general terms a flood relief scheme would be considered economically viable if the benefit cost ratio is greater than 1.

3 Strategic Environmental Assessment

3.1 Introduction

The management of flood risk will be achieved through the implementation of measures which are selected to achieve an acceptable balance of environmental, social, and technical factors. As part of the process to select the measures, the evaluation of the alternatives from an environmental perspective is a key step in the Strategic Environmental Assessment process.

3.2 Overview of the SEA Process

The SEA process involves six key stages as follows:

- **Screening** - the process of deciding whether the flood risk management plans would be likely to have significant environmental effects and as such would warrant a full SEA. The OPW conducted a screening assessment for the CFRAM studies in September 2011 which concluded that a full SEA is required.

- **Scoping** – Scoping determines the key environmental issues which are to be addressed in the Strategic Environmental Assessment. The scoping process set out a framework for the assessment of environmental effects resulting from a plan or programme and the generation of alternatives to ensure minimal environmental impact. The SEA process was completed in April 2015 following a consultation process with stakeholders.

- **Environmental Assessment and Environmental Report** – this is a key document in the SEA process as it outlines the likely significant effects on the environment of the Flood Risk Management Plan and recommends mitigation to address the significant adverse effects. The determination of the likely significant effects on the environment is based on a qualitative assessment under a series of Environmental Objectives. These environmental objectives are based on Environmental headings in Annex 2(f) of the *European Communities (Environmental Assessment of Certain Plans and Programmes) Regulations, 2004 (S.I. 435 of 2004)* as amended and include the following aspects;

    - Biodiversity;
    - Population;
    - Human health;
    - Fauna;
    - Flora;
    - Soil;

- Water;
- Air;
- Climatic factors;
- Material assets;
- Cultural heritage including architectural and archaeological heritage;
- Landscape; and
- The inter-relationship of the above factors.

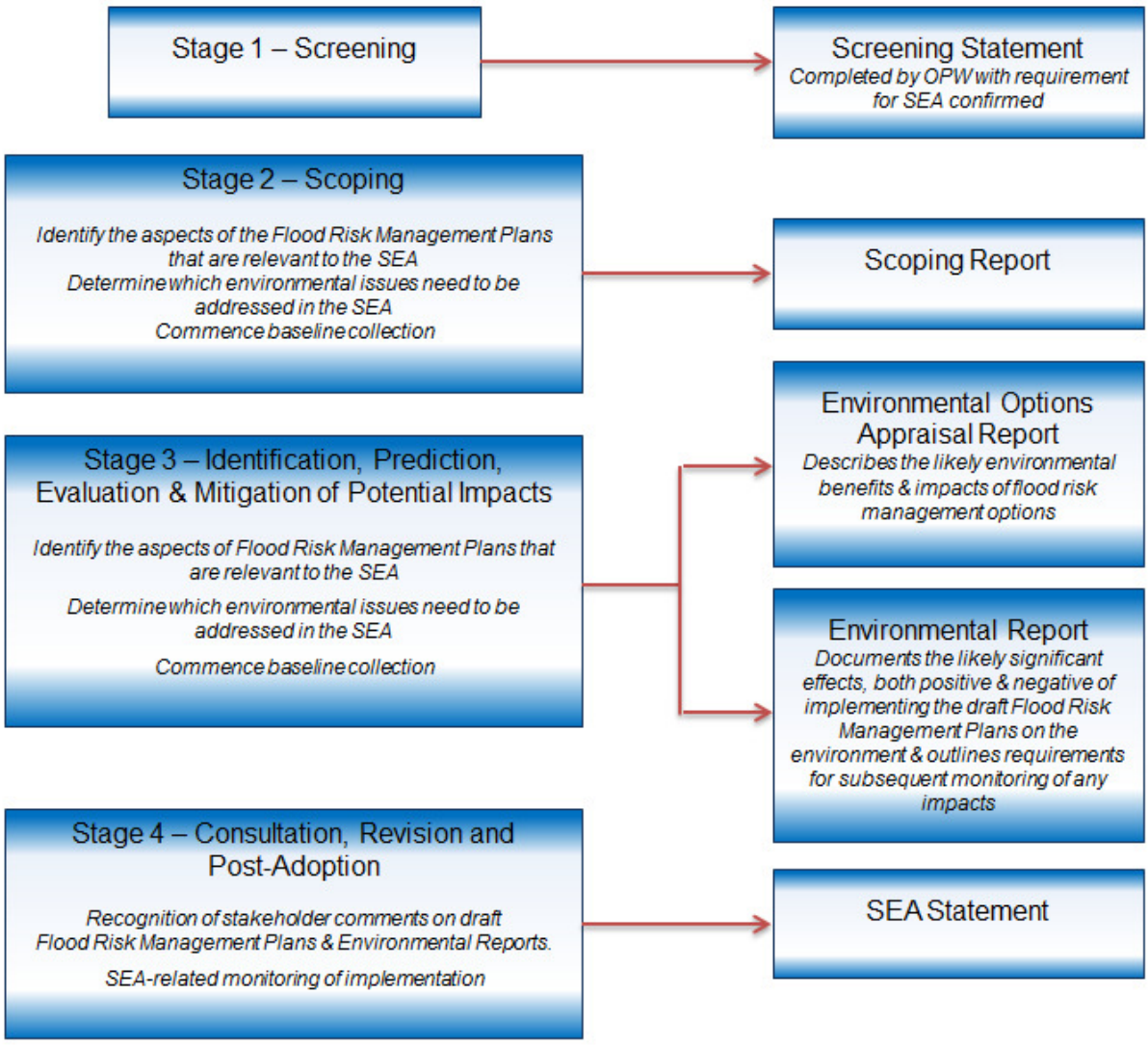
This document will also contain a history of the SEA process and how it was conducted with particular emphasis on stakeholder and public involvement;

- **Consultation on the Draft FRMP and SEA Environmental Report** – Consultation will be conducted with the relevant Environmental Authorities and also with the public. Both groups will be invited to make submissions in relation to the Draft Plan and Environmental Report. Submissions must be considered and the Environmental Report amended appropriately if deemed necessary;

- **SEA Statement** – From a legal and process perspective the production of the SEA Statement is the most important phase in the process. The function of the SEA Statement is to identify how the SEA process has influenced the plan. This requires careful scripting, particularly in the context of how differing opinions from consultees have been managed throughout the process. Another requirement of the SEA Statement is the inclusion of reasons for choosing the plan as adopted in light of the other reasonable alternatives considered.

- **Monitoring** - Monitoring requirements refer to the need to monitor the significant effects on the environment as a result of the implementation of the Flood Risk Management Plans. Monitoring begins with the adoption of the plan and continues for the duration of the plan.

Figure 3-1 Stages of SEA



3.3 SEA Objectives, Sub-Objectives and Targets

During the Scoping Stage, SEA objectives, sub-objectives and indicative targets were developed for each of the social and environmental criteria scoped into the study during this phase of the project. These objectives, sub-objectives and indicators have been developed to ensure that the SEA and multi-criteria flood risk management options appraisal focuses on those issues of relevance and significance to the

SWRBD. The SEA objectives align with the flood risk management objectives which have been developed on a national level through extensive consultation with stakeholders.

Table 3.1: SEA Objective, Sub-Objectives (and Targets)

Criteria	Objective		Sub-Objective		Example Indicator
Social	a	Minimise risk to human health and risk to residents life	i	Minimise risk to human health and life of residents	Number of residential properties at risk of flooding
			ii	Minimise risk to high vulnerability properties	Number of high vulnerability properties at risk from flooding (e.g. hospitals, health centres, nursing and residential homes)
	b	Minimise risk to community	i	Minimise risk to social infrastructure and amenity	(i) Number of social infrastructure assets at risk from flooding (e.g. educational institutions, fire and Garda stations, Bord Gáis facilities). (ii) Number/length of key strategic transport assets at risk of flooding.
			ii	Minimise risk to local employment	Number of non-residential properties at risk from flooding.
Environmental	a	Support the objectives of the WFD		Provide no impediment to the achievement of water body objectives and, if possible, contribute to the achievement of water body objectives.	Likelihood to impact on water body status elements: • Biology; • Physico-chemical; • Hydrology and morphology; • Priority substances and priority hazardous substances.
	b	Support the objectives of the Habitats Directive and Birds Directive		Avoid detrimental effects to, and where possible enhance, Natura 2000 network, other protected sites, protected species and their key habitats, recognising relevant landscape features and stepping stones.	(i)Area of internationally designated sites at risk from flooding and assessment of likely impact. (ii)Reported conservation status of internationally designated sites relating to flood risk management.
	c	Avoid damage to, and where possible enhance, the flora and fauna of the catchment		Avoid damage to or loss of, and where possible enhance, nature conservation sites and protected species or other known species of conservation concern	(i)Area of nationally designated sites at risk from flooding and assessment of likely impact, particularly where designated for Otter, White-clawed Crayfish or

				Freshwater Pearl Mussel (ii)Reported conservation status of nationally designated sites relating to flood risk management. (iii)Area/length of river within Freshwater Pearl Mussel sensitive areas where flood risk management actions are proposed, and assessment of likely impact.
	d	Protect, and where possible enhance, fisheries resource within the catchment	Maintain existing and where possible create new fisheries habitat including the maintenance or improvement of conditions that allow upstream migration for fish species.	(i) Area of suitable habitat supporting salmonid and other fish species (ii)Number of upstream barriers
	e	Protect, and where possible enhance, landscape character and visual amenity within the zone of influence	Protect, and where possible enhance, visual amenity, landscape protection zones and views into / from designated scenic areas within the zone of influence	(i) Length of waterway corridor qualifying as a landscape protection zone within urban areas (ii) Change of quality in existing scenic areas and routes (iii) Loss of public landscape amenities
	f	Avoid damage and reduce risk of flooding to, or loss of, features, institutions and collections of cultural heritage importance and their setting	Avoid damage and reduce risk of flooding to, or loss of, features, institutions and collections of architectural value and their setting	Number of architectural assets at flood risk and assessment of impact on their setting.
			ii Avoid damage and reduce risk of flooding to, or loss of, features, institutions and collections of archaeological value and their setting	Number of cultural heritage and archaeological assets at flood risk and assessment of impact on their setting.

Source: Mott MacDonald

3.4 Assessment of Alternatives

A key requirement for effective strategic environmental assessment is the evaluation of alternatives. The evaluation of alternatives from an SEA perspective is a key consideration in the determination of the best flood risk management option. This process has been described in detail in *Section 2.2 Evaluating the Effectiveness of Flood Risk Management Options.*

The Office of Public Works have published a Guidance Note under the National CFRAM Programme called *Option Appraisal and Multi-Criteria Analysis Framework (Revision C, April 2015).* Appendix B to this guidance note includes a detailed description of each of the social and environmental objectives and the methodology for the environmental evaluation of the flood risk management options.

4 Appropriate Assessment

4.1 Introduction

Directive 2001/42/EC (Strategic Environmental Assessment Directive) requires that Strategic Environmental Assessment (SEA) must be carried out during the preparation stage of a Plan i.e. before the adoption of the Plan. When an Appropriate Assessment is being carried out for a plan it must be published concurrently/jointly with the SEA (as two separate reports). The outcomes and recommendations of each stage in the Appropriate Assessment process inform the Strategic Environmental Assessment and vice versa. It is important that the assessments be carried out in parallel in order that any environmental issues raised in each assessment can be considered as part of the other. Similarly, any mitigation or alternatives proposed must be addressed in both assessments.

Appropriate Assessment is specifically intended to determine the likely significant effects on European sites in view of their conservation objectives, and to ensure that no plan or project that would have adverse effects on the integrity of a European site is approved or adopted (unless in exceptional circumstances where the requirements of Article 6(4) of the Habitats Directive can be met). Appropriate assessment does not deal with all significant ecological issues of relevance to SEA, nor does it address all legal requirements in relation to the conservation and protection of ecological sites, habitats and species.

4.2 Habitats Directive Screening (for Appropriate Assessment)

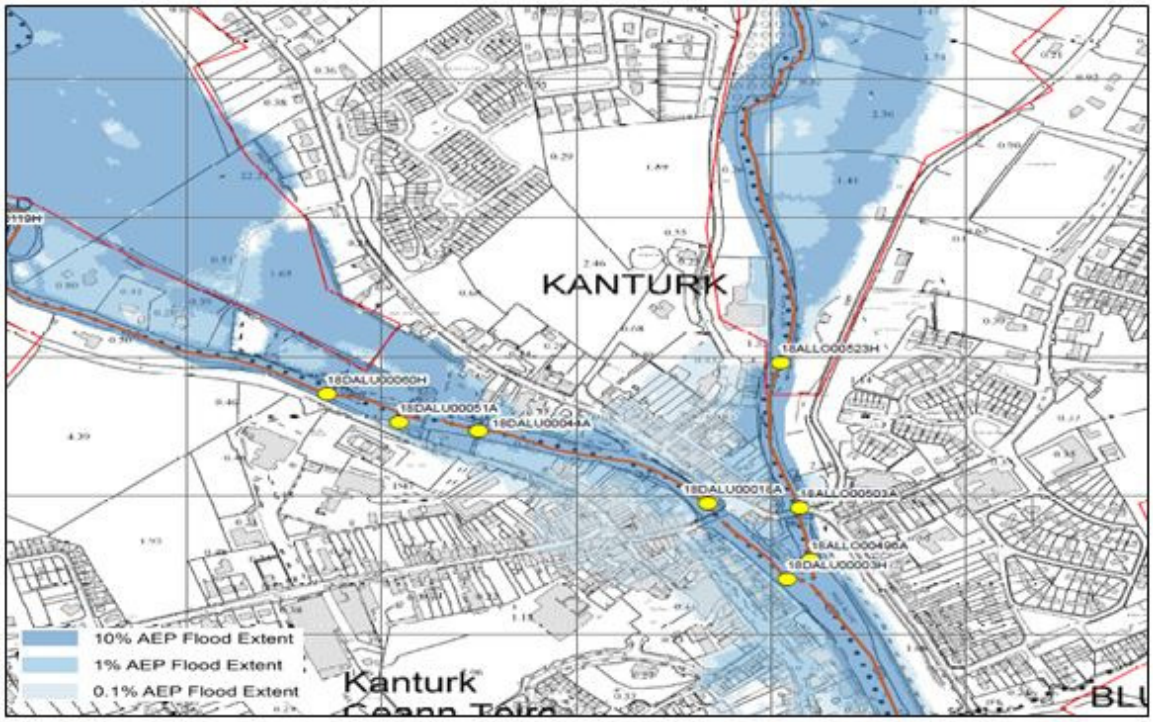
A separate draft Habitats Directive Screening (for Appropriate) Assessment has been developed to inform the Preliminary Options Report. The assessments have been included as an appendix to the Preliminary Options Reports.

5 Kanturk

5.1 Flood Risk

Kanturk is located at the confluence of the Dalua and Allow Rivers in County Cork. Kanturk is at risk of fluvial flooding. The AFA and the existing fluvial flood risk are depicted in Figure 5.1 below.

Figure 5.1: Kanturk Current Scenario Fluvial Flood Extents



5.2 Viable Flood Risk Management Options

A number of viable flood risk management options were identified and modelled to determine their effectiveness and impact. These are described below and illustrated in **Appendix A** of this report. It should be noted that due to the strategic level of the assessment, the locations in which viable options may be constructed within the AFA may change at detailed design stage if an option is progressed through as a scheme. Multi-criteria analysis (MCA) for each option was undertaken to assess if a preferred option could be established on environmental and social grounds. SEA scoring for the purpose of this appraisal is provided in **Appendix B** of this report.

Option 1 – Flood Defences/Localised Protection Works- this option considers the mitigation of flood risk through the construction of flood defences and localised protection works. These defences include a

combination of walls and embankments on both rivers ranging in height from 0.8m to 2.6m. The proposed option fully achieves the required standard of protection for the 1% AEP fluvial event.

Option 2 - Storage and Flood Defences - a viable location for the storage of fluvial flows was identified upstream on the River Dalua. A potential storage area of 330,000m^2 was identified used in combination with localised defence works within the town ranging in height from 0.5m to 1.9m. The proposed option fully achieves the required standard of protection for the 1% AEP fluvial event.

Option 3- Flood Defences & Conveyance - This option would involve the removal of existing constructed weirs within the River Dalua at Church Street Footbridge in combination with localised protection works ranging in height from 0.5m to 2.5m. The proposed option fully achieves the required standard of protection for the 1% AEP fluvial event.

5.3 Key Environmental Sensitivities

The key environmental sensitives of the Kanturk AFA are summarised below:

- Kanturk is located at the confluence of the Dalua and Allow Rivers in County Cork. The River Allow rises near the Mullaghereirk Mountains. The River Allow flows southwards towards Kanturk where it is joined by the similarly sized River Dalua immediately downstream of Greenane Bridge in the town. The Allow continues to flow southwards where it is joined by minor tributaries such as the Brogeen Stream before it flows through Riverview gauge to its confluence with the Blackwater at Leaders Bridge.

- The Allow and Dalua Rivers are classified as having good water status under the Water Framework Directive (WFD). These rivers are considered to be sensitive waterbodies.

- Kanturk is at risk of fluvial flooding. There are two significant polluting sources (CSO and WWTP) are located within the 1% AEP flood extent.

- The Allow and Dalua rivers are considered as part of the Blackwater Valley Special Area of Conservation (SAC). The site is important for the presence of several Annex II species, including Sea Lamprey, River Lamprey, Freshwater Pearl Mussels and otters. It is noted however the populations of Freshwater Pearl Mussels (FPM) occur upstream of Kanturk. FPM is known to be distributed along the Allow River. Targeted FPM surveys were conducted along the entire stretch of the river Allow in April 2013 as part of the CFRAM study for the SWRBD. Consultation with NPWS indicated no pearl mussel populations in the Dalua River. This was confirmed through a Stage 1 survey. The study findings showed good FPM populations between 1 and 5km upstream of Kanturk town on the Allow River. There were no findings of mussels within or below Kanturk Town on the Allow River up to the confluence with the Blackwater River.

- The SAC was also selected for the occurrence of Annex I/II habitats including floating river vegetation and alluvial forests. Otter use riparian habitat as shelter, although, much of the riparian habitat has been significantly impacted through the development of river walkway.

- According to the Cork County Development Plan (2014), the majority of the town centre has been designated an Architectural Conservation Area (ACA).

- According to the Cork County Development Plan (2014), Kanturk is located within an area characterised as "Broad Marginal Middleground" landscape character type. The landscape type has a picturesque quality and is deemed to be of high value and high sensitivity of local value.

- Receptors at risk 1% AEP within the AFA:
  - 53 No. Residential properties;
  - 1 No. High Vulnerability Property;
  - 3 No. Society Amenity Sites;
  - 6 No. NIAH sites;
  - 3 No. Recorded Archaeological Monuments and Sites
  - 99 No. Non Residential Properties;
  - 4 No. Roads at risk

5.4 Environmental Assessment

The potential impacts arising for each of the proposed options has been assessed in detail in the Multi-criteria analysis which is in **Appendix C** of this document. Table 5.1 below provides a summary of the potential impacts arising from the proposed options as determined through the SEA assessment. In addition Table 5.1 below also highlights the requirement for mitigation measures for each option under each social and environmental objective. Table 5.1 should be read in conjunction with the SEA scoring matrix contained within Appendix.

Table 5.1: Kanturk Options Scoring Matrix- Social and Environmental Objectives

SEA Objectives	Do nothing		Option 1		Option 2		Option 3	
Social Objectives	**Impact**	**Mitigation required**	**Impact**	**Mitigation required**	**Impact**	**Mitigation required**	**Impact**	**Mitigation required**
Human Health and life of residents	O	N	√ √		√ √		√ √	
High vulnerability properties	O	N	√ √ √		√ √ √		√ √ √	
Social infrastructure and amenity	O	N	√ √		√ √		√ √	
Risk to local employment	O	N	√		√		√	
Environmental Objectives								
WFD Directive	X X	Y	√	Y	√	Y	√√	Y
Birds and Habitats	X X	Y	X	Y	X X	Y	O	N

SEA Objectives	Do nothing		Option 1		Option 2		Option 3	
Directive								
Flora and Fauna	χ χ	N	χ	Y	χ χ	Y	χ	Y
Fisheries	χ χ	N	χ	Y	χ χ	Y	√√	Y
Landscape	0	N	χ χ	Y	χ χ	Y	χ χ	Y
Architectural Heritage	χ χ	Y	√	Y	√	Y	√	Y
Archaeological Heritage	χ	Y	χ	Y	O	N	O	N

SEA Scoring Matrix

Score	Key	Description
+5	√√√	Achieving aspirational target
+4	√√	
+3	√√	Partly achieving aspirational target
+2	√	Exceeding minimum target
+1	√	
0	O	Meeting minimum target
-1	χ	Just failing minimum target
-2	χ	
-3	χ χ	Partly failing minimum target
-4	χ χ	
-5	χχ χ	Fully failing minimum target
-999.99	χχ χ	Unacceptable negative impact where feasible alternative exists

Generally all options performed well in relation to the WFD objective, all options can contribute to achieving the objectives of the WFD by preventing recurring flooding, which could result in the deterioration of water quality. However, the construction stage of all measures could result in temporary negative impacts on the water body status, resulting from sedimentation, accidental pollution or loss of habitat in the absence of appropriate mitigation. Option 3 includes the removal of the existing weir within the River Dalua at Church Street Footbridge , this will return this section of the River Dalua to a more natural hydrological and morphological regime.

The Allow and Dalua rivers are considered as part of the Blackwater Valley Special Area of Conservation (SAC). All the proposed options are located within/adjacent to the SAC boundary. Having regard to the requirements of the Birds and Habitats Directive, the proposed options may result in relatively localised negative impacts on the Annex II and Annex IV species. Permanent fragmentation of linear riparian

features by construction of very large embankments (e.g. 8m embankment in Kanturk) may occur which may deter commuting protected species from using an area.

Option 2 will require in-stream works during the construction of the control structure in addition to the temporary impacts caused by disturbance to river bed and banks, this option will also result in permanent loss of river bed and bank within the footprint of the control structure.

Option 3 includes for the removal of the weir within the River Dalua at Church Street Footbridge , this will permanently alter the hydrology of the river at this location. Currently sediment builds up behind the weirs and is flushed out during flooding. The removal of the weirs will permit the more natural deposition of sediment in the watercourse. Juvenile Lamprey have been recorded in the Dalua and Allow rivers upstream of Kanturk. The river substrate in proximity to the bridges and weir has high levels of silt . There is potential for the presence of suitable juvenile lamprey habitat. No suitable Lamprey spawning habitat has been recorded in Kanturk, it can be extrapolated that suitable habitat for Salmon is also absent. Conveyance works will be localised in nature and will be confined to below the FPM populations. It is considered that there is no potential for direct destruction of existing FPM habitat.

All of the proposed options have the potential to cause disturbance to species of conservation concern through operational impacts generally associated with construction stage project, , noise generated by the works and possibly artificial lighting that may be used in the darker winter months.

Stretches of the proposed flood walls/embankments are located within areas used for angling within the town, so temporary disruption to access may occur. There is no preference in regard to the potential impacts on the fishing amenity of the rivers. The Blackwater River is designated as a salmonid watercourse under the European Communities (Quality of Salmonid Waters) Regulations, 1988. The objective of this designation is to maintain water quality for salmon and trout freshwater species. Option 3 has the potential to influence water quality and remove the obstructions to fish passage. The removal of the weirs will permit the more hydrological and morphological regime of the river and is likely to allow permanent upstream migration of salmonids, therefore option 3 is considered the preferred option as it partly achieves the aspirational targets set out in the fisheries objective.

Kanturk is designated as an Architectural Conservation Area (ACA) and is at risk from fluvial flooding. All options will provide flood protection within the AFA. There are six (National Inventory of Architectural Heritage (NIAH) buildings at risk from fluvial flooding within the AFA. There are three designated (RMPs[4] within the town centre. One of these is a site of a mill of which there is no above ground evidence. The remaining two RMPs are bridges. The provision of flood defences within the town centre will have a permanent impact on the setting of these RMPs and the NIAHs. Option 1 includes for the construction of extensive defence walls within the town, whereas options 2 and 3 also include the construction of defence walls in the town however to a lesser extent. All the options will be some protection of the RMPs listed in Kanturk from the future occurrence of flooding. However, as two of the designated sites are bridges, they will be afforded only limited protection by the proposed measures.

[4] The Record of Monument and Places (RMP) is a statutory list of all known archaeological monuments provided for in the National Monuments Acts

There is one high vulnerability property and three social infrastructure and amenity sites at risk from fluvial flooding within the AFA. Each of the options considered above score the same in regard to the protection the measures provide to human health and life of residents and protection provided to local employment within the AFA.

5.5 Preferred Flood Risk Management Option

On the basis of the detailed evaluation included in Appendix C and summarised above, Option 3 (Flood Defences & Conveyance) has been determined to be the preferred option. This option includes the removal of the weir at the Church Street footbridge. Mitigation actions are recommended for the identified negative effects. The key recommendation is that these negative impacts should be considered during the next stage of option development, when the alignment of the proposed defences and details of the option would be optimised through detailed design in order to limit impacts on the river channel and banks of the river.

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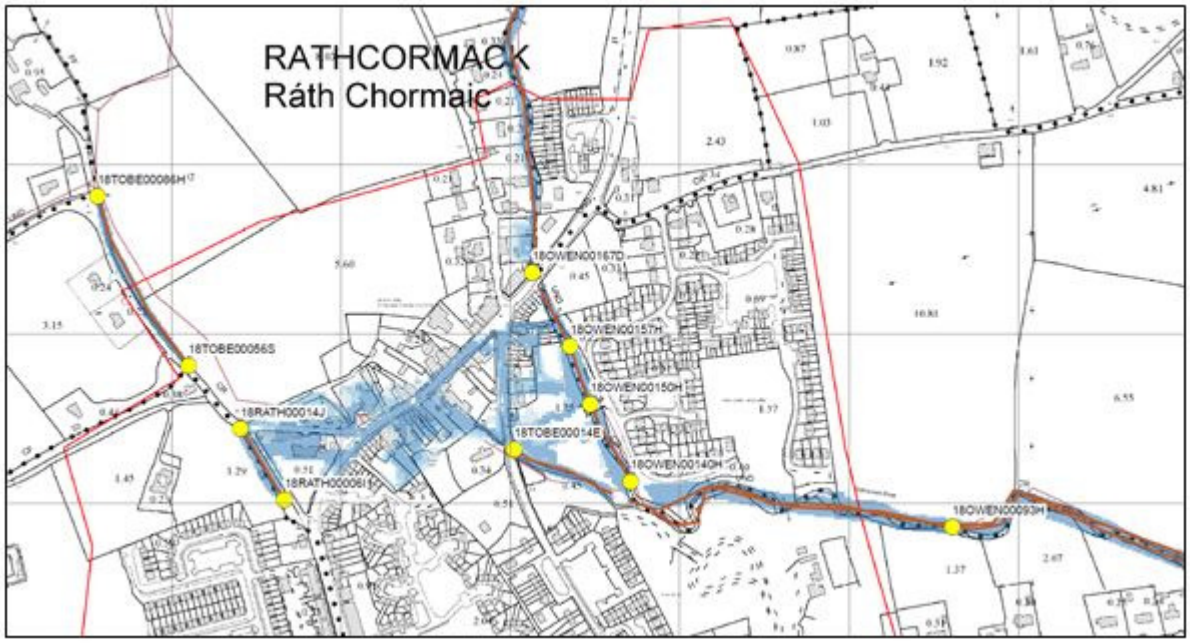
6 Rathcormac

6.1 Flood Risk

Rathcormac is located at the confluence of the Kilbrien Stream and the Shanowen River in County Cork. Rathcormac is at risk of fluvial flooding. The AFA and the existing fluvial flood risk are depicted in Figure 6.1 below.

Figure 6.1: Rathcormac Current Scenario Fluvial Flood Extents



6.2 Viable Flood Risk Management Options

A number of viable flood risk management options were identified and modelled to determine their effectiveness and impact. These are described below and illustrated in **Appendix A** of this report. It should be noted that due to the strategic level of the assessment, the locations in which viable options may be constructed within the AFA may change at detailed design stage if an option is progressed through as a scheme. Multi-criteria analysis (MCA) for each option was undertaken to assess if a preferred option could be established on social and environmental grounds. SEA scoring for the purpose of this appraisal is provided in **Appendix B** of this report.

Option 1 –Storage - a viable location for the storage of fluvial flows was identified upstream on the Kilbrien Stream. A potential storage area of 23,270m^2 was identified with sufficient capacity to reduce the peak flow to approx. 0.4m^3/s. This work will involve stream realignment, construction of embankments to

contain floodwaters and installation of a sluice gate to control flow from the storage area. The proposed option fully achieves the required standard of protection for the 1% AEP fluvial event.

Option 2 – Flow Diversion - The flooding in Rathcormac occurs due to the insufficient capacity of the culverts along the Kilbrien Stream. This measure aims to divert the flow from the Kilbrien Stream to the Shanowen River through the construction of a 582m culvert (1200mm diameter pipe) north of the town. The proposed option fully achieves the required standard of protection for the 1% AEP fluvial event.

Option 3- Flood Defences/ Localised Protection Works -This option considers the mitigation of flood risk through the construction of flood defences and localised protection works. Wall height ranges from 0.8m to 1.6m. The locations and heights of the defences are provided in **Appendix A** of this report. The proposed option fully achieves the required standard of protection for the 1% AEP fluvial event.

6.3 Key Environmental Sensitivities

The key environmental sensitives of the Rathcormac AFA are summarised below:

- Rathcormac is located at the confluence of the Kilbrien Stream and the Shanowen River in County Cork. The status of these waterbodies have not been classified, however previous classification identified the Kilbrien stream of being of "moderate status". Waterbodies are however upstream of the River Blackwater SAC and are therefore considered to be sensitive. The flooding in Rathcormac occurs due to the insufficient capacity of the culverts along the Kilbrien Stream.
- There are no significant polluting sources at risk from fluvial flooding within the AFA.
- The Blackwater River is designated as a salmonid watercourse under the European Communities (Quality of Salmonid Waters) Regulations, 1988.
- Kilbrien stream runs parallel to the local road to Garrynacole for the majority of its path and then diverts into Rathcormac. The stream is surrounded by built land and agricultural lands. The stream is heavily channelized and engineered.
- Annex I habitats have not been documented within Rathcormac AFA. The stream is suboptimal habitat for the qualifying features of the SAC including European Otter, Common Kingfisher, and Lamprey.
- A small stretch of the river has been designated as an amenity walkway within the village. The Kilbrien stream is sub-optimal habitat for species protected under the Wildlife Act or Annex IV species. There is potential that otter commute along the Shanowen River.
- Architectural heritage structures at risk from flooding within the AFA include the Catholic Church and Church of England ruins and a recently restored mill building.
- There are no recorded monuments and sites at risk from flooding.

- Rathcormack is located within an area characterised as “Broad Fertile Lowland Valley” landscape character type. The landscape type is deemed to be of medium value and medium sensitivity and of local value.

- Receptors at risk 1% AEP within the AFA:
  - 20 No. Residential properties
  - 11 No. Non-Residential properties
  - 1 No. Society Amenity Sites
  - 1 No. NIAH sites
  - 4 No. Roads at risk

- There are no high vulnerability properties at risk from fluvial flooding within the AFA.

6.4 Environmental Assessment

Table 6.1 below provides a summary of the potential impacts arising from the proposed options as determined through the SEA assessment. In addition Table 6.1 below also highlights the requirement for mitigation measures for each option under each social and environmental objective. Table 6.1 should be read in conjunction with the SEA scoring matrix contained within Appendix.

Table 6.1: Rathcormac Options Scoring Matrix- Social and Environmental Objectives

SEA Objectives		Do nothing		Option 1		Option 2		Option 3
Social Objectives	**Impact**	**Mitigation required**	**Impact**	**Mitigation required**	**Impact**	**Mitigation required**	**Impact**	**Mitigation required**
Human Health and life of residents	O	N	√√√	N	√√√	N	√√√	N
High vulnerability properties	O	N	O	N	O	N	O	N
Social infrastructure and amenity	O	N	√√√	N	√√√	N	√√√	N
Risk to local employment	O	N	√√√	N	√√√	N	√√√	N
Environmental Objectives								
WFD Directive	X	N	√√	Y	X	Y	X	Y
Birds and Habitats Directive	O	N	X	Y	X	Y	X X	Y
Flora and Fauna	O	N	O	N	O	N	X	Y
Fisheries	O	Y	X	Y	X	Y	X	Y
Landscape	O	N	X	Y	X	Y	X	Y
Architectural Heritage	X	Y	√	Y	√	Y	√	Y

SEA Objectives	Do nothing		Option 1		Option 2		Option 3	
Archaeological Heritage	O	N	O	N	O	N	O	N

SEA Scoring Matrix

Score	Key	Description
+5	√√√	Achieving aspirational target
+4	√√	
+3	√√	Partly achieving aspirational target
+2	√	Exceeding minimum target
+1	√	
0	O	Meeting minimum target
-1	χ	Just failing minimum target
-2	χ	
-3	χ χ	Partly failing minimum target
-4	χ χ	
-5	χχ χ	Fully failing minimum target
-999.99	χχ χ	Unacceptable negative impact where feasible alternative exists

The Kilbrien stream at the option 1 location is engineered and modified and the stream runs parallel to the road. There is potential for short term negative construction impacts resulting in discharges of elevated levels of sediment to the stream if not managed appropriately. The construction of the on-line storage will have a permanent impact on the morphology of the stream, however there is opportunity for long term positive impacts through the provision of a more natural stream channel.

There are no designated ecological sites within the AFA, however the Kilbrien stream and Shanowen river are tributaries of the River Bride which is part of the Blackwater River SAC. Kilbrien stream has no capacity to support qualifying features of the Blackwater River SAC given its heavy modification. Construction works can result in loss of sediment and pollutants to the stream which may ultimately enter the River Bride with potential to impact qualifying features of the SAC e.g. lamprey. The significance of the impact can be mitigated against by staging of the works, retaining an adequate buffer from watercourses and provision of sediment controls on site.

It is considered that there is no fisheries amenity potential along the Kilbrien stream at this location. The provision of the flood defence wall provided in Option 3 will further impact on the permanent morphology as the wall will require excavation of the bank during the construction phase and will replace the existing natural banks. In regards to Option 2 there is potential for recurring negative impacts associated with

diversion of flow into the Shanaowen River during storm events. The increase flow volume and velocity in the Shanowen River during storm events can cause bankside erosion and associated loss of habitat, however it is noted that the river has been assessed as having the capacity to physically accommodate the increase volume without overtopping its bank. In regards to Option 1 there is potential for a short term negative impact during the construction of the sluice gate of the storage area. This would result in emissions of sediment to the waterbody downstream. Potential for short term/intermittent discharges of water from the reservoir, which may result in a reduced trophic status, however it is not considered that this will have a significant impact on the valuable fisheries habitat further downstream in the Blackwater catchment.

All of the options are similar in terms of the potential impacts on architectural heritage and landscape. The flooding in Rathcormac occurs due to the insufficient capacity of the culverts along the Kilbrien Stream. All options will provide flood protection for the recorded structures within the village and will not have any impact on the settings of these structures. All options will have a neutral effect on the archaeological heritage within the town.

There are no high vulnerability properties at risk from flooding within the AFA. Each of the options considered above score the same in the context of the protection the measures provide to human health and life of residents and protection provided to local employment within the AFA.

6.5 Preferred Flood Risk Management Option

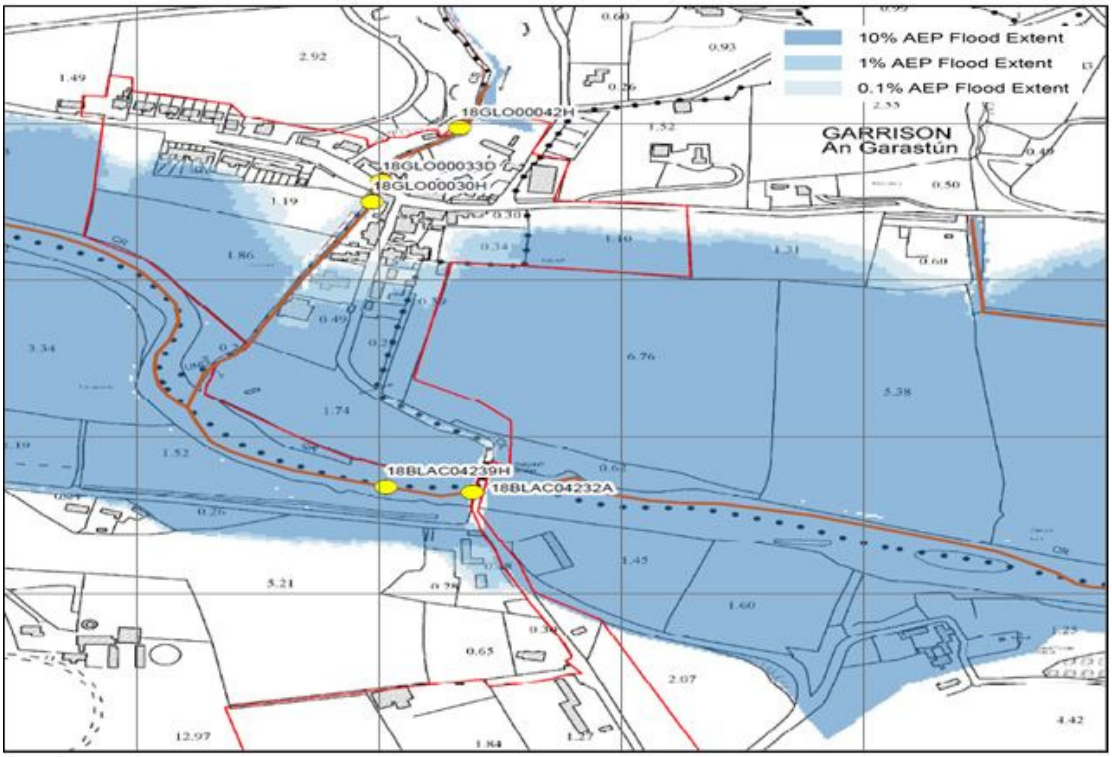
On the basis of the detailed evaluation included above, Option 1 (Storage) is the preferred option. Mitigation actions are recommended for the identified negative effects. The key recommendation is that these negative impacts should be considered during the next stage of option development, when the alignment of the proposed defences and details of the option would be optimised through detailed design in order to limit impacts on the river channel and banks, particularly on dependent fisheries habitat.

7 Ballyduff

7.1 Flood Risk

Ballyduff is located along the Blackwater and is at risk of fluvial flooding. The AFA and the existing fluvial flood risk from the 1% AEP are depicted in Figure 7.1.

Figure 7.1: Ballyduff Current Scenario Flood Extents



7.2 Viable Flood Risk Management Options

One viable flood risk management option was identified and modelled to determine its effectiveness and impact. These are described below and illustrated in **Appendix A of this report**. It should be noted that due to the strategic level of the assessment the locations in which viable options may be constructed within the AFA may change at detailed design stage if an option is progressed through a scheme. Multi-criteria analysis (MCA) for the option was undertaken to assess if a preferred option could be established on environmental grounds. A summary of the findings of the MCA is detailed in **Appendix C** of this report.

Option 1 - Flood Defences Works -This option considers the mitigation of flood risk through the construction of fluvial flood defences within the town. These defences include walls, embankments and road raising. The locations and heights of the defences are provided in **Appendix A** of this report. The proposed option fully achieves the required standard of protection for the 1% AEP fluvial event.

7.3 Key Environmental Sensitivities

The key environmental sensitives of the Ballyduff AFA are summarised below:

- Ballyduff is located along the River Blackwater in Co. Waterford. There are no significant polluting sources at risk from flooding in 1% AEP flood extent.
- The Ballyduff AFA overlaps with areas of the Blackwater River SAC and the Blackwater Callows SPA.
- The river is classified as having 'good status' under the WFD classification system and it is considered to be a sensitive waterbody.
- The river and its tributary are considered as part of the Blackwater Valley Special Area of Conservation (SAC). The site is important for the presence of several Annex II species, including Sea Lamprey, River Lamprey, Freshwater Pearl Mussels and Otters and Annex I habitats including floating river vegetation and alluvial forests. White Well Wood is located c.1km east of Ballyduff but does not have any of the characteristics of the habitat types as set out in the Habitats Directive.
- The Blackwater River is designated a salmonid watercourse under the European Communities (Quality of Salmonid Waters) Regulations, 1988.
- Receptors at risk 1% AEP within the AFA:
  - 3 No. Residential properties
  - 10 No. Non Residential Properties
  - 1 No. Society Amenity Sites
  - 4 No. NIAH sites
  - 1 No. Roads

- There are no high vulnerability properties at risk from fluvial flooding within the AFA. There are no RMP's at risk from fluvial flooding within the AFA.

7.4 Environmental Assessment

Table 7.1 below provides a summary of the potential impacts arising from the proposed options as determined through the SEA assessment. In addition Table 7.1 below also highlights the requirement for mitigation measures for each option under each social and environmental objective. Table 7.1 should be read in conjunction with the SEA scoring matrix contained within Appendix.

Table 7.1: Ballyduff Options Scoring Matrix- Social and Environmental Objectives

SEA Objectives	Do nothing		Option 1	
Social Objectives	**Impact**	**Mitigation required**	**Impact**	**Mitigation required**
Human Health and life of residents	0	N	√√√	N
High vulnerability properties	0	N	0	N
Social infrastructure and amenity	0	N	√√√	N
Risk to local employment	0	N	√√√	N
Environmental Objectives				
WFD Directive	O	N	χ	Y
Birds and Habitats Directive	O	N	χ	Y
Flora and Fauna	O	N	χ	Y
Fisheries	O	N	χ	Y
Landscape	O	N	χ χ	Y
Architectural Heritage	χ	Y	√	Y
Archaeological Heritage	O	N	O	N

SEA Scoring Matrix

Score	Key	Description
+5	√√√	Achieving aspirational target
+4	√√	
+3	√√	Partly achieving aspirational target
+2	√	Exceeding minimum target
+1	√	
0	O	Meeting minimum target
-1	χ	Just failing minimum target
-2	χ	
-3	χ χ	Partly failing minimum

-4	X X	target
-5	XX X	Fully failing minimum target
-999.99	XX X	Unacceptable negative impact where feasible alternative exists

The River Blackwater is classified as having 'good status' under the WFD classification system and it is considered a sensitive waterbody. The construction of the proposed measures may result in temporary negative impacts on the water body status in the absence of appropriate mitigation. There are no significant polluting sources at risk from fluvial flooding within the AFA. There are no in-stream works proposed and the measures will not directly impact on the River Blackwater, however there is an embankment on the tributary which may require excavation of the bank of stream during the construction stage may result in discharges of elevated levels of sediment to the waterbody and downstream to the River Blackwater without treatment/mitigation being implemented.

Option 1 measures are located within/adjacent to the SAC boundary. With reference to the Birds and Habitats Directive, Ballyduff AFA overlaps with areas of the Blackwater River SAC and the Blackwater Callows SPA. The Blackwater Callows SPA is a site of high importance for wintering waterfowl. However there are no records for the Special Conservation Interests of the Blackwater Callows SPA in proximity to Ballyduff.

The proposed measures have the potential to cause temporary disturbance to species of conservation importance through operation of construction plant and personnel and noise generated by the works. The Blackwater River is designated as salmonid. Lamprey have been recorded within the River Blackwater near Ballyduff and Sea Lamprey have been observed spawning downstream of Ballyduff. Potential impacts on the spawning gravels downstream from sedimentation associated with the construction of the flood embankment may occur.

Targeted FPM surveys were conducted along the Blackwater River as part of the CFRAM study for the SWRBD. No pearl mussels were identified between Ballyduff, downstream to Youghal Bridge (at which point the watercourse becomes estuarine). Impacts on FPM are extremely unlikely.

The approach roads into Ballyduff are scenic routes. The proposed measures include construction of embankments of approximate height 1.5m to 2m. Currently there are wide open views of the river along the approach roads bound by 0.5m high stone walls. The proposed measures will potentially change the character of the landscape in the absence of appropriate design.

There are a number of NIAH structures and buildings at risk from flooding within the 1% AEP within the AFA, these include a 17th Century house (castle) and the Ballyduff bridge. The proposed measures will reduce the risk of flooding on the designated sites within the village but does not provide protection to the Ballyduff Castle downstream.

In comparison to the Do-nothing scenario, Option 1 provides protection to residential and non-residential properties at risk from fluvial flooding within the AFA. There are no high vulnerability properties within the AFA therefore the score for the protection of this objective is neutral.

7.5 Preferred Flood Risk Management Option

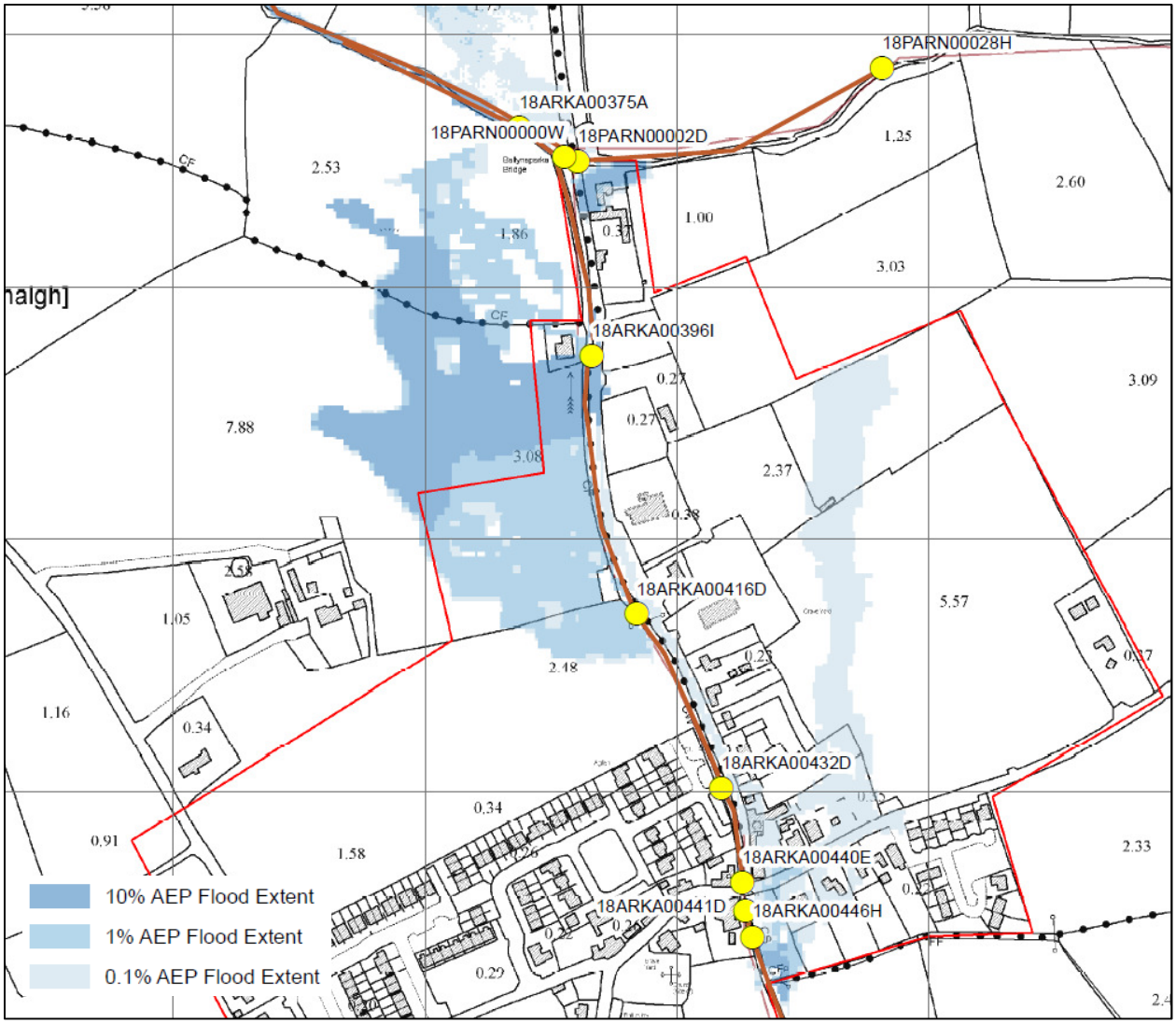
On the basis of the detailed evaluation above, Option 1 (Flood Defences /Localised Protection Works) is considered the preferred option. Mitigation actions are recommended for the identified negative effects. The key recommendation is that these negative impacts should be considered during the next stage of option development, when the alignment of the proposed defences and details of the option would be optimised through detailed design in order to limit impacts on the river channel and banks within the SAC. The appearance of floodwalls would be designed appropriate to minimise potential visual effects within the AFA.

8 Aglish

8.1 Flood Risk

Aglish is located in County Waterford and is at risk of fluvial flooding. The AFA and the existing fluvial risk are shown in Figure 8.1.

Figure 8.1: Aglish – Current Scenario Tidal Flood Extents



8.2 Viable Flood Risk Management Options

One viable flood risk management option was identified and modelled to determine its effectiveness and impact. These are described below and illustrated in **Appendix A of this report**. It should be noted that due to the strategic level of the assessment the locations in which viable options may be constructed within the AFA may change at detailed design stage if an option is progressed through a scheme. Multi-criteria analysis (MCA) for the option was undertaken to assess if a preferred option could be established on environmental grounds. A summary of the findings of the MCA is detailed in **Appendix C** of this report.

Option 1 - Flood Defences Works -This option considers the mitigation of flood risk through the construction of fluvial flood defences within the town. These defences include walls, and embankments. The locations and heights of the defences are provided in **Appendix A** of this report. The proposed option fully achieves the required standard of protection for the 1% AEP fluvial event.

8.3 Key Environmental Sensitivities

The key environmental sensitives of the Aglish AFA are summarised below;

- The town of Aglish is situated in a minor sub-catchment of the lower Blackwater on the Ballynaparka River. The Ballynaparka River rises 2km upstream of the town flowing north-west along the main street through Aglish Stream. Downstream of the confluence, the river flows west through Bleach to join the tidal Goish River and the River Blackwater 1km further downstream. Ballynaparka River is assigned good water status under the WFD.

- There are no significant polluting sources within the 1% AEP Flood Extent.

- The Aglish AFA boundary does not overlap with any Natura 2000 site boundary. The nearest designated area is the Blackwater River SAC which is located 2km downstream and west of the AFA.

- Aglish stream is heavily channelized and engineered. There are no fisheries amenity or habitat potential along the stream. The Aglish stream is heavily modified and considered sub-optimal habitat for salmonids and lamprey. The availability of spawning habitat in the Ballynaparka Stream has not been recorded.

- European Otter (Lutra lutra) are known to occur in proximity to Aglish. Otter use riparian habitat as shelter and as commuting routes. The riparian habitat on the Aglish stream is considered sub-optimal habitat for otter and it is unlikely that otters have established holts in the area.

- The environs of Aglish have a high potential to support bat species. Natterer's, long-eared, pipistrelle and Daubenton's bats have been recorded in the area.

- Receptors at risk 1% AEP within the AFA:

- 3 No. Residential properties
- 2 No. Non Residential Properties
- 2 No. Roads

- There are no high vulnerability properties and society amenity sites at risk from fluvial flooding within the AFA. There are no RMP's or NIAH sites at risk from fluvial flooding within the AFA.

8.4 Environmental Assessment

Table 8.1 below provides a summary of the potential impacts arising from the proposed options as determined through the SEA assessment. In addition Table 8.1 below also highlights the requirement for mitigation measures for each option under each social and environmental objective. Table 8.1 should be read in conjunction with the SEA scoring matrix contained within Appendix.

Table 8.1: Aglish Options Scoring Matrix- Social and Environmental Objectives

SEA Objectives	Do nothing		Option 1	
Social Objectives	**Impact**	**Mitigation required**	**Impact**	**Mitigation required**
Human Health and life of residents	0	N	√√√	N
High vulnerability properties	0	N	0	N
Social infrastructure and amenity	0	N	0	N
Risk to local employment	0	N	√√√	N
Environmental Objectives				
WFD Directive	O	N	X	Y
Birds and Habitats Directive	O	N	O	Y
Flora and Fauna	O	N	X	Y
Fisheries	O	N	X	Y
Landscape	O	N	X	Y
Architectural Heritage	O	Y	O	N
Archaeological Heritage	O	N	O	N

SEA Scoring Matrix

Score	Key	Description
+5	√√√	Achieving aspirational target
+4	√√	
+3	√√	Partly achieving aspirational target
+2	√	Exceeding minimum target
+1	√	
0	O	Meeting minimum target

-1	χ	Just failing minimum target
-2	χ	
-3	χ χ	Partly failing minimum target
-4	χ χ	
-5	χχ χ	Fully failing minimum target
-999.99	χχ χ	Unacceptable negative impact where feasible alternative exists

The Ballynaparka River , is assigned good water status under the WFD. There are no significant polluting sources at risk from flooding.

There are no designated ecological sites within the AFA, however the Ballynaparka River is a tributary of the Blackwater River SAC. Ballynaparka River has no capacity to support qualifying features of the Blackwater River SAC given its heavy modification. Construction works can result in loss of sediment and pollutants to the stream. The significance of the impact can be mitigated against by staging of the works, retaining an adequate buffer from watercourses and provision of sediment controls on site.

According to the Waterford County Development Plan 2011-2017, there are no scenic or visually sensitive landscapes within the AFA. Option 1 includes the construction of low lying wall parallel to the local approach road adjacent to the local school and within the town at the rear of a dwelling. There is a currently a low lying boundary hedgerow. The construction of the walls and embankment are unlikely change the character of the area or change the existing views from the property. However, temporary negative impacts are likely to occur during the construction of the proposed measure.

In regard to the architectural and archaeological objectives, there are no recorded architectural or archaeological sites or monuments at risk within the 1% AEP flood extent, therefore the score in regard to these objectives is neutral.

In comparison to the Do-nothing scenario, Option 1 provides protection to residential and non-residential properties at risk from fluvial flooding within the AFA. There are no high vulnerability properties or social amenity sites within the AFA therefore the score for the protection of this objective is neutral.

8.5 Preferred Flood Risk Management Option

On the basis of the detailed evaluation above, Option 1 (Flood Defences) is considered the preferred option. Mitigation actions are recommended for the identified negative effects. The key recommendation is that these negative impacts should be considered during the next stage of option development, when the

alignment of the proposed defences and details of the option would be optimised through detailed design in order to limit impacts on the stream channel. The appearance of floodwalls would be designed appropriate to minimise potential visual effects within the AFA.

9 Youghal

9.1 Flood Risk

Youghal is located in east Cork at the mouth of the Blackwater and is at risk of both fluvial and tidal flooding. However, the fluvial flood risk is minor and there are no receptors at risk. The AFA and the existing tidal risk are shown in Figure

Concern has been raised in relation to this level as it has been exceeded by a number of flood events in recent years. Based on a review of recent flood events, it was decided to assess the preliminary flood risk mitigation options for Youghal using the water level for the Mid-Range Future Scenario (MRFS) 0.5% AEP tidal event.

Figure 9.1: Youghal – Mid-Range Future Scenario Tidal Flood Extents

9.2 Viable Flood Risk Management Options

A number of viable flood risk management options were identified and modelled to determine their effectiveness and impact. These are described below and illustrated in **Appendix A** of this report. It should be noted that due to the strategic level of the assessment, the locations in which viable options may be constructed within the AFA may change at detailed design stage if an option is progressed through as a scheme. Multi-criteria analysis (MCA) for each option was undertaken to assess if a preferred option could be established on social and environmental grounds. SEA scoring for the purpose of this appraisal is provided in **Appendix B** of this report.

Option 1 –Monitoring and Flood Defences - This option considers the mitigation of flood risk through the construction of fluvial flood defences within the town. These defences comprise low lying walls and removable defence barriers, ranging in height from 1.1m to 1.3m.. The locations and heights of the defences are provided in **Appendix A** of this report. The proposed option fully achieves the required standard of protection for the 0.5% AEP tidal event.

Option 2 – Monitoring and Tidal Barrage (a) – This option considers the mitigation of tidal flood risk through the construction of a tidal barrage at the narrowest part of the estuary within the Blackwater River SAC . The barrage will be approximately 715m in length. The elevation of the barrage will be 3.63m O.D. Malin, approximately 1.5m in height above the Mean High Spring. The location and height of the barrage is provided in **Appendix A** of this report. In order for the tidal barrage to be an effective measure it must have sufficient storage within the barrage to accommodate the fluvial flows during the 0.5% AEP tidal event. To maximise the potential storage area for fluvial flows the barrage should be closed at the low tide preceding a tidal event. The barrage should remain closed until the tide level outside is lower than the maximum water level within the barrage. The proposed tidal barrage is deemed to be a viable measure for mitigating tidal flooding for the 0.5% AEP tidal event

Option 3- Monitoring and Tidal Barrage (b)- This option considers the mitigation of tidal flood risk through the construction of a tidal barrage outside the SAC boundary. The barrage will be approximately 1.4km in length. The elevation of the barrage will be 3.63m O.D. Malin approximately 1.5m in height above the average water level. The location and height of the barrage is provided in **Appendix A** of this report. In order for the tidal barrage to be an effective measure it must have sufficient storage within the barrage to accommodate the fluvial flows during the 0.5% AEP tidal event. To maximise the potential storage area for fluvial flows the barrage should be closed at the low tide preceding a tidal event. The barrage should remain closed until the tide level outside is lower than the maximum water level within the barrage. The proposed tidal barrage is deemed to be a viable measure for mitigating tidal flooding for the 0.5% AEP tidal event.

9.3 Key Environmental Sensitivities

The key environmental sensitives of the Youghal AFA are summarised below;

- Youghal is located in east Cork at the mouth of the Blackwater in Youghal Bay and Estuary. The AFA is located on the Blackwater Estuary SPA and the Blackwater River SAC. These watercourses are assigned moderate status under the WFD, and have been identified as nutrient sensitive areas.

- There are no significant polluting sources at risk from flooding.

- The Blackwater Estuary is a RAMSAR site designated under the Convention on Wetlands of International Importance for the protection of wetland areas (which are important feeding habitats for birds).

- According to the Cork County Development Plan (2014), Youghal is designated a high value landscape. The town occurs within the Broad Bay Coast landscape character type. This landscape has a very high value and very high sensitivity on a county level.

- The River Blackwater is renowned for its Salmon fishing and Lamprey. These species are Qualifying Interests of the SAC. The estuary provides good shore fishing for species such as Flounder, Bass and Codling; shore angling marks include the mouth of the Tourig River, Ferry Point upstream of the works area and the remains of the old bridge while charter boats are available from Youghal harbour.

- Receptors at risk 0.5% AEP MRFS within the AFA:
  - 192 No. Residential properties
  - 195 No. Roads
  - 60 No. NIAH sites
  - 16 No. archaeological sites
- There are no high vulnerability properties and society amenity sites at risk from tidal flooding within the AFA. There are no non-residential properties at risk for 0.5% AEP tidal event.

9.4 Environmental Assessment

Table 9.1 below provides a summary of the potential impacts arising from the proposed options as determined through the SEA assessment. In addition Table 9.1 below also highlights the requirement for mitigation measures for each option under each social and environmental objective. Table 9.1 should be read in conjunction with the SEA scoring matrix contained within Appendix.

Table 9.1: Youghal Options Scoring Matrix- Social and Environmental Objectives

SEA Objectives		Do nothing		Option 1		Option 2		Option 3
Social Objectives	**Impact**	**Mitigation required**	**Impact**	**Mitigation required**	**Impact**	**Mitigation required**	**Impact**	**Mitigation required**
Human Health and life of residents	O	N	√√√	N	√√√	N	√√√	N
High vulnerability properties	O	N	O	N	O	N	O	N

SEA Objectives		Do nothing		Option 1		Option 2		Option 3
Social infrastructure and amenity	O	N	√√√	N	√√√	N	√√√	N
Risk to local employment	O	N	√√√	N	√√√	N	√√√	N
Environmental Objectives								
WFD Directive	O	N	χ	Y	χ χ χ	Y	χ χ χ	Y
Birds and Habitats Directive	O	N	χ	Y	χ χ χ	Y	χ χ	Y
Flora and Fauna	O	N	χ	N	χ χ	N	χ χ	Y
Fisheries	O	N	O	Y	χ χ χ	Y	χ χ χ	Y
Landscape	χ χ	N	χ χ	Y	χ χ χ	Y	χ χ χ	Y
Architectural Heritage	χ χ	Y	√√	Y	√√	Y	√√	Y
Archaeological Heritage	O	N	√√	Y	√√	Y	√√	Y

SEA Scoring Matrix

Score	Key	Description
+5	√√√	Achieving aspirational target
+4	√√	
+3	√√	Partly achieving aspirational target
+2	√	Exceeding minimum target
+1	√	
0	O	Meeting minimum target
-1	χ	Just failing minimum target
-2	χ	
-3	χ χ	Partly failing minimum target
-4	χ χ	
-5	χχ χ	Fully failing minimum target
-999.99	χχ χ	Unacceptable negative impact where feasible alternative exists

Youghal is located in east Cork at the mouth of the Blackwater and is at risk of both fluvial and tidal flooding. However, the fluvial flood risk is minor and there are no receptors at risk. The AFA is located on the Blackwater Estuary SPA and the Blackwater River SAC. These watercourses are sensitive waterbodies. The estuary is considered a nutrient sensitive area. There are no significant polluting sources

at risk from flooding. Youghal strand bathing waters are assigned a low/moderate status. These occur outside the AFA boundary.

In regard to the Habitats Directive objective, Option 1 requires the construction of local defence wall. These walls will be confined to the urban fabric of the town. There will be no requirement for machinery movement within the Annexed habitats. Installation of flood walls along quays has the potential to cause disturbance to species of conservation concern through physical presence of construction machinery and personnel, noise generated by the works and possibly artificial lighting that may be used in the darker winter months, but it is possible to implement effective mitigation measures. Option 2 includes the construction of a tidal barrage approximately 715m in length across the narrowest part of the estuary within the Blackwater River SAC. The Annex I habitats: Blackwater Estuary and mudflats and sandflats not covered by sea water at low tide and course sediments occur within the bay. Option 2 occurs within the boundary of the SAC. Option 3 occurs outside the SAC boundary and will extend approximately 1.4km length. The mudflats provide sheltered feeding grounds for a diversity of wintering waterbirds. When exposed or partially exposed by the tide, intertidal habitats provide important foraging areas for many species of waterbirds, especially wading birds, as well as providing roosting/loafing areas. When the intertidal area is inundated by the tide it becomes available for benthic and surface feeding ducks and piscivorous/other waterbirds. During this tidal state this area can be used by various waterbirds as a loafing/roosting resource. The proposed measures will not impact on the roosting habitat of these birds. The proposed measure will have result in the temporary freshwater inundation on the lower marsh habitat feeding grounds resulting in the temporary relocation of feeding grounds during a flood event. For Blackwater Estuary SPA this is estimated to be 318 ha of intertidal area, the availability of suitable feeding habitat is further upstream.. Changes in freshwater inundation may result at signficnat effects on less tolerant saline lower marsh Annex I habitats. Construction activities will cause temporary localised disturbance to waterbirds which may cause them to temporarily move to alternative suitable feeding areas. The disturbance to other areas may temporary increase feeding competition in these areas which can indirectly impact population. The construction of Option 2 will result in loss of direct loss of sandflat/mudflat habitat from within the footprint of the barrage. There is no direct loss of Annex I habitat resulting from the construction of Option 3.

The tidal barrage is a permanent structure within the estuary and will have a significant impact on the fisheries habitat, and flow characteristic of the bay when it is closed during a flood event. The construction of the tidal barrage has also potential negative impact on the migratory fish (Salmon, lamprey) and indirect impacts on the reproductive success of Freshwater Pearl Mussels dependent on host salmon to host glochidial larvae these are QI within the SAC during a flood event The construction of a tidal barrage is considered to be the least preferred option from a flora and fauna objective.

According to the Cork County Development Plan (2014), Youghal AFA is located within an area characterised as Broad Bay Coast, this landscape character type is considered to be of county importance and value and as having very high sensitivity. The construction of the tidal barrage will have a significant permanent impact on the setting of the harbour and the town. In regards to Option 2 and Option 3, it is noted that the tidal barrage will have a significant impact on the setting of the harbour. Whilst Option 1 requires the construction of low lying walls along the quays, it is considered the preferred option from a landscape and visual objective.

There are considerable numbers of NIAHs at risk from flooding within the town. The provision of all options will perform well in terms of their protection to the AFA and its architectural and archaeological heritage, however there are potential for permanent long term negative impacts arising from their setting within the visual envelope of the town resulting from the measures. Option 2 the construction of a tidal barrage is considered to fail the minimum target as it will have change the quality of the landscape characteristic of the harbour area.

There is no preference in terms of the social objectives, each of the do something options ensures the risk to flooding on human health and risk to community is minimised.

9.5 Preferred Flood Risk Management Option

On the basis of the detailed evaluation, Option 1 has been determined to be the preferred option in a do something scenarios. Do something is always preferable as it ensures the risk of flooding on human health and risk to community is minimised. Mitigation actions are recommended for the identified negative effects. The key recommendation is that these negative impacts should be considered during the next stage of option development, when the alignment of the proposed defences and details of the option would be optimised through detailed design in order to limit impacts. The appearance of floodwalls would be designed appropriate to minimise potential visual effects within the AFA.

10 Conclusions and Next Steps

10.1 Conclusions

The strategic environmental assessment has identified that the preferred alternatives are as set out below.

Table 10.1: Preferred Flood Risk Management Options (UoM 18)

AFA	Preferred Flood Risk Management Option
Kanturk	Option 3 (Flood Defences & Conveyance)
Rathcormac	Option 1 (Storage)
Ballyduff	Option 1 (Flood Defence /Localised Protection Works)
Aglish	Option 1 (Flood Defence)
Youghal	Option 1 (Flood Defence)

10.2 Next Steps

The findings from the strategic environmental assessment of the flood risk management options will be integrated into the overall multi-criteria analysis for the identification of the overall preferred flood risk management option in each AFA.

Once the preferred flood risk management option has been identified in each AFA the draft flood risk management plan will be prepared. The next stage (Stage 3 with reference Figure 3-1 in Chapter 3 of this report) of the strategic environmental assessment process involves the identification of the environmental impacts (including where appropriate mitigation measures) and recommending monitoring for the evaluation of the plan.

Appendices

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Appendix A. AFA Option Drawings

Figure A.1: Kanturk Option 1 Flood Defences

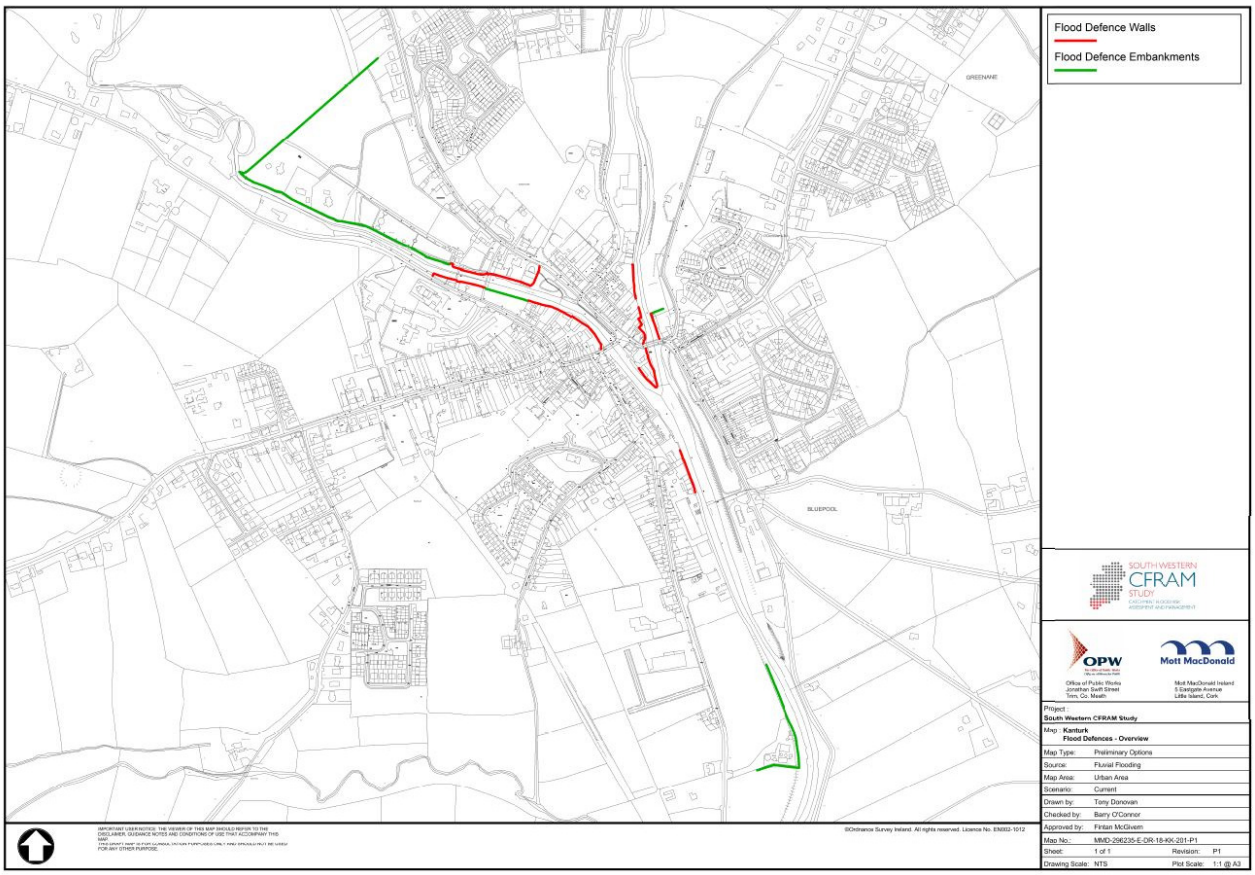


Figure A.2: Kanturk Option 2 Storage and Flood Defences

Figure A.3: Kanturk Option 3 Flood Defences & Conveyance

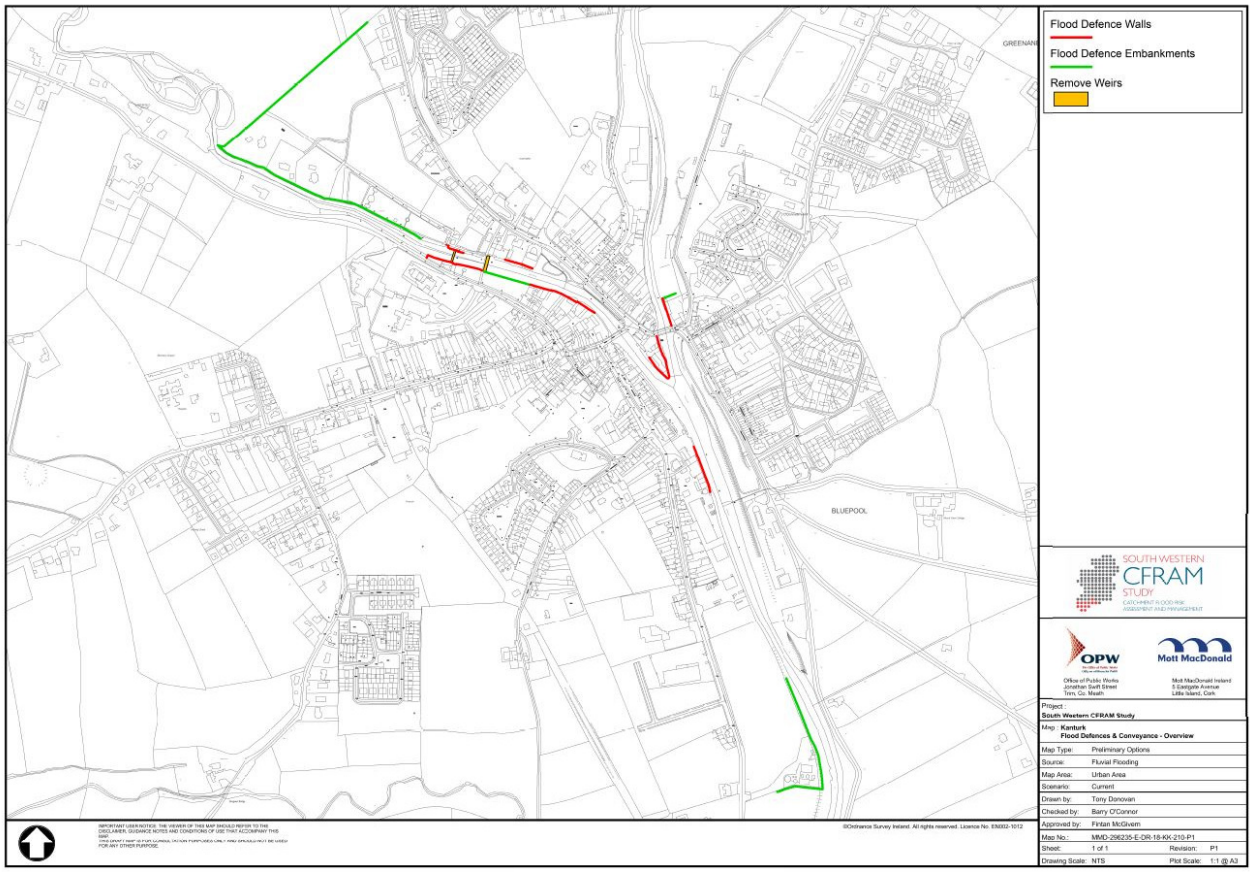


Figure A.4: Rathcormac Option 1 Storage

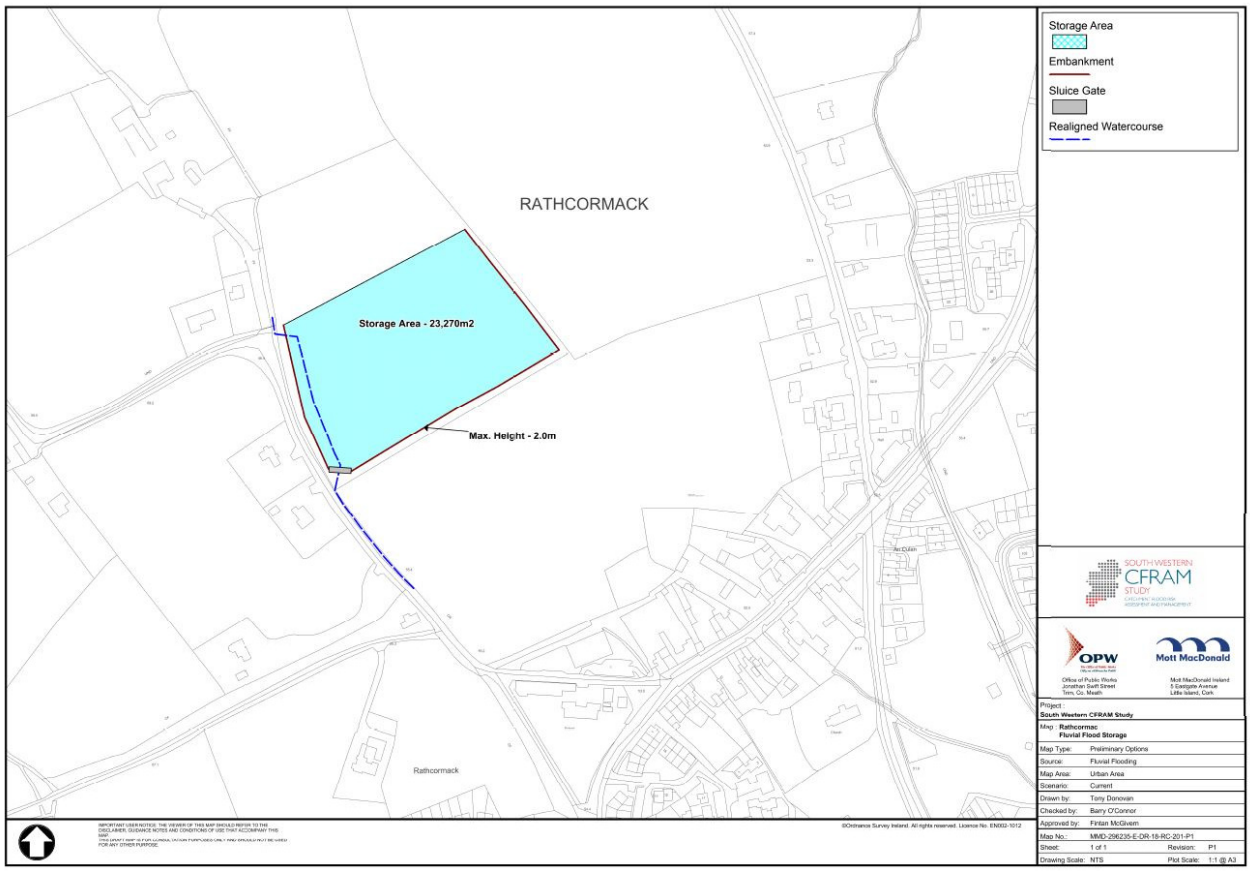


Figure A.5: Rathcormac Option 2 Flow Diversion

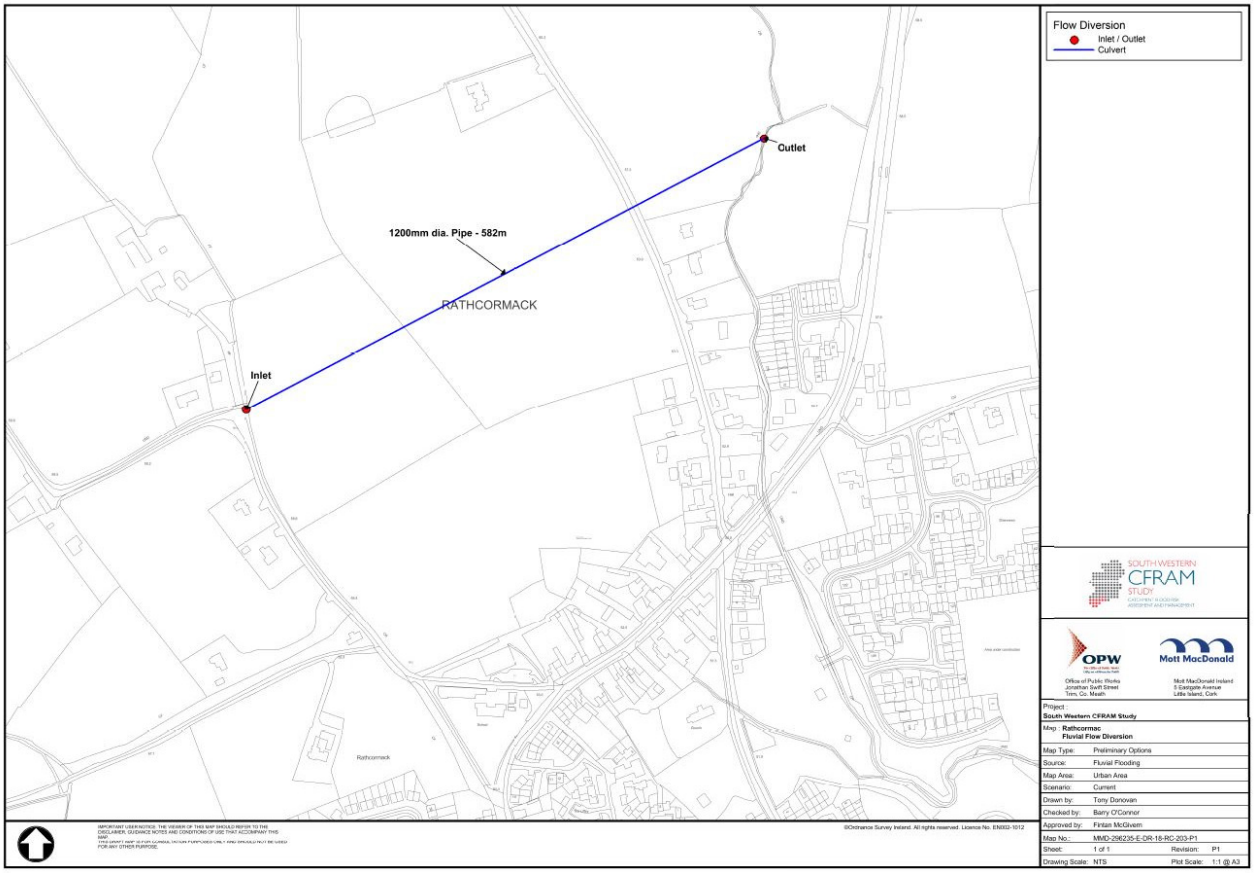


Figure A.6: Rathcormac Option 3 Flood Defences/Localised Protection Works

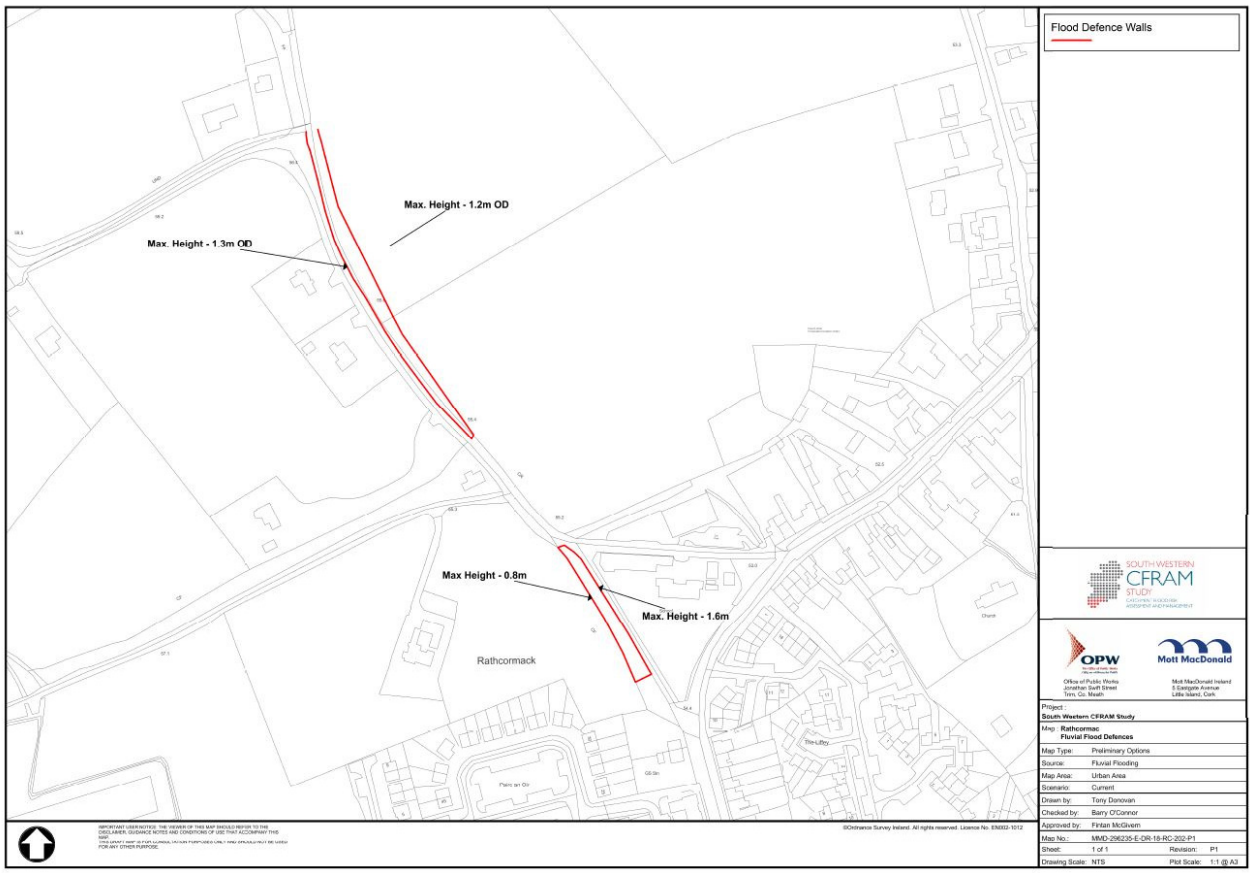


Figure A.7: Ballyduff Option 1 Flood Defences/ Localised Protection Works

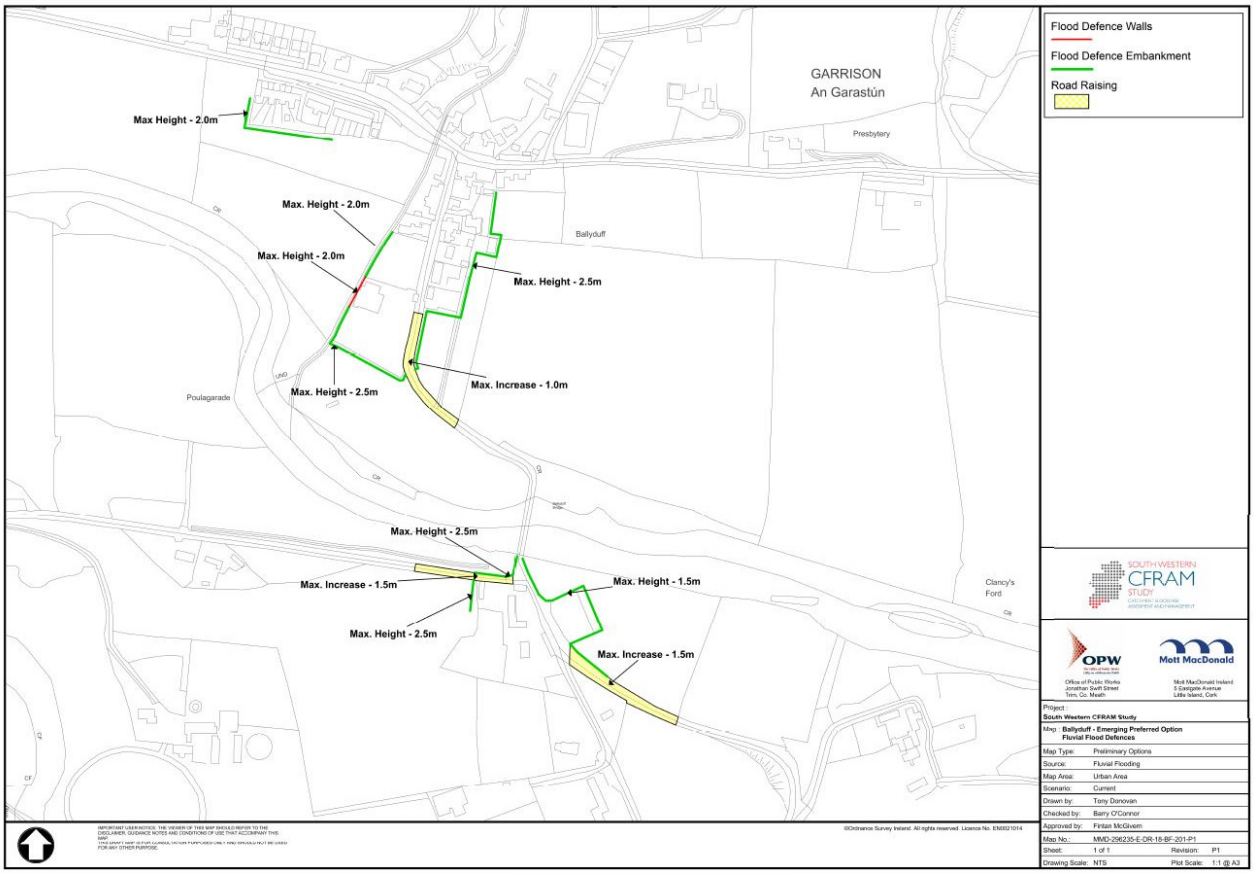


Figure A.8: Aglish Option 1 Flood Defences

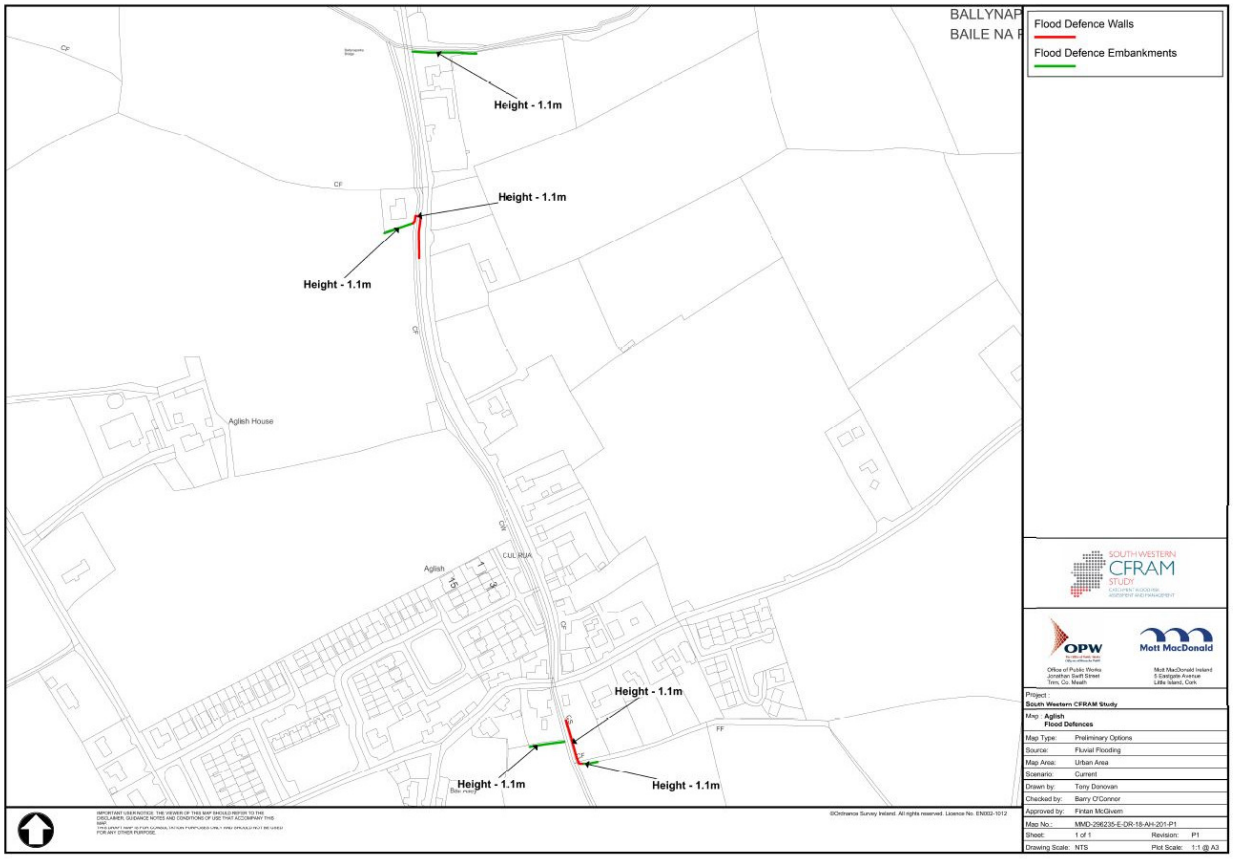


Figure A.9: Youghal Option 1 – Flood Defences

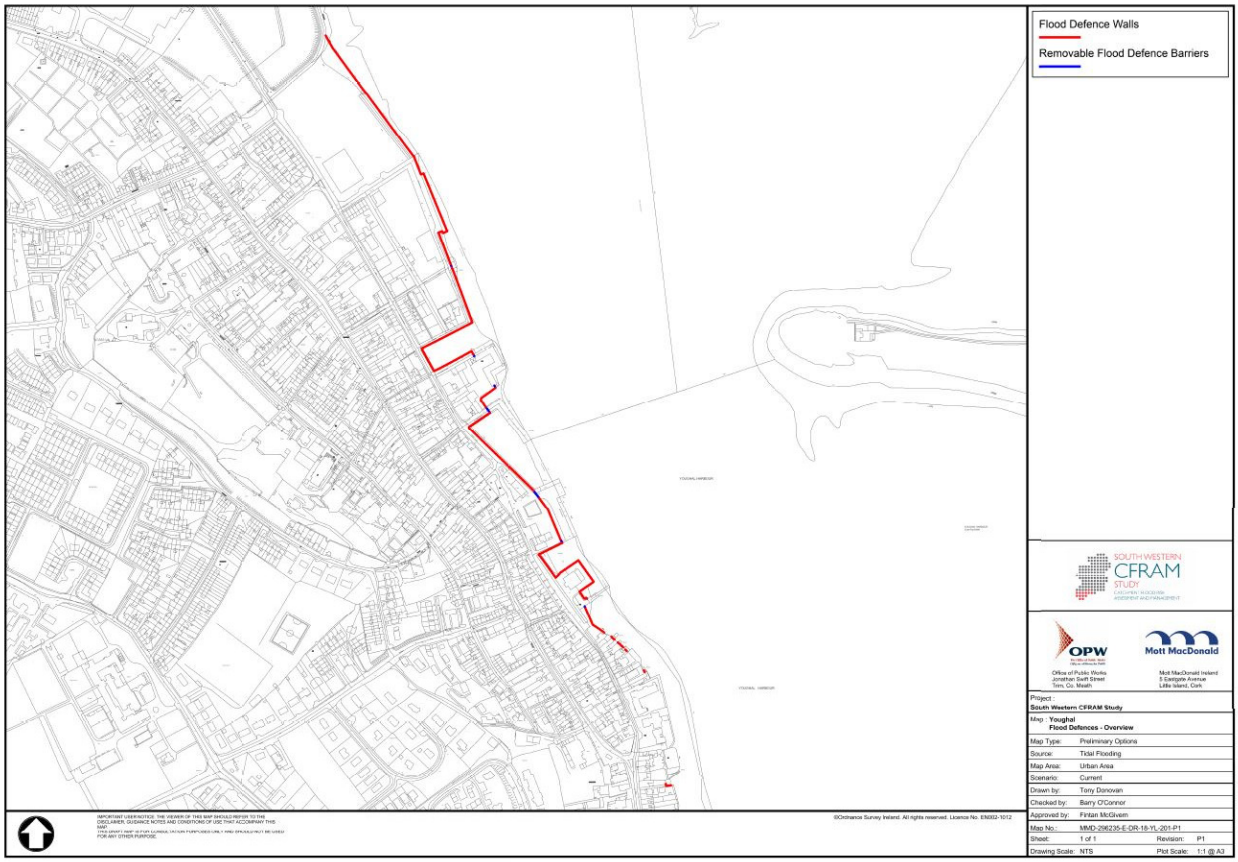
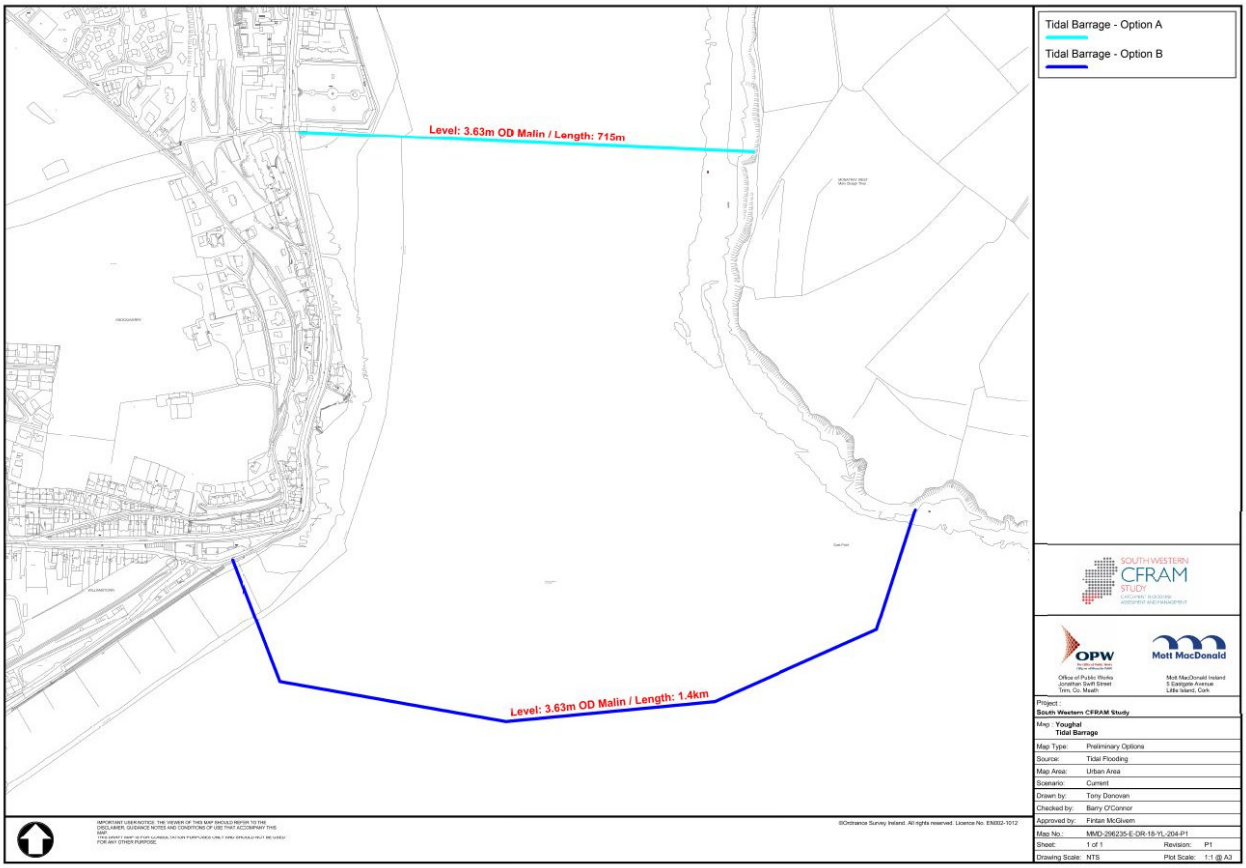


Figure A.10: Youghal Options 2 & 3- Tidal Barrage



Appendix B. SEA Scoring Matrix

Score	Key	Description
+5	√√	Achieving aspirational target
+4	√	
+3	√	Partly achieving aspirational target
+2	√	Exceeding minimum target
+1	√	
0	O	Meeting minimum target
-1	X	Just failing minimum target
-2	X	
-3	X X	Partly failing minimum target
-4	X X	
-5	XX X	Fully failing minimum target
-999.99	XX X	Unacceptable negative impact where feasible alternative exists

Refer to the Preliminary Options Report for MCA Matrix

Appendix D. Draft Screening for Appropriate Assessment under the Habitats Directive

South Western CFRAM Study

Screening for Appropriate Assessment: Munster Blackwater Catchment (UoM 18)

March 2016

Office of Public Works

OPW
The Office of Public Works
Oifig na nOibreacha Poiblí

Mott MacDonald

South Western CFRAM Study

Screening for Appropriate Assessment: Munster Blackwater Catchment (UoM 18)

March 2016

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B	14th March 2016	R. Mansfield/ N. Roche	R. Hallissey	P. Kelly	Issue for client review

Information class: Standard

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Executive Summary

Introduction

The Office of Public Works (OPW) is the competent authority in Ireland for the implementation of the EU Floods Directive [2007/60/EC], which is transposed into Irish law by the European Communities (Assessment and Management of Flood Risk) Regulations, 2010. The Floods Directive requires Member States to:

- Identify areas of existing or foreseeable future potentially significant flood risk (referred to as Areas for Further Assessment - AFAs);
- Prepare flood hazard and risk maps for the AFAs;
- Prepare Flood Risk Management Plans by 22 December 2015, setting objectives for managing the flood risk within the AFAs and setting out a prioritised set of measures for achieving those objectives.

Mott MacDonald Ireland Ltd. was appointed by the OPW to undertake the above activities as part of the Catchment Flood Risk Assessment and Management Study (CFRAMs) for the South Western River Basin District.

The South Western River Basin District CFRAM study (and output Flood Risk Management Plans) will be informed by Appropriate Assessment, the requirement for which is derived from Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats Directive). Appropriate Assessment is the process of determining whether the Flood Risk Management Plan is likely to pose a risk to the attainment or maintenance of conservation objectives for areas protected for their ecological value within the State (Natura 2000 sites - Special Areas of Conservation and Special Protection Areas), and the identification of alternatives or mitigation as appropriate.

One Flood Risk Management Plan will not be developed for the entire South Western River Basin District but rather, targeted individual plans will be produced on a waterbody catchment basis (Units of Management basis). The South Western River Basin District is broken down into five Units of Management:

- The Munster Blackwater Catchment (UoM18)
- The Lee / Cork Harbour Catchment (UoM19)
- The Bandon / Skibbereen Catchment (UoM20)
- The Dunmanus / Bantry / Kenmare Bay Catchment (UoM21)
- The Laune / Maine / Dingle Bay Catchment (UoM22)

UoMs are further broken down in to Areas for Further Assessment (AFAs). These are communities within an individual UoM with a quantifiable flood risk and include towns, villages and areas where significant development is anticipated. Associated with AFAs are high and medium priority watercourses. High priority watercourses are located within and 2km upstream of AFAs whereas medium priority watercourses are the interconnecting watercourses between AFAs or the coast.

Munster Blackwater Catchment (UoM18)

The Munster Blackwater UoM covers an area of approximately 3,295 km^2. The large majority of the area is in North County Cork with parts in County Waterford but also includes small parts of Limerick, Kerry and Tipperary. The UoM has only a few kilometres of coastline at Youghal Bay. UoM 18 comprises three major river catchments: the Blackwater and its tributaries the Allow and the Bride.

The Munster Blackwater UoM contains nine Areas for Further Assessment (AFAs): Aglish, Ballyduff, Fermoy, Freemount, Kanturk, Mallow, Rathcormac, Tallow, Youghal.

Flood risk management options for the Munster Blackwater UoM have provisionally been identified and can be summarised as:

- Conveyance measures - physical alteration of a river channel or floodplain to improve flood flow throughput;
- Upstream storage – using embankments coupled with a control structure on the watercourse to hold back water in order to limit the flow in the downstream watercourse;
- Flow diversion - interception of flood flows within a watercourse and diverting these flows through an artificial channel into another watercourse or into another section of the same watercourse;
- Flood Walls and Embankments - physical structures designed to contain floodwaters for a defined flood event;
- Flood forecasting - providing advance warning about the timing and scale of flooding by monitoring weather combined with watercourse flows and levels.

Natura 2000 Sites

Flood risk management options in Kanturk are proposed for both the Dalua and Allow Rivers. These watercourses are tributaries of the Blackwater River and are within the Blackwater River SAC (002170).

Flood risk management options in Ballyduff are proposed for the Blackwater River within the boundaries of the Blackwater River SAC (002170) and the Blackwater Callows SPA (004094).

Flood risk management options in Rathcormac are proposed for the Kilbrien stream and the Shanowen River. These waterbodies are tributaries of the River Bride which is part of the Blackwater River SAC (002170). The Shanowen River flows into the River Bride approximately 500m downstream of Rathcormac town.

Flood risk management options in Aglish are proposed for the Aglish stream. The Aglish stream is a tributary of the Goish River which discharges into the Blackwater River SAC (002170).

Flood risk management options in Youghal are proposed for Youghal Estuary which is part of the Blackwater River SAC (002170) and downstream of the Blackwater Estuary SPA (004028).

Potential Impacts on Qualifying Features

Flood risk management options will involve the use of construction machinery and materials which can impact on protected species and habitats. Construction work can result in disturbance to protected species through the generation of noise, the use of flood lighting or lighting from construction plant, and the

physical presence and movement of the plant and personnel. Machinery movement between sites can also result in the translocation of invasive species. Construction works can also result in the destruction of protected habitats whereby vegetation removal is required to allow access. The removal of river substrate can also result in the loss of important aquatic habitat for protected species or can result in the excavation of protected species from the watercourse. There is also potential for pollution of the environment through for example accidental spillages when laying foundations for demountable defences or from site drainage to a watercourse.

The construction activities for the tidal flood risk management measure have the potential to re-suspended sediments which could be transported outside the works area by tidal currents and subsequently settle out and impact on benthic habitats and species in other locations within the estuary. Tidal flood risk measures includes the construction of two variants of tidal barrage, tidal barrage (a) occurs within the boundary of the Blackwater SAC, and tidal barrage (b) occurs outside the SAC boundary.

Barrage may alter tidal regime landward of the barrage and may therefore alter habitat type and tidal range resulting in temporary influx of freshwaters. Changes in tidal inundation may result at Annex I habitats and at lands upstream of the barrage due to alteration of tidal inundation. These may include changes to the intertidal range of the estuary and influx of freshwater changes in the nutrient loading and water salinity during the flood event. This in combination with changes in suspended sediments may alter the biodiversity and species range for the Salicornia and other annuals colonising mudflats and sandflats. The closure of the barrage will result in the temporary impediment of migration and out migration of sea lamprey and salmon. This may impede the reproductive success of Freshwater Pearl Mussels upstream in the Blackwater River catchment.

Significance of Impacts

Significant impacts of flood risk management measures on Freshwater Pearl Mussel were identified Youghal AFA. Significance of impact on the distribution of lamprey and salmon has also been identified resulting from risk of impediment of upstream migration of lamprey and salmon following the closure of the tidal barrage. Potential for significant impact on Annex I habitats (Mudflats, Sandflats not covered by seawater at low tide, estuaries, Salicornia and other annuals colonising mud and sand) has been identified for both tidal flood protection measures, whilst tidal option (a) will have the direct of Annex I habitat within the boundary of the SAC.

Potential for significant risk of disturbance of birds has been identified for the following AFAs: Kanturk, Mallow, Tallow.

Potential for significant risk of spread of invasive species has been identified for the following AFAs: Fermoy, Kanturk, Tallow.

Significance of impact is unknown in many cases given the absence of information on the presence of certain protected species or their habitat within the locality of the proposed works, namely otter, bats, lamprey, and Atlantic salmon. It is recommended that pre-construction surveys be conducted to fill these data gaps.

- Potential for significant impact on protected fisheries (lamprey and salmon) is uncertain for the following AFAs: Aglish, Fermoy, Kanturk.
- Potential for significant impact on otter is uncertain for the following AFAs: Tallow
- Potential for significant impact on bats is uncertain for the following AFAs: Aglish, Kanturk, Tallow.

1 Introduction

1.1 Flood Risk Assessment and Management in Ireland

Flood risk management in Ireland has historically focused on land drainage schemes for the improvement of agricultural land. The 1945 Arterial Drainage Act established a national drainage authority (the Office of Public Works) with the remit of implementing a national arterial drainage programme. The Arterial Drainage Act was amended in 1995 to include for the protection of urban areas suffering from flooding.

In 2004, the Irish Government adopted a new National Flood Policy for Ireland which shifted the emphasis in addressing flood risk away from arterial drainage (targeted towards the protection of agriculture and cities / town liable to serious flooding) and towards a waterbody catchment-based flood risk assessment (a similar catchment-based management approach to that already being implemented under the Water Framework Directive 2000/60/EC).

In 2007 the Floods Directive [2007/60/EC] was published which requires the establishment of a framework of measures to reduce the risks of flood damage. The Floods Directive was transposed into Irish law by the European Communities (Assessment and Management of Flood Risks) Regulations, 2010 (S.I. No. 122 of 2010). The Regulations identify the Office of Public Works (OPW) as the lead agency in implementing flood management policy in Ireland.

Catchment Flood Risk Assessment and Management (CFRAM) Studies

For the purpose of delivering on the components of the National Flood Policy and on the requirements of the European Union Floods Directive, the OPW, in conjunction with local authorities and stakeholders, is conducting a number of Catchment Flood Risk Assessment and Management (CFRAM) Studies. *These studies are the core activity from which medium to long-term strategies for the reduction and management of flood risk in Ireland will be achieved*.

The overarching objectives of the CFRAM Studies are to:

- Identify and map the existing and potential future flood hazard within the study area;
- Assess and map the existing and potential future flood risk within the study area;
- Identify viable structural and non-structural options and measures for the effective and sustainable management of flood risk within the study area;
- Prepare Flood Risk Management Plans (FRMPs) setting out recommendations to manage the existing flood risk and also the potential future flood risk which may increase due to climate change, development, and other pressures that may arise in the future. FRMPs will set out policies, strategies, measures and actions that should be pursued by the relevant bodies (including the OPW, Local Authorities and other Stakeholders), to achieve the most cost-effective and sustainable management of existing and potential future flood risk within the study area, taking account of environmental plans, objectives and legislative requirements and other statutory plans and requirements[1].

[1] The Floods Directive requires that Flood Risk Management Plans should take into account the particular characteristics of the areas they cover and provide for tailored solutions according to the needs and priorities of those areas, whilst promoting the

The programme for the delivery of flood risk management in Ireland comprises of the following phases:

- Preliminary Flood Risk Assessment, which was completed in 2011, identified areas of existing or foreseeable future potentially significant flood risk (referred to as 'Areas for Further Assessment'/AFAs);
- CFRAM Studies, which are being completed in the period 2011 to 2016;
- By June 2016 Flood Risk Management Plans will be produced for each CFRAM study;
- The Flood Risk Management Plans will be implemented from 2016 onwards and will be reviewed on a rolling six-yearly cycle.

It should be noted that the detailed designs for flood risk management measures will not be developed as part of the Flood Risk Management Plans / CFRAM Studies but rather measures will be progressed on a scheme by scheme basis, outside of the scope of the CFRAM studies.

The OPW has commissioned a CFRAM study for each of Ireland's seven River Basin Districts (RBDs)[2]. This report is an Appropriate Assessment produced in accordance with the Habitats Directive and pertains to the South Western River Basin District.

achievement of environmental objectives laid down in Community legislation.

[2] River Basin Districts (RBDs) are the main units for the management of river basins and have been delineated by Member States under Article 3 of the Water Framework Directive (2000/60/EC). RBDs are areas of land and sea, made up of one or more neighbouring river basins together with their associated groundwaters and coastal waters.

2 Appropriate Assessment

2.1 Statutory Requirement for Appropriate Assessment

Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats Directive) is European Community legislation regarding nature conservation. The intention of the Directive is to aim to ensure biodiversity through the conservation of natural habitats and wild fauna and flora in Europe. The Habitats Directive was transposed into Irish law by the European Communities (Natural Habitats) Regulations, 1997 (S.I. No. 94/1997) which was subsequently revoked and replaced by the European Communities (Birds and Natural Habitats) Regulations 2011.

A network of sites of conservation importance hosting habitats and/or species identified in the Directives as needing to be either maintained at or returned to favourable conservation status have been identified by each Member State. These sites are known as the Natura 2000 network and in Ireland, Natura 2000 sites comprise areas designated as Special Areas of Conservation (SACs) and candidate Special Areas of Conservation (cSACs), and/or Special Protection Areas (SPAs) and candidate Special Protection Areas (cSPAs).

The Habitats Directive requires that where a plan or project is likely to have a significant effect on a Natura 2000 Site, while not directly connected with or necessary to the nature conservation management of the site, it shall be subject to 'Appropriate Assessment' to identify any implications for the site in view of the site's conservation objectives[3].

Specifically Article 6(3) of the Habitats Directive states:

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

The CFRAM studies will identify viable strategies and measures for flood risk management in Ireland, some of which will be within areas designated under the Natura 2000 network. The Flood Risk Management Plans developed under these studies **are not directly connected with or necessary to the management of any Natura 2000 sites.** Therefore, in the context of the Habitats Directive, the Plans must be subjected to Screening for Appropriate Assessment is to determine whether the strategies or measures outlined therein are likely to have a significant effect on a Natura 2000 site, either alone or in

[3] The NPWS is currently developing Conservation Management Plans for all SACs nationally. Objectives for the conservation of the features of interest for which the site is designated are set out in the Conservation Management Plans and the principal pressures impacting the achievement of Favourable Conservation Status are identified. Strategies to meet the objectives are also identified.

combination with other plans or projects. Where significant effects are determined to be likely the Plans are statutorily required to be subjected to Appropriate Assessment.

2.2 Appropriate Assessment – The Process

The European Commission in 2002 published guidance on the assessment of plans and projects significantly affecting Natura 2000 sites. This guidance provides details of the general approach to Appropriate Assessment. The guidance sets out a tiered/staged approach as summarised below:

Stage 1 - Screening for a likely significant effect: An initial assessment of the project or plan's effect on a European site(s). A description of the plan/project and the elements that have the potential to impact on Natura 2000 sites must be provided. The potential impacts and their significance must be assessed. If it cannot be concluded that there will be no significant effect upon a European site, an Appropriate Assessment is required; (*Note this report is a Stage 1 Screening Assessment*).

Stage 2 - Appropriate Assessment: The consideration of the impact on the integrity of the Natura 2000 site of the project or plan, either alone or in combination with other projects or plans, with respect to the site's structure and function and its conservation objectives. Additionally, where there are adverse impacts, an assessment of the potential mitigation of those impacts. The output of this stage of Appropriate Assessment is a Natura Impact Statement (NIS) report;

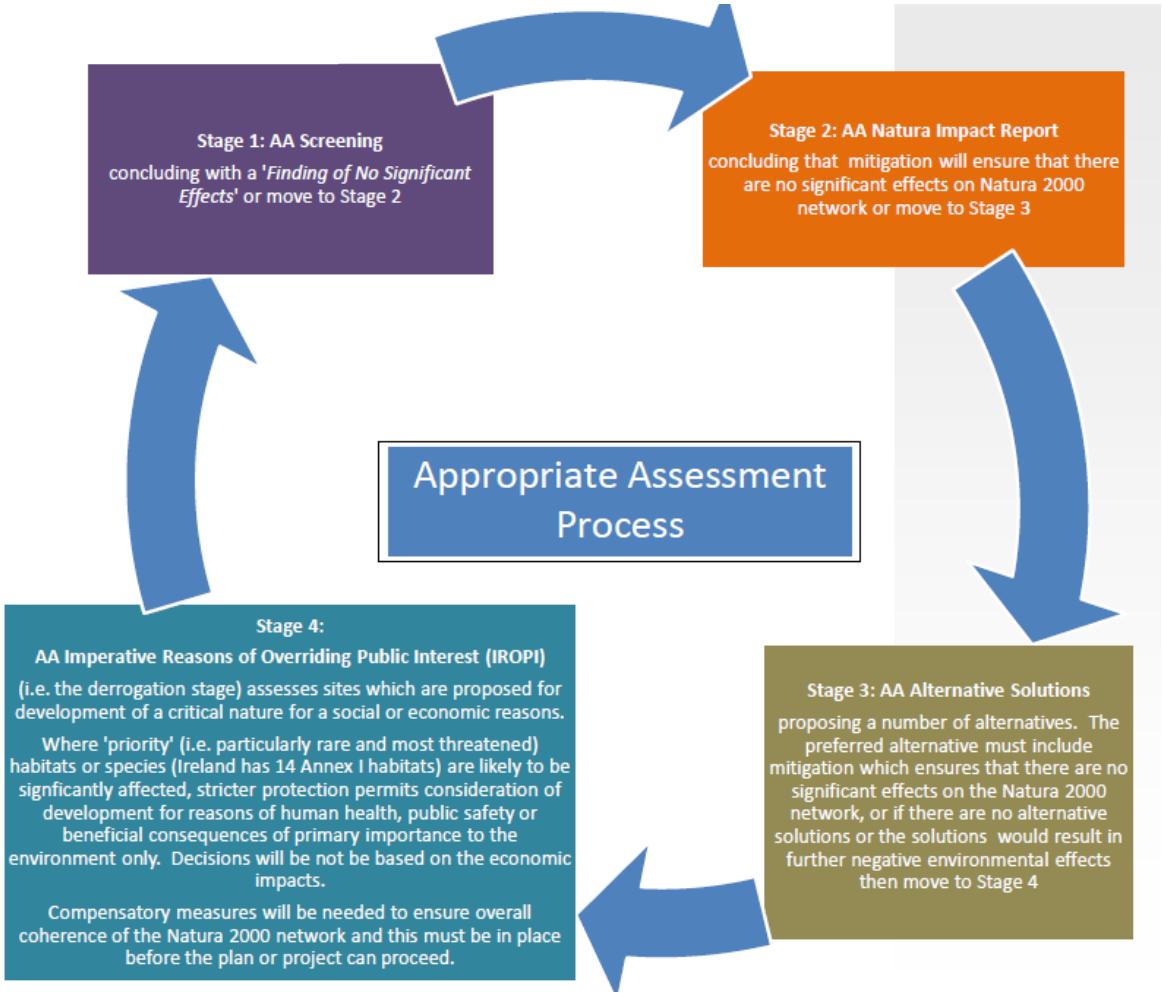
Stage 3 – Assessment of alternative solutions: The process which examines alternative ways of achieving the objectives of the project or plan that avoid adverse impacts on the integrity of the Natura 2000 site (where mitigation cannot be achieved); and

Stage 4 – Assessment where no alternative solutions exist and where adverse impacts remain: Development of compensatory measures where, in the light of imperative reasons of overriding public interest (IROPI), it is deemed that the project or plan should proceed.

Each stage in the process determines whether a further stage is required. If, for example, the conclusions at the end of Stage 1 are that there will be no significant impacts on the Natura 2000 site, there is no requirement to carry out an Appropriate Assessment (Stage 2). The approach to Appropriate Assessment screening must however apply the precautionary principle i.e. where it cannot be definitively determined that a plan/project will not adversely impact the integrity of the Natura 2000 site then it must be assumed that there is potential for impact and a full Appropriate Assessment must be carried out.

The objective of the process is to provide adequate information, based on the best available scientific information, to inform the Competent Authority to enable them to conduct an assessment of whether the plan or project is likely to have a significant effect on the conservation objectives of the relevant Natura 2000 sites within the zone of influence. Where adverse impacts are identified mitigation measures necessary to avoid, reduce or offset such impacts must be prescribed.

Figure 2-1 Appropriate Assessment the Process



Source: West Regional Authority (WRA) in association with the Environmental Protection Agency (EPA) (2013) Draft 'SEA Resource Manual for Local and Regional Authorities'

2.3 Objective of Appropriate Assessment Screening

The objective of this Stage 1 Screening Assessment is to determine whether the South Western RBD Flood Risk Management Plans are likely to have adverse impacts on conservation objectives of Natura 2000 sites. The direct, indirect and in-combination ecological impacts of the proposed plan policies / measures on Natura 2000 sites are identified and the necessity to carry out a Stage 2 Appropriate Assessment is determined. The findings of this Stage 1 Screening Assessment are documented through this Screening Statement. The outcomes of the assessment are also summarised in a 'Screening Matrix' presented in Section 6.

The DEHLG Guidance (2009), '*Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities'* requires that the findings and recommendations of Appropriate Assessment informs the policies and strategies of the Plan.

Information contained in the Appropriate Assessment that will inform the South Western RBD Flood Risk Management Plans (FRMP) includes the following;

- the areas likely to be significantly affected by the plan;
- any existing environmental characteristics which are relevant to the plan including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to Directives 79/409/EEC and 92/43/EEC;
- the environmental protection objectives and qualifying interests (established at international, Community or Member State level) which are relevant to the areas of the environment likely to be affected by the plan;
- the likely significant effects on the Natura 2000 sites, such as impacts on biodiversity, fauna, flora, soil, water, etc.
- the measures envisaged to mitigate against any significant adverse effects on the designated sites of implementing the plan; and
- alternatives to the proposals in the plan and their potential effectiveness in maintaining the conservation value of the site.

2.4 Methodology

This screening assessment has been prepared in accordance with all relevant guidance and legislation including:

- European Communities (Birds and Natural Habitats) Regulations 2011;
- NPWS (2012) Marine Natura Impact Statements in Irish Special Areas of Conservation. A Working Document.
- DEHLG (2009) Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities [revised, February 2010];
- EC (2000) Managing Natura 2000 Sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC;
- EC (2001) Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC;
- EC (2007) Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC: Clarification of the concepts of alternative solutions and imperative reasons of overriding public interest, compensatory measures, overall coherence, opinion of the Commission.

An extensive data collection exercise was conducted as part of this Appropriate Assessment Screening. Available information utilised in the preparation of this report includes:

- Conservation Status Assessment Reports[4] (CSARs), Backing Documents and Maps prepared in accordance with Article 17 of the Habitats Directive;

[4] Every six years, Member States of the European Union are required to report on the conservation status of all habitats and species listed on the annexes of the Habitats Directive as required under Article 17 of the Directive. Ireland submitted our conservation

- Natura 2000 Site Synopsis, Data Forms and Conservation Objective Reports available from NPWS;
- Published and unpublished NPWS reports on protected habitats and species including Irish Wildlife Manual reports, Species Action Plans and Conservation Management Plans;
- Existing relevant mapping and databases e.g. waterbody status, species and habitat distribution etc. (sourced from the Environmental Protection Agency - http://gis.epa.ie/, the National Biodiversity Data Centre - http://maps.biodiversityireland.ie and the National Parks and Wildlife Services - http://www.npws.ie/mapsanddata/).

2.5 Statement of Authority

This Screening for Appropriate Assessment was prepared by Rita Mansfield. Rita is a Senior Ecologist [BSc. (Hons) Applied Ecology, University College Cork, 2003 and H.Dip Environmental Protection and Pollution Control, Sligo Institute of Technology, 2008] with over ten years' post graduate experience in public and private sector projects with the main focus being public infrastructure (water and waste water, roads, power). Rita has managed numerous Ecological Impact Assessments, Appropriate Assessments and environmental feasibility assessments of complex projects and land use plans. Rita has prepared ecological monitoring and mitigation guidance for the NRA for inclusion in their PPP and DB Contracts. Rita has undertaken and managed a wide range of field surveys including protected species surveys (e.g. badger, otter, red squirrel, bats, wetland birds, kingfisher, crayfish and lamprey), habitat surveys and biological and physicochemical water quality monitoring and habitat mapping.

2.6 Consultation

A National Workshop on Appropriate Assessment (AA) of Flood Risk Management Plans (FRMP) was held between the Office of Public Works (OPW), their consultants on the CFRAMs projects and the National Parks & Wildlife Service (NPWS) on the 28th January 2015. The NPWS outlined their expectations of the AA for the FRMPs as follows:

- The zone of influence of flood risk management options should be identified on a case by case basis using the Source-Pathway-Receptor approach;
- Any mitigation prescribed it the NIS should be specific and should be demonstrated to be achievable and effective;
- Consideration should be given the construction impacts at Plan level;
- Appropriate Assessment must be based on scientific evidence;
- If an option for one AFA needs to go to IRPOI then it may be the case that the entire FRMP will need to go through IROPI;
- Care needs to be taken in how the fresh water pearl mussel is considered.

status report to the European Commission in June 2013. The assessment document may be viewed on the NPWS website: http://www.npws.ie/publications/article17assessments/article172013assessmentdocuments/

3 Description of the Plan

3.1 Flood Risk Management Plan

The Floods Directive [2007/60/EC] requires the establishment of a framework of measures to reduce the risks of flood damage. Catchment Flood Risk Assessment and Management (CFRAM) Studies have been commissioned to determine flood hazard and identify risk receptors that are susceptible to flooding in Ireland. Measures to mitigate risk (both existing and future) must also be determined. The outputs of the CFRAM studies are Flood Risk Management Plans (FMRPs). The purpose of the FMRPs are to set out policies, strategies, measures and actions that should be pursued by the relevant bodies to achieve the most cost-effective and sustainable management of existing and potential future flood risk.

One Flood Risk Management Plan will not be developed for the entire South Western River Basin District but rather, targeted individual plans will be produced on a waterbody catchment basis (Units of Management basis). The South Western River Basin District is therefore broken down into Units of Management (UoMs) for the purpose of implementing the Floods Directive.

UoMs are representative of existing Hydrometric Area boundaries constituting major catchments or river basins typically greater than 1,000km^2 and their associated coastal areas, or conglomerations of smaller river basins and their associated coastal areas.

Flood Risk Management Plans for each Unit of Management (UoM) in the South Western River Basin are due to be published in 2016.

The FRMPs shall include a prioritised set of actions and measures aimed at meeting defined flood risk management objectives for each UoM. The flood risk management objectives are set out under four categories (Technical, Economic, Social, and Environmental), and include objectives such as:

- Minimise health and safety risk of flood risk management options;
- Manage risk to agricultural land;
- Minimise risk to social amenity;
- Minimise the risk of environmental pollution;
- Avoid damage to, and where possible enhance, fisheries within the catchment.

A description of the flood risk management objectives which are particular to each UoM will be included in the Flood Risk Management Plans.

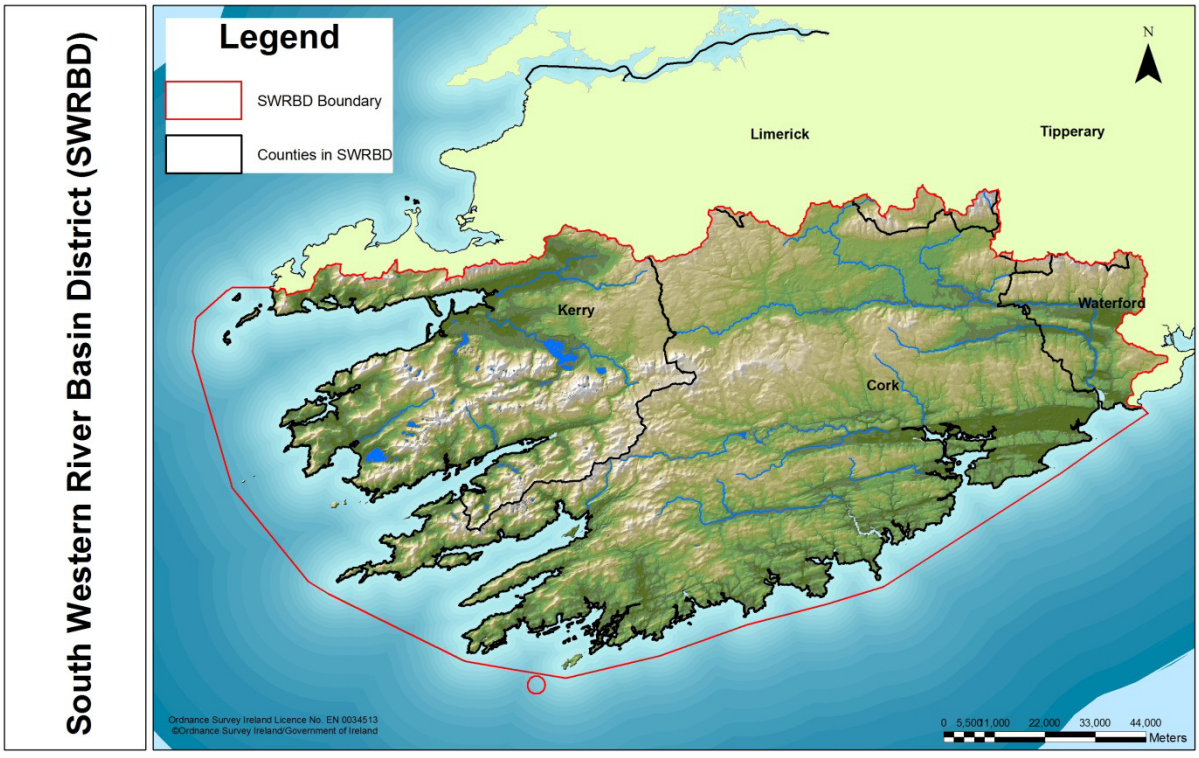
The Flood Risk Management Plans will demonstrate the indicative costs and benefits of the preferred actions and measures, the robust reasoning for the identification of a measure as a preferred option and the priority each measure should be afforded. The plans shall also recommended a programme of work (including a prioritised and costed programme of policies, strategies, actions and measures) to be implemented by the OPW, Local Authorities or other relevant bodies to mitigate flood risk in each UoM.

The FRMPs will influence, and will in turn be influenced by external statutory and non-statutory plans, strategies and policies and programmes. National and local policies relating to the protection of the environment must be considered in the development of the FRMPs. This process is conducted as part of the Strategic Environmental Assessment of the FRMPs.

3.2 Overview of the South Western River Basin District

The South Western River Basin District (SWRBD) covers an area of approximately 11,160 km^2 and includes most of county Cork, large parts of counties Kerry and Waterford along with small parts of the counties of Tipperary and Limerick. The SWRBD contains over 1,800 km of coastline along the Atlantic Ocean and the Celtic Sea.

Figure 3-1 South Western River Basin District (SWRBD)



3.2.1 Units of Management in the SWRBD

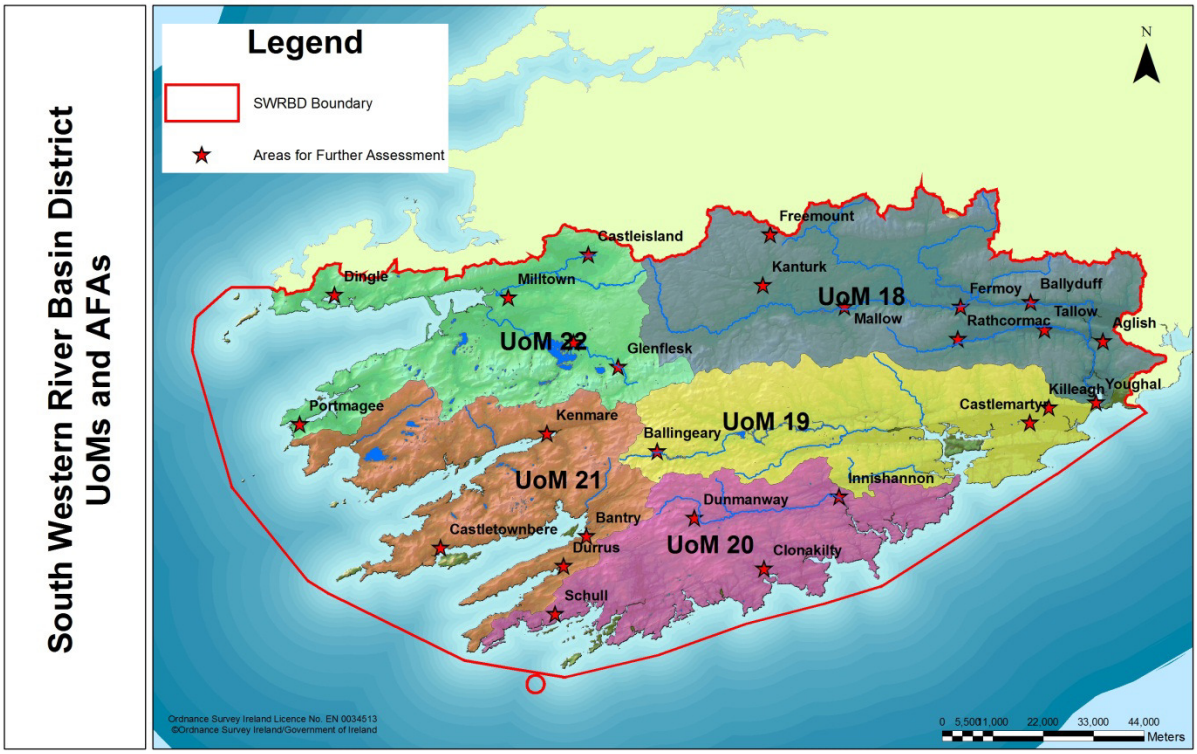
There are five Units of Management within the South Western River Basin District which follow watershed catchment boundaries rather than political boundaries. The Units are as follows;

- The Munster Blackwater Catchment (UoM18)
- The Lee / Cork Harbour Catchment (UoM19)

- The Bandon / Skibbereen Catchment (UoM20)
- The Dunmanus / Bantry / Kenmare Bay Catchment (UoM21)
- The Laune / Maine / Dingle Bay Catchment (UoM22)

UoMs are further broken down in to Areas for Further Assessment (AFAs). The SWRBD includes 27 Nr. Areas for Further Assessment (AFAs).

Figure 3-2 Units of Management and Areas for Further Assessment in the SWRBD



3.3 Flood Risk Management Options

The CFRAM study for the SWRBD is currently at the *options appraisal stage*, to identify the preferred measures and options to manage flood risk for each UoM in the SWRBD. Receptors to flood risk within each UoM in the SWRBD have been identified through detailed technical studies. The potential options to manage the flood risk of the various receptors have provisionally been identified and are currently being assessed for viability.

A flood risk management option consists of one, or more commonly a combination of, flood risk management measures. The suite of flood risk management options for consideration under the CFRAM study are presented in Table 3.1.

Table 3.1: Suite of Flood Risk Management Options

Option	Description
Do Nothing	Implement no new flood risk management measures and abandon any existing practices.
Existing Regime	Continue with any existing flood risk management practices, such as reactive maintenance.
Do Minimum	Implement additional minimal measures to reduce the flood risk in specific problem areas without introducing a comprehensive strategy - infill gaps in existing walls, maintain channel.
Non-Structural Measures	Planning and development control measures (zoning of land for flood risk appropriate development, prevention of inappropriate incremental development, review of existing Local Authority policies in relation to planning and development and of inter-jurisdictional co-operation within the catchment, etc.);
	Building regulations (regulations relating to floor levels, flood-proofing, flood resilience, sustainable drainage systems, prevention of reconstruction or redevelopment in flood-risk areas, etc.);
	Sustainable urban drainage systems (SUDS);
	Installation of a flood forecasting and warning system and development of emergency flood response procedures;
	Targeted public awareness and preparedness campaign;
	Individual property flood resistance (protection / flood-proofing) and resilience;
	Land use management, including creation of wetlands, riparian buffer zones, etc.
Structural measures	Storage (single or multiple site flood water storage, flood retardation, etc.)
	Flow diversion (full diversion / bypass channel, flood relief channel, etc.)
	Increase conveyance (in-channel works, floodplain earthworks, removal of constraints / constrictions, channel / floodplain clearance, etc.)
	Construct flood defences (walls, embankments, demountable defences, etc.)
	Rehabilitate, improve existing defences
	Relocation of properties
	Localised protection works (e.g. minor raising of existing defences / levels).
Channel or Flood Defence Maintenance Works / Programme	-
Other relevant works	-

Flood risk management options have been developed for each UoM in the SWRBD. All of the available options from the prescribed suite (Table 3.1) are not applicable to every UoM. Options appraisal involves the technical assessment[5] of all options to determine those which are applicable and viable for each UoM and associated AFAs. Following the technical assessment a cost analysis of the viable options is conducted such that a preferred option (in terms of effectiveness, potential impacts, and cost) is determined.

The options proposed in the Flood Risk Management Plans are set at an appropriate scale which includes the following levels:

[5] The effectiveness and potential impacts of each FRM option is considered in terms of the following criteria:
- Applicability to the area
- Economic (potential benefits, impacts, likely costs etc.)
- Environmental (potential impacts and benefits)
- Social (impacts on people, society and the likely acceptability of the method) and
- Cultural (potential benefits and impacts upon heritage sites and resources)

- Units of Management (UoM) – i.e. at river basin catchment level;
- Analysis Unit (AU) - these are sub-catchments or coastal areas within the Unit of Management;
- Areas for Further Assessment (AFAs) - these are communities within an individual UoM with a quantifiable flood risk and include towns, villages and areas where significant development is anticipated. Associated with AFAs are high and medium priority watercourses. High priority watercourses are located within and 2km upstream of AFAs whereas medium priority watercourses are the interconnecting watercourses between AFAs[6].

3.4 The Munster Blackwater UoM 18

The Munster Blackwater UoM covers an area of approximately 3,295 km^2. The large majority of the area is in North County Cork with parts in County Waterford but also includes small parts of Limerick, Kerry and Tipperary. The UoM has only a few kilometres of coastline at Youghal Bay. UoM 18 comprises three major river catchments: the Blackwater and its tributaries the Allow and the Bride (refer to Figure 3-3).

Blackwater River Catchment

The River Blackwater rises near Glenatripple flowing southwards to Rathmore, before flowing eastwards to Banteer where it is joined by the River Allow from the north. The River Blackwater continues eastwards where it is joined by the Glen River from the south and Awbeg Minor from the north before flowing into Mallow. Within Mallow, there is an existing flood defence scheme that protects the town (completed between 2005 and 2012). There are a number of smaller urbanised tributaries that join with the River Blackwater in Mallow. The most significant of these are the Clyda River which joins from the south upstream of Quartertown and Spa Glen which joins from the north at Mallow Bridge.

The River Blackwater continues to flow east downstream of Mallow towards Killavullen some 10km downstream before being joined by the Awbeg Major from the north downstream of Castletownroche and flowing eastwards into Fermoy (the Fermoy flood defence scheme was completed in 2008). The River Blackwater is then joined by the River Funshion and Araglin River from the north, 2km and 2.7km downstream of Fermoy.

The gradient of the River Blackwater continues to reduce as it flows eastwards through Ballyduff to Lismore. Downstream of Lismore, the River Blackwater is considered fully tidal. The river channel continues eastwards for another 6km before turning to flow southwards at the confluence with the Glenshealan River. The River Blackwater flows southwards through Villerstown Gap before being joined by the River Bride from the west and River Licky from the east. The River Blackwater then continues to flow southwards to outfall into the Celtic Sea at Youghal.

The town of Aglish is situated in a minor sub-catchment of the lower Blackwater on the Ballynaparka River. The Ballynaparka River rises 2km upstream of the town flowing north-west along the main street through

[6] The designation of a watercourse as high priority or medium priority is not a reflection of how the watercourse is viewed in terms of its importance in flood risk management planning.

Aglish before joining with the tributary immediately downstream of Ballynaparka Bridge. Downstream of the confluence, the river flows west through Bleach to join the tidal Goish River and the river Blackwater 1km further downstream.

Allow River Catchment:

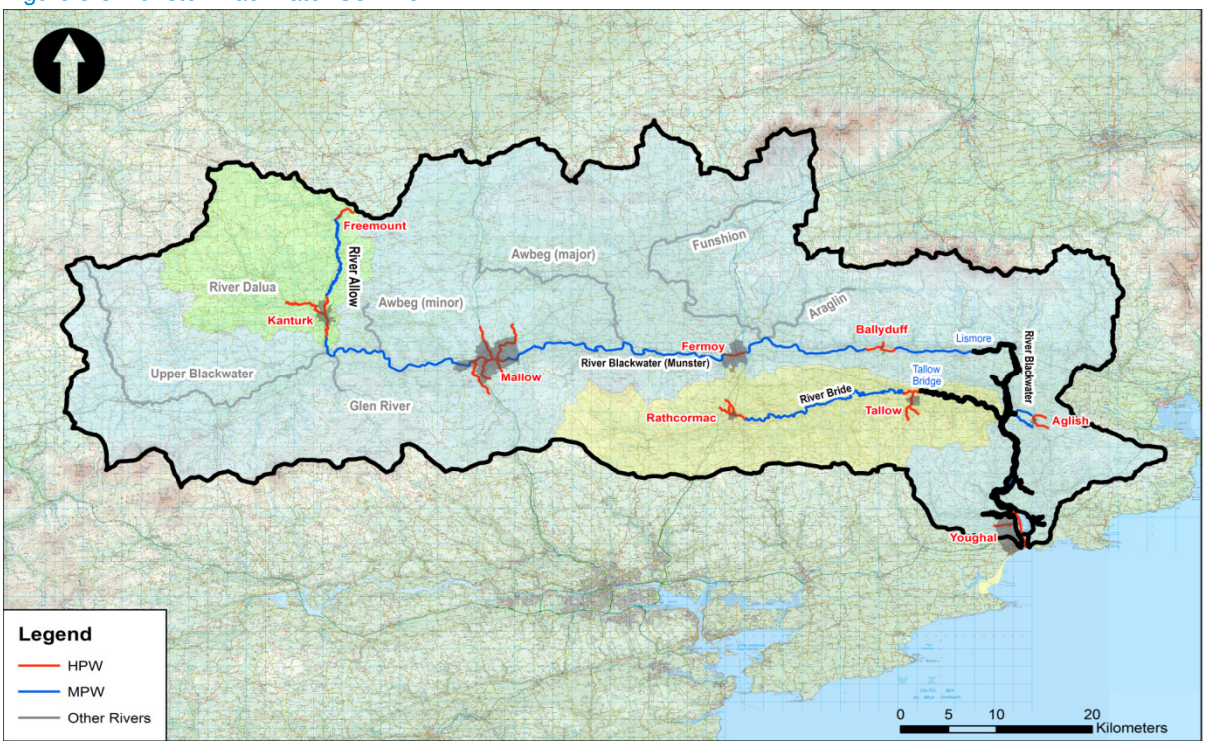
The Allow sub-catchment comprises of 25km of the River Allow from Freemount to its confluence with the River Blackwater near Banteer. The River Allow/Glashawee River rises near the Mullaghereirk Mountains and flows in a south-easterly direction towards Freeemount where is joined by the Freemount Stream at Allow Bridge. The River Allow then flows southwards towards Kanturk where is joined by the similarly sized River Dalua immediately downstream of Greenane Bridge in the town. The Allow continues to flow southwards where is joined by minor tributaries such as the Brogeen Stream before it flows through Riverview gauge to its confluence with the Blackwater at Leaders Bridge.

Bride River Catchment:

The River Bride rises from the Nagles Mountains and flows eastwards under the N8 road to Rathcormac, where it is joined by the Shanowen River from Rathcormac and the River Flesk from the south.

The River Bride continues to meander eastwards where it is joined by a number of smaller tributaries before reaching Mogeely. Downstream of Mogeely, the Bride continues east towards Tallow Bridge where it becomes fully tidal, before joining the River Blackwater some 12km downstream. The Glenaboy River flows from the south through Tallow before joining the River Bride upstream of Tallow Bridge.

Figure 3-3 Munster Blackwater UoM 18



3.4.1 Areas for Further Assessment in UoM 18

The Munster Blackwater UoM contains nine Areas for Further Assessment (AFAs). There is 80km of high priority watercourse and 158km of medium priority watercourse Associated with the AFA's.

Table 3.2: List of AFAs in the Munster Blackwater UoM

AFA Name	Unique ID	Fluvial Flooding	Coastal Flooding	County	Easting	Northing
Aglish	180247	Yes	No	Waterford	212250	91500
Ballyduff	180248	Yes	No	Waterford	196500	99500
Fermoy	180252	Yes	No	Cork	182750	99500
Freemount	180253	Yes	No	Cork	139500	114250
Kanturk	180254	Yes	No	Cork	138250	102750
Mallow	180262	Yes	No	Cork	155250	98500
Rathcormac	180265	Yes	No	Cork	181750	91000
Tallow	180266	Yes	No	Waterford	199750	93750
Youghal	180267	Yes	Yes	Cork	210250	78750

3.5 Flood Risk Management Options for the Munster Blackwater UoM

Flood risk management options for the Munster Blackwater UoM have been identified through option appraisal. Non-structural and structural options (as described in Table 3.1 of this report) will be combined to reduce the risk of damage to properties from flooding. Structural options are not viable for all AFAs however non-structural measures can be applied on a UoM basis.

This Appropriate Assessment Screening is carried out in conjunction with the option appraisal process such that potential environmental impacts of the various options are considered at option selection stage.

3.5.1 Non-Structural Measures

Planning Control

In November 2009, the Guidelines on the Planning System and Flood Risk Management, jointly developed by DECLG and the OPW, were published under Section 28 of the Planning Acts. These Guidelines provide a systematic and transparent framework for the consideration of flood risk in the planning and development management processes, whereby:

A sequential approach should be adopted to planning and development based on avoidance, reduction and mitigation of flood risk.

A flood risk assessment should be undertaken that should inform the process of decision-making within the planning and development management processes at an early stage.

Development should be avoided in floodplains unless there are demonstrable, wider sustainability and proper planning objectives that justify appropriate development and where the flood risk to such development can be reduced and managed to an acceptable level without increasing flood risk elsewhere (as set out through the Justification test).

The proper application of the Guidelines by the planning authorities is essential to avoid inappropriate development in flood prone areas, and hence avoid unnecessary increases in flood risk into the future. The flood mapping provided as part of the FRMP will facilitate the application of the Guidelines.

In flood-prone areas where development can be justified (i.e., re-development, infill development or new development that has passed the Justification Test), the planning authorities can manage the risk by setting suitable objectives or conditions, such as minimum floor levels or flood resistant or resilient building methods

Building Regulations / Planning Conditions

The risk of damage to properties from flooding can be mitigated by the use of appropriate construction techniques and materials. For example the damage caused to an internal wall of a property by flooding can depend on the materials and methods of its construction. A timber stud partition covered with plasterboard with low level electrical wiring would have to be completely replaced following immersion in flood water. However, a solid concrete block wall covered with tiles and high level electrical wiring on the other hand would only have to be washed down following a flood.

If for a particular town or high flood probability areas, certain building regulations or planning conditions were adopted that ensured structures were flood resilient through specified construction methods, building fabrics and uses, a decrease in the risk of damage could be achieved. The question of whether such regulations or planning conditions could be imposed upon developers, business owners or householders in flood prone areas would need to be addressed if this were to be brought forward as a flood risk management measure.

Flood Forecasting

Flood forecasting is a means of providing advanced warning of an impending flood event. A reliable advance warning system allows protective measures to be put in place and protective actions to be carried out in advance of a flood event. These actions and measures can reduce the damage caused in a flood event.

Flood forecasting is not a viable Flood Risk Management Measure for all of the UoM 18 AFAs. This is because the time between transmitting a flood forecast the arrival of flood waters may not be long enough for people to take effective action to reduce flood damage. Flood warning is a viable option in Kanturk, Ballyduff and Youghal AFAs. The infrastructure required for flood forecasting in these AFAs are listed in Table 3.3.

Table 3.3: Flood Forecasting Infrastructure required

AFA	Infrastructure
Kanturk	River Level Gauges
	Rain Gauges
	Hydraulic flood forecasting model
	Flood warning system
Ballyduff	Add to Fermoy flood warning system
Youghal	Existing tidal flood forecasting system

Public Awareness

Many of the measures to mitigate and manage flood risk and the potential consequences for flooding will involve the public at large. It is therefore important that the public is made aware of where to find

information, what the information means and what actions the public and business owners can take to reduce the damage that would occur to their properties, possessions and interests in the event of a flood.

Measures to increase and promote public awareness include:

- Identifying the areas prone to flooding
- Information on measures to be implemented to reduce and / or manage the risk of flooding
- Measures in place to provide advance warning of flooding
- Establishment of methods to interface with the public and in particular the owners of vulnerable properties, i.e. workshops and meetings, Facebook, Twitter, text messaging, newsprint, websites, etc.

Land Use Management

Land Use Management includes strategies to control overland flow, such as improving agricultural and forestry practices in key catchment areas. Local natural flood management measures such as the creation of wetlands or forestry to retain overland flow could also be adopted.

Emergency Response Planning

Well prepared and executed emergency response plans can significantly reduce the impact of flood events, particularly for human health and welfare.

The Framework for Major Emergency Management was developed in 2005 and was adopted by Government decision in 2006. Its purpose is to set out common arrangements and structures for front line public sector emergency management in Ireland. The Framework is based on the internationally recognized systems approach that, in essence, proposes an iterative cycle of continuous activity through five stages of emergency management:

- Hazard Identification
- Mitigation
- Preparedness
- Response
- Recovery

Under the Framework, Local Authorities are designated as the lead agency for co-ordinating the response to severe weather events, and each Local Authority should have, as a specific sub-plan of its Major Emergency Plan, a plan for responding to severe weather emergencies, whether a major emergency is declared or not. The other principal response agencies should include sub-plans for responding to notifications from the Local Authorities of severe weather warnings.

A Guide to Flood Emergencies (MEM Guidance Document 11, July 2013) has been published to assist the Principal Response Agencies in meeting their responsibilities, under the Framework for Major Emergency Management, and to deliver on the responsibilities of the OPW and the Local Authorities with respect to emergency planning as set out in the Report of the Flood Policy Review Group. The Guide provides advice

on the development and implementation of consistently effective flood emergency response and short-term recovery planning by the Principal Response Agencies and others, and includes a template plan.

3.5.2 Structural Measures

Structural flood risk management options for the Munster Blackwater UoM are shown in Table 3.4. Options are presented in terms of the viable options considered for each AFA. Figures showing the viable flood risk management options are included the Preliminary Options Report. It should be noted that these figures are indicative only. The locations in which viable options may be constructed within the AFAs may change at detailed design stage if an option is progressed through a scheme.

A preferred option for the AFAs will emerge following technical assessment and cost analysis of the viable options and following input from members of the public. Public input is gained through Public Consultation in December 2015 and January and March 2016.

Table 3.4: Structural Flood Risk Management Options for UoM 18

AFA	Viable Options
Freemount	• No measures are proposed.
Kanturk	• Option 1 -Fluvial flood defence of the town using walls and embankments on the banks of the Rivers Dalua and Allow, ranging in height from 0.8m to 2.6m. • Option 2 - Flood Storage on the Dalua River (330,000m^2 in area) combined with fluvial flood defence of the town using walls and embankments on the banks of the Rivers Dalua and Allow, ranging in height from 0.5m to 1.9m. • Option 3 - Removal of the weirs at the Church Street Footbridge on the River Dalua combined with fluvial flood defence of the town using walls and embankments on the banks of the Rivers Dalua and Allow, ranging in height from 0.5m to 2.5m. • Non structural flood forecasting gauge within Allow River.
Mallow	• There is an existing and functioning flood alleviation scheme in place for Mallow
Fermoy	• There is an existing and functioning flood alleviation scheme in place for Fermoy
Ballyduff	• Option 1 - Embankments of varying height (ranging between 1m and 2.5m) within the town in proximity to properties near the Blackwater River. A flood wall, 2m high, at the rear of the farm holding next to the church. Raising the roads north and south of the Ballyduff Bridge by between 1m and 1.5m.
Youghal	• Option 1- Tidal flood defence of the town using low lying walls on the quays, ranging in height from 1.1m to 1.4m. • Option 2 - Tidal Barrage (a) at the narrowest part of the estuary within the Blackwater River SAC. The barrage is approximately 715m in length. To maximise the potential storage area for fluvial flows the barrage will be closed at the low tide preceding a tidal event. The barrage will remain closed until the tide level outside is lower than the maximum water level within the barrage. • Option 3- This option includes the construction of a tidal barrage (b) outside the SAC boundary. The barrage will be approximately 1.4km in length. To maximise the potential storage area for fluvial flows the barrage will be closed at the low tide preceding a tidal event. The barrage will remain closed until the tide

AFA	Viable Options
	level outside is lower than the maximum water level within the barrage.
Rathcormac	• Option 1 - Storm attenuation of flood waters on the Kilbrien Stream through construction of a storage area of 23,270m^2. This work will involve stream realignment, construction of embankments to contain flood waters and installation of a sluice gate to control flow from the storage area. • Option 2 - Divert flow from the Kilbrien stream to the Shanowen River through the construction of a 582m culvert (1200mm diameter pipe) north of the town. • Option 3 - Flood Walls within the town along the Kilbrien stream to keep the flows in channel. Wall height ranges from 0.8m to 1.6m.
Tallow	• No measures are proposed.
Aglish	• Option 1- Fluvial flood defence of the town using walls and embankments along the Ballynaparka River, 1.1m in height.

3.6 Flood Risk Management Options with Potential for Significant Effects on Natura 2000 Sites

Flood risk management measures, while having a positive social impact can have a negative environmental impact. The requirement for ecological protection can limit potential options for flood risk management. The South Western River Basin District contains a variety of habitats and species of conservation concern which are protected under national and European legislation. A flood risk management option is unlikely to emerge as the preferred option for an AFA where there is an associated significant impact on species or habitats for which Ireland has designated areas for their protection (i.e. Natura 2000 Sites).

The potential impacts of the structural and non-structural flood risk management options for UoM 18 are characterised hereunder.

3.6.1 Potential Impacts of Non-Structural Options in UoM 18

Periodic high (flood) and low (drought) flows are a natural element of river hydrology. The flora and fauna inhabiting a watercourse and its riparian zone will be adapted to the natural variation in flow and level which is typical of the system. An extreme flood event, outside of the river systems normal range, can have negative impacts on the ecology of the watercourse as follows:

- Prolonged submergence of riparian flora can result in damage to and loss of species, this can provide opportunity for colonisation by invasive species;

- Increase pollution of the watercourse due to high levels of runoff from land and increased erosion of river banks due to high flow velocities can lead to high sedimentation in the river which can have subsequent negative impacts on fishery habitat;
- Reduced biomass in the watercourse due to the washing out of macroinvertebrates and detritus which has subsequent impacts on populations of consumers in the watercourse;

With the exception of Land Use Management, non-structural measures will not restrain the flow of water during an extreme flood event. The implementation of these measures cannot therefore influence the current frequency, extent or depth of flooding. Impacts on an ecosystem from an extreme flood event will not be prevented by the implementation of non-structural measures. Non-structural measures can however prevent future exacerbation of flooding by ensuring that development within the catchment will not increase runoff to the watercourse through Planning Control.

Land Use Management aims at retaining / delaying runoff within a catchment such that a sudden increase in flows in a watercourse is not experienced / is limited. This option can have the effect of reducing the depth and extent of a flood event. There will be an associated reduction in the potential negative impacts on ecology. Land Use Management provides an opportunity to increase biodiversity through creation of woodland or wetland habitat in place of agricultural lands. This can have a long term positive impact.

Flood Forecasting requires the installation of gauges along a watercourse to measure level and flow. Typically river gauges are installed within a housing (usually a PVC pipe) strapped to a bridge. The bridge acts as a supporting structure to the gauge housing, thereby eliminated the requirement for bankside works. It is not always practical to site a river gauge at the location of a bridge, in which case a bank-side structure is required to support the gauge. The installation of a gauge and supporting structure can have the following impacts on the watercourse:

- permanent removal of riparian vegetation to accommodate the support structure;
- temporary disturbance of river bank and river bed during installation resulting in the release of sediment into the watercourse which can cause temporary deterioration in the quality of fishery habitat and can smother immobile flora and fauna in the watercourse;
- release of concrete into the watercourse (where the structure is not prefabricated) which can result in reduced water quality with subsequent negative consequences for the ecology of the watercourse;
- temporary noise and physical disturbance to species in proximity to the gauge site during installation;
- alteration of water turbulence / flow pattern in the immediate vicinity of the gauge structure which can result a change in erosion / deposition pattern locally and therefore a change in habitat.

3.6.2 Potential Impacts of Structural Options in UoM 18

The viable structural options identified for the management for the extreme flood event within the UoM can be summarised as Storage, Conveyance Measures, Flow Diversion and Flood Walls,Embankments and Tidal barrage. The potential impacts associated with each viable structural option are presented hereunder.

It should be noted that all of the options will have the effect of reducing the flood extents. Certain habitats have a dependence on flooding e.g. alluvial woodlands, a priority habitat protected under the Habitats Directive. Alteration of flood regime can negatively impact the distribution of flood dependent habitats and species.

Also all options will involve the use of machinery which is a potential source of environmental pollution through oil and fuel leaks.

Storage

Storage is provided upstream of a flood risk area in order to limit the flow in the downstream watercourse such that it does not overtop its banks. The storage area will come in to operation in times of flood flows. Implementation of flood storage requires the availability of land upstream of the flood risk area with suitable topography which can be allowed to flood during flood conditions in the river. A storage area / reservoir is typically formed by constructing earth embankments perpendicular to the course of the river coupled with a control structure on the watercourse which will limit flows to that which can be accommodated downstream. The storage area is designed such that during flood flows the watercourse will overtop its banks into the surrounding lands within the storage area (which is contained by the earth embankments) and the control structure will ensure that flows downstream are maintained at levels which will not overtop the banks.

Flood Storage has been assessed as a viable option for:

- Kanturk (on the Dalua River), comprising an area of 330,000m^2 within agricultural lands; and
- Rathcormac (on the Kilbrien Stream), comprising an area of 23,270m^2 within agricultural lands.

Construction of the flood storage areas in Kanturk and Rathcormac will require that earth is brought to site for embankment construction. Potential significant environmental effects associated with the construction of embankments include:

- Sedimentation of the Dalua River and the Kilbrien Stream. Sediment deposition in a watercourse can cause a temporary to short term reduction the quality of fishery habitat by infilling interstitial spaces in gravel beds. Sedimentation can reduce light penetration in the water column and can affect oxygen levels both in the river bed and in the free moving water thereby impacting river vegetation and river fauna. Sedimentation can block the gills of in-stream fauna.
- Dust deposition in proximity to the works due to wind blow from the earth used in embankment construction. Dust deposition on the foliage of protected flora or habitats can inhibit effective photosynthesis and transpiration. Dust deposition within a watercourse or on soil can affect the chemical composition and therefore potentially the ecology of the habitat.
- Permanent fragmentation of linear riparian features by construction of very large embankments (e.g. 8m embankment in Kanturk) which may deter commuting protected species from using an area;
- Temporary disturbance of species protected under Annex II of the Habitats Directive by noise and physical presence on site;

- Introduction of invasive species, e.g. Japanese Knotweed, in the earth imported to site.

The storage areas will require a control structure (sluice gate / penstock) to be installed on the watercourse to ensure downstream flows are maintained below extreme flood levels. The installation of the control structure will require in-stream works. Installation of a sluice gate / penstock requires that bed and bank material is excavated and the section is replaced by a concrete channel and walls such that the control structure can be anchored to the concrete. Potential significant environmental effects associated with the installation of the control structure include:

- Permanent loss of river bed and river bank within the footprint of the control structure;
- Damage to river bed and bank due to machinery movement in-stream;
- Release of sediment in to the watercourse during installation caused by disturbance to river bed and banks (sedimentation effects are discussed in relation to the embankments above);
- Obstruction to fish / lamprey passage within the river channel when the control structure is restricting flows;
- Isolation of fish / lamprey within the flooded storage area in the event that flood waters subside rapidly;
- Creation of temporary wetland habitat within the storage area during flooding;

The Kilbrien Stream will need to be realigned to facilitate the construction of the storage area in Rathcormac. Stream realignment can impair the biological function of the waterbody through:

- permanent loss of fishery habitat within the diverted section of the watercourse;
- temporary release of sediment to the watercourse during construction;
- impairment to fish passage during construction.

Conveyance Measures

Conveyance Measures involve the physical alteration of a river channel or floodplain to improve flood flow throughput. Examples of conveyance measures include:

- Reduction of hydraulic resistance to flow through improvement works to structures in the river channel (including replacement or removal of bridges / weirs / culvert), and clearance of debris from the channel.
- Increase in the river's cross-sectional area through, for example, channel regrading (by excavating some material from the river bed).

Conveyance measures have been identified as a viable option for Kanturk. Removal of the weirs at the Church Street Footbridge on the River Dalua will result in a reduction in flood extent within the town by facilitating better throughput of water within the river. Potential environmental effects of removing the weir on the Dalua River include:

- Resuspension of silt which has built up behind the weirs. If weir removal was to take place during migration / spawning season for lamprey / fish, release of sediment in to the watercourse would act as

a barrier to migration. Also deposition in downstream spawning areas could inhibit spawning with subsequent effects on population dynamics;

- The silt which has built up behind the weirs may be suitable habitat for juvenile lamprey. Resuspension of this silty material could result in a permanent loss of suitable juvenile lamprey habitat;
- Bank erosion / slippage upstream of the weirs is likely as the removal of flow control will alter river hydrology upstream. This will stabilise over time.
- The weirs are a potential barrier to fish / lamprey migration. Removal of the weirs is likely to positively impact fishery populations in the Dalua River in the long term by permitting access to upstream habitats.

Flow Diversion

Flow diversion involves the interception of flood flows within a watercourse and diverting these flows through an artificial channel into another watercourse or into another section of the same watercourse such that a reduction in water volumes is achieved within areas at risk of flooding.

Flow diversion has been identified as a viable option for the Kilbrien stream in Rathcormac. Flood flows are proposed to be diverted from the stream into the Shanowen River via a 582m culvert (1200mm diameter pipe) through agricultural lands north of the town. Potential environmental effects of flow diversion from the Kilbrien Stream to the Shanowen River include:

- Increased flow volume and velocity in the Shanowen River during storm events. This can cause bankside erosion and associated loss of habitat (note the river has been assessed as having the capacity to physically accommodate the increased volume without overtopping it's banks);
- Scouring of the bed of the Shanowen River at the culvert discharge point resulting in possible loss of fishery habitat and sedimentation of the watercourse;
- Attraction of fish into the culvert and ultimately into the Kilbrien stream when the culvert is in operation. The Kilbrien stream is of lower value in terms of the availability of suitable fishery habitat than the Shanowen River. This could influence fish / lamprey populations in the Shanowen River;

Flood Walls and Embankments

Flood Walls and Embankments are physical structures designed to contain floodwaters for a defined flood event. Floodwalls can be constructed from a variety of materials including concrete, brick / stone masonry and steel. Embankments are typically constructed from earth which is vegetated to protect against erosion.

The construction of flood walls and embankments has been determined to be a viable option in Rathcormac, Ballyduff, Kanturk, Aglish and Youghal. The physical implementation of these structural measures can have the following impacts on protected habitats and species:

- Temporary release of sediment to the watercourse from embankments with subsequent effects on habitat quality;

- Compaction of riparian area due to weight of embankment and machinery movement during construction (note embankment design would need to consider ground stability). This can have consequences for species that burrow into the river bank e.g. crayfish;
- Temporary disturbance to species by noise and physical presence on site during construction;
- Introduction of invasive species, e.g. Japanese Knotweed, in the earth imported to site for embankments;
- Accidental spill of construction materials e.g. concrete for wall construction, which can have toxic effects on flora and fauna.

Tidal Barrage

A tidal barrage is proposed for Youghal. The barrage will be a solid structure with a gate / sluice system approximately 50m wide to allow tidal conditions to operate as normal except in times of tidal flooding where the sluice gate would close and the barrage would become impermeable. The barrage will be closed at low tide preceding a tidal event. This will facilitate adequate storage for fluvial flows from the River Blackwater.

The barrage should remain closed for approx. 7 hours. Allowing for the 50% AEP fluvial event (543.6m^3/s) to coincide with the 0.5% AEP tidal event, the tidal barrage must be able to store approx. 13.5Mm^3 of fluvial flow. Based on the average depth of available storage of 2.49m, the tidal barrage should have an inside area of approx. 5,497,078.65m^2 and a minimum barrage height of 3.63m. Potential impacts of constructing a barrage in Youghal Estuary include:

- Damage to Annex I habitat within the footprint of the barrage;
- Alteration of tidal inundation within the barrage during flooding (because barrage is closed) and change in salinity due to stronger fluvial influence when barrage is closed;
- Restriction of fish movement during barrage closure;
- Disturbance of estuary bed causing sediment plumes during construction;
- Noise impacts during construction.

4 Characteristics of Natura 2000 Sites

4.1 Natura 2000 Sites within the Zone of Impact

Viable flood risk management options have been determined for the AFAs of Kanturk, Ballyduff, Rathcormac, Aglish and Youghal.

- Flood risk management options in Kanturk are proposed for both the Dalua and Allow Rivers. These watercourses are tributaries of the Blackwater River and are within the Blackwater River SAC (002170).
- Flood risk management options in Ballyduff are proposed for the Blackwater River within the boundaries of the Blackwater River SAC (002170) and the Blackwater Callows SPA (004094).
- Flood risk management options in Rathcormac are proposed for the Kilbrien stream and the Shanowen River. These waterbodies are tributaries of the River Bride which is part of the Blackwater River SAC (002170). The Shanowen River flows into the River Bride approximately 500m downstream of Rathcormac town.
- Flood risk management option in Aglish is proposed for the Ballynaparka River. This watercourse is a tributary of the River Blackwater. The Aglish AFA boundary does not overlap with any Natura 2000 site boundary. The nearest Natura 2000 site is the Blackwater River SAC (002170), which is approximately 2km west of the AFA
- Tidal flood risk management options in Youghal are proposed for the Youghal Estuary. The estuary at Youghal is part of the Blackwater River SAC (002170) and downstream of the Blackwater Estuary SPA (004028).

There is potential that impacts as described in Section 3.6 of this Screening Assessment could affect the qualifying features of the Blackwater River SAC and the Blackwater Callows SPA and Blackwater Estuary SPA.

The Blackwater River SAC

The River Blackwater is one of the largest rivers in Ireland, draining a major part of Co. Cork and parts of Counties Kerry, Limerick, Tipperary and Waterford. The site consists of most of the freshwater stretches of the system as well as the estuarine component at Youghal.

- Annex I habitats occurring within the site include estuaries, intertidal mudflats and sandflats, perennial vegetation of stony banks, salt meadows, floating river vegetation, alluvial forests, yew woodland and oak woodlands.
- Aquatic species include: Lamprey (*Lampetra planeri, L. fluviatilis, Petromyzon marinus*) Twaite shad (*Alosa fallax fallax*), and Atlantic Salmon (*Salmo salar*). Substantial populations of Freshwater pearl mussel (*Margaritifera margaritifera*) occur. White-clawed crayfish (*Austropotamobius pallipes*) are confined to the Awbeg River.
- Otter (*Lutra lutra*) is widespread throughout the SAC.
- Killarney fern (*Trichomanes speciosum*) occurs near Lismore.

The Blackwater Callows SPA

The site comprises a 23 km stretch of the River Blackwater, running in a west to east direction between Fermoy and Lismore. It includes the river channel and strips of seasonally flooded grassland within the flood plain.

The site is of high importance for wintering waterfowl. It supports an internationally important population of Whooper Swan (*Cygnus Cygnus*) and nationally important populations of Wigeon (*Anas Penelope*),Teal (*Anas crecca*) and Black-tailed Godwit (*Limosa limosa*). The population of *Limosa limosa* has exceeded the threshold for international importance at times. Little Egret also uses the site.

The Blackwater Estuary SPA

The Blackwater Estuary SPA is a relatively small, sheltered south-facing estuary, which extends from below Youghal Bridge to the Ferry Point peninsula. It comprises a section of the main channel of the River Blackwater. At low tide, intertidal flats are exposed. The intertidal sediments are mostly muds or sandy muds. Salt marshes occur along the sheltered inlets. A low-lying field which provides an important roost is included. The Blackwater Estuary is of high ornithological importance for wintering waterfowl, providing good quality feeding areas for a diversity of waterfowl species. At high tide, the birds roost along the shoreline and salt marsh fringe.

The site supports an internationally important population of Black-tailed Godwit *Limosa limosa* (over 5% of the national total). It supports a further eight species in numbers of national importance: Wigeon (*Anas Penelope,* Golden Plover *(Pluvialis apricaria), Lapwing (Vanellus vanellus), Dunlin (Calidris alpine), Curlew (Numenius arquata), and Redshank (Tringa totanus)*. A population of Bar-tailed Godwit *Limosa lapponica* exceeds the threshold for national importance in some winters. *Egretta garzetta* breeds locally and the Blackwater Estuary is a main feeding area.

4.2 Likelihood of Impacts on Natura 2000 Sites

The likelihood of the potential impacts as described in Section 3.6 of this Screening Assessment affecting the qualifying features of the Blackwater River SAC and the Blackwater Callows SPA is determined through Source-Pathway-Receptor assessment.

A review of available data was carried out to determine the presence of qualifying features of the Blackwater River SAC, the Blackwater Callows SPA, and the Blackwater Estuary SPA within the environs of Kanturk, Ballyduff, Rathcormac, Aglish and Youghal. Data reviewed included:

- Protected species spatial datasets for the SWRBD provided by NPWS
- Article 17 spatial data on protected habitats and species available through NPWS website
- Article 12 reporting data on breeding distributions and ranges of protected bird species available through NPWS website
- iWebs data
- National Survey of Native Woodlands 2003-2008 spatial data available through NPWS website
- Irish Semi-natural Grassland Survey spatial data available through NPWS website

- Coastal Monitoring Project 2004-2006 available through NPWS website
- Saltmarsh Monitoring Project 2006-2008 available through NPWS website
- Protected species data sourced through the National Biodiversity Data Centre

The likelihood of an impact occurring is characterised in accordance with the NRA (2009) classification:
- Near-certain: >95% chance of occurring as predicted
- Probable: 50-95% chance of occurring as predicted
- Unlikely: 5-50% chance of occurring as predicted
- Extremely unlikely: <5% chance of occurring as predicted

4.2.1 Ballyduff AFA

Flood Walls and Embankments

The likelihood of potential impacts of constructing Flood Walls and Embankments in Ballyduff on the qualifying features of the Blackwater River SAC and the special conservation interests of the Blackwater Callows SPA are discussed hereunder.

Lamprey have been recorded within the River Blackwater near Ballyduff: Sea lamprey have been observed spawning downstream of Ballyduff and Juvenile lamprey (sea and brook/river) have been recorded upstream of Ballyduff. Impacts on lamprey from sedimentation associated with flood embankment construction are probable given the close proximity of spawning gravels downstream of the AFA.

The Blackwater River is designated as salmonid. Atlantic Salmon and Lamprey require the same qualities in spawning habitat. Impacts on Atlantic Salmon from sedimentation are therefore probable.

Targeted Freshwater Pearl Mussel surveys were conducted along the Blackwater River between October and December 2012 as part of the CFRAM study for the SWRBD and included this habitat (a stage 1 overbank and wading survey took place here). No pearl mussels were identified between Ballyduff, downstream to Youghal Bridge (at which point the watercourse becomes estuarine). Impacts on Freshwater Pearl Mussel are extremely unlikely.

White-clawed crayfish are confined to the Awbeg River. Impacts on White-clawed crayfish are extremely unlikely.

Twaite Shad have been recorded as far inland as Cappoquin on the Blackwater River. Shad spawn at the upper tidal reaches of the estuary and do not generally enter freshwater habitat. Impacts on Shad are extremely unlikely given the distance from the estuary.

Otter has been recorded at Ballyduff Bridge. Damage to Otter resting places (couch or holt) by the construction of flood walls and embankments in Ballyduff is extremely unlikely given that the proposed locations for these structures are principally confined towards the rear of properties along the Glounagad Stream (which flows into the Blackwater River at Ballyduff). The Glounagad Stream is suboptimal habitat for Otter due to its size. Embankments are proposed south of Ballyduff Bridge in proximity to the

Blackwater River. Damage to Otter resting places is extremely unlikely here also given that the embankment will be set back from the river bank for most of its length. Disturbance of otter commuting and foraging is extremely unlikely during construction activities given that Otter are crepuscular animals, i.e. most active at dawn and dusk (which are outside of the hours of a typical working day).

Floating river vegetation is poorly surveyed in Ireland. Article 17 reporting suggests an almost national distribution of this habitat type. This Annex I habitat type is likely to occur extensively on the Blackwater River. Impacts of sedimentation on floating river vegetation are probable.

Killarney Fern occurs near Lismore in proximity to the Ownenashad River (a tributary of the Blackwater River). Impacts on Killarney Fern are extremely unlikely given that this qualifying feature is on a separate watercourse to Ballyduff. There is therefore no direct connectivity between the site of the Killarney Fern and the flood management measures.

White Well Wood is an alluvial woodland located c.1km east of Ballyduff (outside of the SAC boundary) but does not equate to Annex I habitat. There are no records of Annex I alluvial woodlands in proximity to Ballydiff. Impacts on this qualifying feature of the SAC are therefore extremely unlikely.

Old sessile oak woods (Annex I habitat code 91A0) occurs further downstream of Ballyduff (approximately 6.5km) towards Lismore (The Grove Woodlands). Modelling carried out as part of the assessment of viable options shows that flood management measures in Ballyduff will not affect river flows downstream at the Grove Woodlands. Impacts on Oak Woodlands are extremely unlikely.

Ballyduff is on the freshwater section of the Blackwater River. Estuarine and coastal qualifying features of the SAC do not feature within the environs of Ballyduff. Impacts on estuaries, intertidal mudflats and sandflats, perennial vegetation of stony banks and salt meadows are therefore extremely unlikely.

A number of wetland waterbirds have been recorded on the River Blackwater near Ballyduff Bridge including Mallard and Mute Swan. However there are no records for the Special Conservation Interests of the Blackwater Callows SPA in proximity to Ballyduff. Teal and Little Egret have been recorded within the environs of Fermoy, upstream of Ballyduff. Disturbance, during the construction works, to waterfowl for which the Blackwater Callows SPA is designated is unlikely.

4.2.2 Kanturk AFA

The likelihood of potential impacts of the construction of viable options in Kanturk on the qualifying features of the Balckwater River SAC are discussed hereunder.

Flood Walls and Embankments

The Dalua River and the Allow River have strong depositional features on approach to Kanturk with numerous meanders and large sediment banks evident. Degradation of fishery habitat due to sediment runoff from embankment material depositing within the watercourse is extremely unlikely given the existing condition of the watercourse.

It is possible that suitable Lamprey and Atlantic Salmon spawning gravels are present within the upstream reaches of the Dalua and Allow Rivers (although there are no documented records of spawning activity in the Dalua or Allow Rivers). The release of large volumes of sediment to a watercourse can act as a barrier to fish migration. Impacts on movements of Lamprey and Atlantic Salmon to possible spawning areas upstream due to sediment release are unlikely (given that suitable spawning habitat is poorly represented) but cannot be disqualified.

Freshwater Pearl Mussel is known to be distributed along the Allow River. Targeted Freshwater Pearl Mussel surveys were conducted along the entire stretch of the River Allow in April 2013 as part of the CFRAM study for the SWRBD. The study identified Freshwater Pearl Mussel populations between 1km and 5km upstream of Kanturk town on the Allow River. There were no findings of mussels within or below Kanturk Town on the Allow River up to the confluence with the Blackwater River. Consultation with NPWS indicated no pearl mussel populations the Dalua River. This was confirmed through Stage 1 survey. The Freshwater Pearl Mussel surveys also found small numbers of adult pearl mussel in the Blackwater River upstream of Mallow in proximity to Lombardstown Bridge (approximately 11km downstream of the Allow-Blackwater confluence and 16km downstream of the centre of Kanturk. Habitat along the Blackwater River between the Allow-Blackwater confluence and the Lombardstown Bridge was assessed as sub-optimal for pearl mussel (due to high levels of sedimentation). Impacts on Freshwater Pearl Mussel are extremely unlikely given the large distance to the nearest downstream population from Kanturk.

Otter have been recorded in proximity to Kanturk. Otter use riparian habitat as shelter and to commute between foraging and resting habitat. There is limited riparian cover within the town. Much of the riparian habitat has been significantly impacted through the development of the river walkway. Access to the river is restricted in places by walls and railings. The habitat within the town is sub-optimal habitat for Otter. However Otter may commute along the watercourse. Noise and site activities associated with the construction of flood protection works within the town may deter otter from commuting through this area. However given that otter are crepuscular animals, i.e. most active at dawn and dusk, it is extremely unlikely that Otter activity would coincide with site works. Impacts on Otter are therefore extremely unlikely.

Habitat within the town comprises narrow riparian treeline (primarily mature trees) bound by built land (Fossitt Code BL3) with small areas of agricultural grassland (Fossitt Code GA1). Much of the riparian habitat has been fragmented by walkways. Stone walls (Fossitt Code BL1) are a prominent feature of the river banks. Annex I habitats have not been documented within Kanturk AFA. Damage to Annex I habitat for which the Blackwater River SAC is designated due to the construction of flood walls and embankments is extremely unlikely.

Storage Area

Juvenile Sea Lamprey have been recorded in proximity to Allen's Bridge, immediately upstream of the indicative location of the flood storage area on the Dalua River. Juvenile brook / river and sea Lamprey have also been recorded on upstream tributaries. Damage to Juvenile Lamprey habitat is near certain. Excavation of Juvenile Lamprey from the watercourse to facilitate the installation of the control structure is probable.

Degradation of fishery habitat due to sediment runoff from embankment material depositing within the watercourse is extremely unlikely given the existing high levels of sedimentation in the watercourse.

The control structure for the storage area can act as a barrier to fish / lamprey passage. Lamprey and Atlantic Salmon spawning has not been documented in the Dalua River. Impacts on Atlantic Salmon passage are extremely unlikely given that suitable spawning habitat is poorly represented in the river and natal fidelity to the Dalua River is therefore unlikely for Atlantic Salmon. Adult lamprey migrate to spawning sites in spring. There is a lesser probability that the control structure would be brought into operation (i.e. aligned to provided restricted flow) at this time of year. The probability of flooding in spring is low. Barrier to lamprey migration is therefore extremely unlikely. It is probable that young sea lamprey migrating downriver to estuarine waters could be restricted by the control structure as it is more likely to come into operation at this time of year, i.e. in autumn.

Freshwater Pearl Mussel are absent from the Dalua River. Impacts are extremely unlikely.

Otter have been documented throughout the area, on the Allow River upstream and downstream of Kanturk, and on the Dalua River and its tributaries upstream of Kanturk. Given the distribution of Otter upstream and downstream of Kanturk, it is likely that they commute along the rivers to feeding and resting places. An eight metre high embankment will be required at the head of the storage area on the Dalua River. The embankment will have a gradual slope (1:2) and will therefore not act as a barrier to connectivity between otter habitat. The footprint of the 8m embankment at the head of the storage area will be approximately 40m in width and the 2.5m embankment at the rear of the storage area will be approximately 10m in width. Construction of the embankments will require that riparian habitat is removed on either side of the Dalua River. This will equate to approximately 100m of riparian habitat at this location. Given the high level of Otter activity in the area, it is possible that Otter resting places (couches / holts) are present on the section of the Dalua River. It is probable therefore that Otter resting places would be damaged by the works.

Aghaneenagh Woods, Annex I habitat Old Oak Woodlands (Habitats Directive Code 91A0), is located within the Blackwater river SAC upstream of Allen's Bridge i.e. upstream of the indicative location of the flood storage area on the Dalua River. Modelling carried out as part of the assessment of viable options for Kanturk shows that flood storage will not affect patterns of inundation upstream at Aghaneenagh Woods. Impacts on Oak Woodlands are extremely unlikely on the basis of the indicative location of the flood storage area.

Floating River Vegetation is likely to be present in the Dalua River on the basis of Article 17 reporting on national distribution. Excavation of river bed material in order to install the control structure is extremely likely to result in habitat damage. Also when the storage area is in flood the depth of inundation will be greater than would traditionally be the case in the absence of the storage area. This will affect light penetration which is near certain to negatively impact habitat structure and species composition.

Weir Removal

Fine silty material has built up behind the weirs on the Dalua River in Kanturk due to the slowdown in flow velocities on approach to the weirs. This is suitable habitat for juvenile lamprey. Removal of the weirs will result in this habitat being disturbed. It is probable that juvenile Lamprey would be displaced.

Floating river vegetation is likely to occur throughout the Blackwater catchment. It is probable that modification of the hydrological regime due to weir removal and alteration of river bed material due to washing out of sediment at the weirs will result in a local change in vegetation composition.

Freshwater Pearl Mussel are absent from the Dalua River and do not occur in the catchment until 16km downstream on the Blackwater River. Sediment which is disturbed during weir removal is unlikely to be carried 16km before being deposited, particularly considering the depositional characteristics of the Dalua and Allow Rivers. Impacts on Freshwater Pearl Mussel from sediment deposition are extremely unlikely.

The weirs on the Dalua are likely to act as a barrier to the upstream migration of adult Lamprey and Atlantic Salmon. It is probable that the removal of the weirs will increase access to upstream areas however the presence of potential suitable spawning habitat is uncertain.

Non structural Flood Forecasting

It is unlikely that gauge support structures will be required along the Dalua River given that there are frequent bridge crossings on the watercourse. Bracketing the gauge housing to a bridge will cause minimal disturbance to river bed and bank. Impacts on qualifying features of the Blackwater River SAC in proximity to flood forecasting on the Dalua River are extremely unlikely.

Freshwater Pearl Mussel occur on the Allow River upstream of Kanturk. Any in-stream works or bankside works associated with the installation of river gauges is highly likely to result in sediment release into the watercourse. The Freshwater Pearl Mussel Regulations, 2009 require that there is no artificially elevated levels of siltation present within pearl mussel habitat. Sedimentation of the Allow River is near certain to result in negative impacts on the pearl mussel population.

4.2.3 Rathcormac AFA

The likelihood of potential impacts of constructing viable options in Rathcormac on the qualifying features of the Balckwater River SAC are discussed hereunder.

Flood Walls

Flood walls are identified as a viable option along the Kilbrien Stream. The Kilbrien Stream runs parallel to the local road to Garrynacole for the majority of its path and then diverts into Rathcormac. The stream is surrounded by built land (Fossitt Code BL3) and agricultural lands (Fossitt Code GA1). The stream is heavily channelized and engineered and is culverted in a number of locations. Flood walls will be aligned

such that riparian treelines are retained. The footprint of the walls will be on road verges and agricultural grassland. Impacts on the qualifying features of the River Blackwater SAC are extremely unlikely.

Storage Area

Flood storage on the Kilbrien Stream will require realignment of the stream into agricultural lands which will be allowed to flood during storm events.

The Kilbrien stream has no capacity to support the qualifying features of the Blackwater River SAC given its heavy modification (culverting and channelisation) and riparian habitat which is already compromised by adjacent land uses (road and agriculture). The loss of a section of the stream in place of the diverted channel is extremely unlikely to negatively impact the fishery value of the watercourse and subsequently the status of qualifying features within the River Blackwater SAC.

Sediment released into the Kilbrien Stream during realignment may to be flushed into the Shanowen River. The Shanowen River is depositional as evidenced by the presence of large sediment banks at meanders. The temporary increase in deposited sediment is extremely unlikely to adversely impact the fishery habitat within the river.

Flow Diversion

Diversion of flood flows from the Kilbrien Stream into the Shanowen River will increase flows in the Shanowen River. Flood modelling carried out as part of the CFRAM study has determined that the Shanowen River has available capacity to accommodate diverted flows from the Kilbrien Stream. Increased flow velocity can result in increased sediment suspension and bank erosion, however this is likely to be an existing condition during extreme flood events in the Shanowen River. The Shanowen River has exiting high levels of sedimentation as evidenced by the islands which have formed at the confluence with the River Bride. Increased flows from the Kilbrien Stream during extreme flood events may add to the level of sedimentation in the Shanowen River. An overall alteration in fishery habitat quality is extremely unlikely however the need for maintenance in the watercourse may be expedited by increased flows from the Kilbrien Stream. It should be noted that maintenance of the river is not included as an option for flood risk management in Rathcormac and would be subject to statutory processes if required, which would include screening for Appropriate Assessment. It is not considered further in this assessment.

The Shanowen River and the River Bride do not support Freshwater Pearl Mussel. Impacts on Pearl Mussel from sedimentation are extremely unlikely.

Juvenile River / Brook Lamprey have been recorded in the River Bride. There are no documented records for the Shanowen River. It is unlikely that lamprey would be attracted into the flow diversion channel and ultimately into the Kilbrien stream. Similarly Atlantic Salmon are unlikely to utilise the Shanowen River. Impacts are extremely unlikely.

Damage to Annex I habitat during construction of the flow diversion channel is extremely unlikely. The diversion will be through improved agricultural grasslands which are managed and are of low ecological

value. Also there are no documented records of Annex I habitat along the Shanowen River, possible bank erosion due to increased flow velocities during flood is extremely unlikely to result in loss of Annexed habitat.

Otter are widespread in the area and may be present on the Shanowen River. The Shanowen River is outside of the SAC boundary. It is extremely unlikely that Otter resting places will be impacted given the small section of riparian habitat that would be affected by the diversion channel.

4.2.4 Aglish AFA

There is no potential for the flood risk management works in the Aglish AFA to impact upon Natura 2000 sites, as the Ballynaparka River has no capacity to support qualifying features of the Blackwater River SAC given its heavy modification. Aglish AFA is screened out from further assessment

4.2.5 Youghal AFA

The likelihood of potential impacts of constructing tidal flood risk management works in the Youghal AFA on the qualifying features of the Blackwater River SAC and Blackwater Estuary SPA are discussed hereunder:

Flood Defences

The proposed Flood defence works will be confined to the urban fabric of the town. The Annex I habitats: of the Blackwater Estuary include the mudflats and sandflats not covered by sea water at low tide and course sediments occur within the Blackwater Estuary in proximity to Youghal. There will be no requirement for machinery movement within these Annexed habitats. Impacts on the qualifying features of the River Blackwater SAC are extremely unlikely.

Disturbance to species is extremely unlikely given distance from site. The flight response distance (i.e. the point at which the bird moves away from a source of disturbance). The flight response varies between species, is greater during adverse weather, and depends on the acclimatisation of the birds to such disturbance. Wetland birds have been documented to tolerate noise levels at or below 70dB(A) (Institute of Estuarine & Coastal Studies, University of Hull, 2009). BS 5228-1:2009+A1:2014 prescribes typical noise level data for various construction plant and activities within 10m from source. The inverse square law[7] can be applied to determine likely noise levels at varying distances from construction activities (Table 4.1).

[7] Inverse Square Law – For every doubling of the distance from the noise source, the sound pressure levels will broadly be reduced by 6 decibels (dB)

Table 4.1: Noise Levels, dB(A), at Various Distances from Construction Activities

Distance from Source (m)	Tracked excavator	Mixing cement - large lorry concrete mixer	Dumper Truck (empty)	Dumper Truck (tipping fill)	Breaking concrete	Dozer	Wheeled Loading Lorry
10	**78**	**77**	**87**	**79**	**96**	**81**	**80**
20	74	73	83	75	92	77	76
40	68	67	77	69	86	71	70
80	62	61	71	63	80	65	64
160	56	55	65	57	74	59	58
320	50	49	59	51	68	53	52
640	44	43	53	45	62	47	46
1280	38	37	47	39	56	41	40
2560	32	31	41	33	50	35	34

Based on BS 5228-1:2009+A1:2014

From Table 4.1, noise generated during construction will have diminished to tolerable levels for wetland birds [70dB(A)] within 320m of the works. The proposed works occur within Youghal town and are unlikely to be discernible from the existing noise levels typical of the town.

Significant sediment release to the harbour is extremely unlikely given that the walls would be constructing within existing hardstanding areas along the town.

Tidal Barrage

Tidal Barrage (a) occurs within the boundary of the SAC. The Annex I habitats: Blackwater Estuary and mudflats and sandflats not covered by sea water at low tide occur within the Blackwater Estuary. Tidal barrage (a) will occur within the Blackwater River SAC boundary. The construction of the barrage will have direct loss of Annex I habitat (Estuarine, Mudflats and Sandflats habitats). The total area of "Estuarine" habitat is estimated at 1208 Ha while the total area "mudflats and sandflats not covered by seawater at low tide" habitat is estimated at 284 Ha. The works will result in loss of relatively discrete area approximately 0.26 Ha within the footprint of the barrage from the overall of Annex I habitat availability within the Blackwater SAC. Tidal barrage (b) occurs outside the boundary of the SAC, damage to Annex I habitat during construction of the tidal barrage is extremely unlikely.

Perennial vegetation of stony habitats does not occur within the flood risk management zone of influence impacts are extremely unlikely and are therefore screened out for further assessment. Marine community types that have been recorded within the proposed zone of influence include; Coarse sediment community complex, intertidal estuarine sandy mud community complex, *Mytilus edulis* community, sand and mixed sediment with polychaetes and crustaceans community complex and subtidal estuarine fine sand communities. These are typical marine and coastal communities that occur throughout Ireland.

Youghal is on the estuarine section of the Blackwater River. Freshwater qualifying features of the SAC do not feature within the environs of Youghal. White clawed crayfish, brook Lamprey and River Lamprey are not known to inhabit saline waters. And as a resultimpacts are extremely unlikely and therefore screened out of this assessment.

It is near certain that tidal barrage (a) will be a direct loss of Annex I habitat and sediment resuspension and washing out will occur in the estuary during in-channel works to construct a control structure for the tidal barrage. The construction activities of both tidal barrage options (a) and (b) have the potential to re-suspended sediments and pollutants which could be transported outside the works area by tidal currents and subsequently settle out and impact on benthic habitats and species in other locations within the estuary.

To maximise the potential storage area for fluvial flows both barrage options (a) and (b) be closed at the low tide preceding a tidal event. The lowest tide level within the bay preceding a 0.5% AEP tidal event is -1.19m OD Malin. The typical low bank level within the harbour is 1.6m OD Malin. The barrage will be mechanically operated depending on flood forecasting. If the barrage is closed at low tide, this gives an average depth of available storage for fluvial flows within the barrage of 2.49m less than the fluvial flood extents. The proposed storage area will result in the temporary reoccuringimpact due fluvial inundation of freshwater on the Annex I coastal habitats (estuary, mudflat, sandflat and saltmarsh communities) upstream. *Mytilus edulis* are important indicator species and are known to occur within the estuary. *Mytilus edulis* are tolerant to changes in salinity and will close during any temporary changes resulting from the influx of freshwater during a flood event. Significant impacts on the long term community structure and distribution of this species are unlikely.

There are several vegetation communities present on the Atlantic saltmarsh (ASM). The main saltmarsh is typically dominated by mid and mid-upper Atlantic Salt marsh communities these typically occur along the upper intertidal zone. *Salicornia* flats tend to be fringe type communities on saltmarsh habitats, and are typically tolerant to temporary freshwater inundation. Neither tidal barrage (a) nor (b) will have direct impact on the areas of *Salicornia* mud or Mediterranean salt meadows found at the eastern side of the townland of Foxbole above Youghal, at Blackbog, along the Tourig and Kinsalebeg estuaries. It is difficult to understand the main environmental factors affecting the distribution and extent of *Salicornia* flats within saltmarsh habitats. The extent of *Salicornia* flats can be very ephemeral and occur at the fringes of the Saltmarsh. The extent of *Salicornia* flats and Atlantic Salt Meadows are connected to accretion and the supply of sediment to form suitable areas for colonisation by this species. Typical lower marsh species such as Sea Arrowgrass and Salicornia are saline species, they are less tolerant of freshwater influx during the flood event. The potential impacts on these species are probable.

The proposed measures are designed to accommodate fluvial flows of 2.49m these are less than fluvial flood extents upstream within the Blackwater Estuary. The closure of the tidal barrage will result in indirect impacts on Annex I habitats upstream of the estuary due to alteration of tidal inundation and the influx of freshwater, changes in the nutrient loading and water salinity during the flood event. This in combination with changes in suspended sediments will temporarily alter the biodiversity and species range for the *Salicornia*, and other annuals colonising mudflats and sandflats and saltmarsh communities. The potential impacts on these communities are probable, however recovery will occur and habitat will regenerate itself.

The proposed measures will not impact on the intertidal range. The proposed tidal barrage will temporarily change the tidal inundation during 0.5% AEP flood event this will not likely affect the long term population dynamic of the community, the measure provide adequate fluvial storage which is less than the fluvial flood extent. The proposed measure will likely to temporary reoccurring change the composition of the intertidal area during a flood event.

The mudflats provide sheltered feeding grounds for a diversity of wintering waterbirds. When exposed or partially exposed by the tide, intertidal habitats provide important foraging areas for many species of waterbirds, especially wading birds, as well as providing roosting/loafing areas. When the intertidal area is inundated by the tide it becomes available for benthic and surface feeding ducks and piscivorous/other waterbirds. During this tidal state this area can be used by various waterbirds as a loafing/roosting resource. The construction of the tidal barrage has also potential negative impact on the migratory fish (Salmon, lamprey) these are QI within the SAC during a flood event. Freshwater Pearl Mussels do not occur within saline environments. The impediment to movement of host fish upstream due to physical obstruction of the migration of the host fish to pearl mussel populations during glochidia release will have significant effect on the reproductive success of the Freshwater Pearl Mussel. The tidal barrage is a physical structure with a mechanical sluice control gate approximately 40-50m wide, to accompany fishing vessels commuting in and out of the estuary. The sluice gate will be closed temporarily during a flood event.

The proposed measures, both tidal barrage (a) and (b), occurs downstream and outside the boundary Blackwater Estuary SPA. For Blackwater Estuary SPA, it has an estimated intertidal area of 318 ha, the availability of suitable feeding habitat is further upstream of the proposed measures. Temporary recurring impacts on the local conditions of the feeding grounds for waterbirds are probable. The barrage will remain closed until the tide level outside is lower than the maximum water level within the barrage (1.6m OD Malin). Therefore, the barrage should remain closed for approx. 7 hours. The tidal barrage is designed to allow sufficient storage below the fluvial flood extent level and will alter tidal regime landward of the barrage. The barrage will potentially result in localised impact feeding habitat for the waterbirds. The closure of the tidal barrage will occur during a 0.5% AEP flood event is extremely unlikely to result in change in distribution and long term habitat availability for the forage and roosting of waterbirds within the SPA.

Construction activities will cause temporary disturbance to birds in the SPA which may cause them to temporarily move to alternative suitable feeding areas. The disturbance to other areas may increase feeding competition in these areas in the short term, however the construction of the flood risk management measures will unlikely impact on the population sizes and success rates and conservation status of the qualifying interests of the SPA in the long term.

4.2.6 Summary of Likely Impacts on the Blackwater River SAC, the Blackwater Callows SPA and Blackwater Estuary SPA

Likely impacts of flood risk management options for the AFAs of Ballyduff, Kanturk and Rathcormac and Youghal are summarised in Table 4.2. Impacts which have been identified as 'extremely unlikely' (i.e. <5% chance of occurring) have been screened out from further assessment. All other impacts are considered to be likely and are considered for significance in Section 5 of this assessment.

Table 4.2: Summary of Likely Impacts

Qualifying Feature /	Viable Options for the Areas of Further Assessment										
	Youghal			Ballyduff	Kanturk				Rathcormac		
	Flood Walls	Tidal Barrage (a)	Tidal Barrage (b)	Flood Walls and Embankments	Flood Walls and Embankments	Storage Area	Weir Removal	Flood Forecasting	Flood Walls	Storage Area	Flow Diversion
Estuaries	Impacts are extremely unlikely	**Near certain direct impacts on the estuary habitat**	**probable indirect impacts on the coastal Annex I habitat during flood event**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Mudflats and Sandflats not covered by seawater at low tide	Impacts are extremely unlikely	**Near certain direct damage on Annex I habitat** **probable indirect impact coastal Annex I habitats during flood event**	**probable indirect impacts on the coastal Annex I habitat during flood event**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Perennial Vegetation of stony banks	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Qualifying Feature /	Viable Options for the Areas of Further Assessment										
	Youghal			Ballyduff	Kanturk				Rathcormac		
	Flood Walls	Tidal Barrage (a)	Tidal Barrage (b)	Flood Walls and Embankments	Flood Walls and Embankments	Storage Area	Weir Removal	Flood Forecasting	Flood Walls	Storage Area	Flow Diversion
Salicornia and other annuals colonising mud and sand	Impacts are extremely unlikely	**Probable impact species during flood event**	**Probable impact species during flood event**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Atlantic Salt Meadows	Impacts are extremely unlikely	**Probable impact species during flood event**	**Probable impact species during flood event**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lamprey	Impacts are extremely unlikely	**Probable impacts from sedimentation during construction** **Barrier to migration is probable**	**Probable impacts from sedimentation during construction** **Barrier to migration is probable**	**Probable impacts from sedimentation**	**Unlikely impacts from sedimentation**	**Damage to Juvenile Lamprey habitat is near certain.** **Excavation of Juvenile Lamprey is probable** **Barrier to young Sea Lamprey migration is probable**	**Displacement of Juvenile Lamprey is probable**	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely
Atlantic Salmon	Impacts are extremely unlikely	**Probable impacts from sedimentation** **Barrier to migration is probable**	**Probable impacts from sedimentation** **Barrier to migration is probable**	**Probable impacts from sedimentation**	**Unlikely impacts from sedimentation**	Impacts on fish passage are extremely unlikely	Probable positive impact by removal of barrier	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely
White Clawed	Impacts are extremely	Impacts are extremely	Impacts are extremely	Impacts are extremely	Impacts are extremely	Impacts are extremely	Impacts are extremely	Impacts are extremely	Impacts are	Impacts are	Impacts are

Qualifying Feature /	Viable Options for the Areas of Further Assessment										
	Youghal			Ballyduff	Kanturk				Rathcormac		
	Flood Walls	Tidal Barrage (a)	Tidal Barrage (b)	Flood Walls and Embankments	Flood Walls and Embankments	Storage Area	Weir Removal	Flood Forecasting	Flood Walls	Storage Area	Flow Diversion
Crayfish	unlikely	unlikely	unlikely	unlikely	unlikely	unlikely	unlikely	unlikely	extremely unlikely	extremely unlikely	extremely unlikely
Twait Shad	Impacts are extremely unlikely	**Barrier to migration is probable**	**Barrier to migration is probable**	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely
Freshwater pearl mussel	Impacts are extremely unlikely	**probable impacts on the migration of host salmon upstream**	**probable impacts on the migration of host salmon upstream**	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	**Impacts are near certain in the Allow River**	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely
Otter	Disturbance of Otter is extremely unlikely	Disturbance of Otter is extremely unlikely	Disturbance of Otter is extremely unlikely	Impacts are extremely unlikely	Disturbance of Otter is extremely unlikely	**Impacts on Otter resting places are probable**.	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely
Killarney Fern	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely
Floating river vegetation	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	**Impacts of sedimentation are probable**	Impacts are extremely unlikely	**Impacts are near certain**	**Local change in habitat is probable**	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely
Alluvial forests	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely
Oak woodlands	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely	Impacts are extremely unlikely
Wetland Birds of	N/A	N/A	N/A	**Disturbance is unlikely**	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Qualifying Feature /	Viable Options for the Areas of Further Assessment										
	Youghal			Ballyduff	Kanturk				Rathcormac		
	Flood Walls	Tidal Barrage (a)	Tidal Barrage (b)	Flood Walls and Embankments	Flood Walls and Embankments	Storage Area	Weir Removal	Flood Forecasting	Flood Walls	Storage Area	Flow Diversion
the Blackwater Callows SPA											
Wetlands of the Blackwater Callows SPA	N/A	N/A	N/A	Damage to habitat is extremely unlikely	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wetland Birds of the Blackwater Estuary SPA	Local change in habitat is extremely unlikely	**Local change in habitat is probable**	**Local change in habitat is probable**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

5 Significance of Impacts on Natura 2000 Sites

5.1 General

The significance of an impact is relative to the existing condition/conservation status of a Natura 2000 site and to the scale of the impact in space and time.

Favourable conservation condition of an Annex I habitat is achieved when:
- its natural range, and area it covers within that range, are stable or increasing,
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation condition of an Annex II species is achieved when:
- population dynamics data on the species concerned indicate that it is maintaining itself on a long term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Ireland has determined site-specific conservation objectives for a number of Natura 2000 sites within the State, including the River Blackwater SAC. These site-specific conservation objectives define favourable conservation condition for each of the habitats and species for which the SAC is designated in terms of specific attributes and targets which must be achieved / maintained.

Impacts are assessed as significant where the conservation objectives of a Natura 2000 site are undermined.

5.2 Assessment of Significance

The assessment of the significance of the likely impacts on the conservation objectives / condition of Natura 2000 sites are presented hereunder.

Where it is determined that a likely impact of the flood risk management options will have a significant impact on a Natura 2000 site, the flood risk management options must be assessed through full Appropriate Assessment. The precautionary principle must be applied in determining significance of an impact. Where the significance of an impact cannot definitively be ascertained on the basis of the information available it is required to progress to full Appropriate Assessment i.e. an option cannot be screened out unless there is certainty that no significant impact is likely.

No likely impacts from the implementation of flood risk management options in Rathcormac and Aglish have been identified. The significance of the likely impacts of flood risk management options in Ballyduff and Kanturk and Youghal are assessed hereunder in Tables 5.1 to 5.7.

Table 5.1: Assessment of Significance of Impacts for Flood Walls and Embankments in Ballyduff AFA

Qualifying Feature	Conservation Objectives	Impact Type	Significance of Impact
Sea Lamprey	**Distribution** - Greater than 75% of the main stem length of rivers in the SAC should be accessible from the estuary. Artificial barriers can block or cause difficulties to lampreys' upstream migration. **Extent and distribution of spawning habitat** - No decline in extent and distribution of spawning beds **Population structure of juveniles** - At least three age/size groups present **Juvenile density in fine sediment** - at least 1/m² **Availability of juvenile habitat** - More than 50% of sample sites positive	Sedimentation of spawning gravels	Sedimentation of Sea Lamprey spawning gravels within the River Blackwater downstream of Ballyduff will result in a decline in the extent of spawning beds within the SAC. **This is a significant Impact.**
Atlantic Salmon	**Distribution** - 100% of river channels down to second order accessible from estuary **Adult spawning fish** - Conservation Limit (CL) for each system consistently exceeded. **Salmon fry abundance** - Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. **Out-migrating smolt abundance** - No significant decline **Number and distribution of redds** - No decline in number and distribution of spawning redds due to anthropogenic causes **Water quality** - At least Q4 at all sites sampled by EPA	Sedimentation of spawning gravels	Sedimentation of Atlantic Salmon spawning gravels within the River Blackwater downstream of Ballyduff will result in a decline in the extent of spawning beds within the SAC. **This is a significant Impact.**
Floating river vegetation	The full distribution of this habitat and its sub-types in this site are currently unknown. Also the sub-types of this habitat are poorly understood and their typical species in Ireland have not yet been defined. **Significance of impact cannot be determined** in the absence of such information.		
Wetland Birds of the Blackwater Callows SPA	**Population** - Long term population trend stable or increasing. **Distribution** - No significant decrease in the numbers or range of areas used by waterbird species.	Noise and physical disturbance	The long term population trend for wintering wetland birds is determined over a 12 year period. The long term population trend for a species can show a pattern of increase and decline, i.e. variation between years. The long term population trend accommodates fluctuations in bird densities year on year and will not be impacted by temporary displacement of birds from feeding habitat during installation of flood protection measures. There will be no significant impact on population trend. Birds will be deterred from the Ballyduff area during construction works due to displacement by noise. The range of areas used by the birds of the SPA will therefore be reduced. However temporary displacement of birds from such a small proportion of the available foraging habitat within the SPA does not constitute a significant decrease in the numbers or range of areas used by waterbirds. There will be no significant impacts on distribution. **No Significant Impacts Determined**

Table 5.2: Assessment of Significance of Impacts for Flood Walls and Embankments in Kanturk AFA

Qualifying Feature	Conservation Objectives	Impact Type	Significance of Impact
Sea Lamprey	**Distribution** - Greater than 75% of the main stem length of rivers in the SAC should be accessible from the estuary. Artificial barriers can block or cause difficulties to lampreys' upstream migration. **Extent and distribution of spawning habitat** - No decline in extent and distribution of spawning beds **Population structure of juveniles** - At least three age/size groups present **Juvenile density in fine sediment** - at least 1/m² **Availability of juvenile habitat** - More than 50% of sample sites positive	Sediment release during construction forming a barrier to migration	Sedimentation of the Dalua or Allow can form a physical barrier to lamprey migration. Given the location of Kanturk on the lower reaches of the main channels of the Allow and Dalua Rivers, a barrier to migration at this location would inhibit access to a large proportion of the rivers. The 'Distribution' target that greater than the 75% of the main stem of rivers in the SAC should be accessible would not be met. **This would be a significant impact in the event that the temporary release of sediment to the watercourses as to occur during sea lamprey migration to spawning areas in Spring.**
Atlantic Salmon	**Distribution** - 100% of river channels down to second order accessible from estuary **Adult spawning fish** - Conservation Limit (CL) for each system consistently exceeded. **Salmon fry abundance** - Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. **Out-migrating smolt abundance** - No significant decline **Number and distribution of redds** - No decline in number and distribution of spawning redds due to anthropogenic causes **Water quality** - At least Q4 at all sites sampled by EPA	Sediment release during construction forming a barrier to migration	Physical barrier to migration due to sedimentation will be a temporary impact associated with the construction period only. The distribution target for Atlantic Salmon would be temporarily impacted. **This would be significant if it were to occur during inland migration of salmon during spring /summer or seaward migration of salmon smolts between April and June.** Also, given the location of Kanturk on the lower reaches of the main channels of the Allow and Dalua Rivers, a barrier to out-migration of salmon smolts at this location could cause a significant decline in the number of smolts reaching the sea. .

Table 5.3: Assessment of Significance of Impacts for a Storage Area on the Dalua River in Kanturk AFA

Qualifying Feature	Conservation Objectives	Impact Type	Significance of Impact
Lamprey (Sea, Brook and River)	Sea Lamprey: **Distribution** - Greater than 75% of the main stem length of rivers in the SAC should be accessible from the estuary. Artificial barriers can block or cause difficulties to lampreys' upstream migration. **Extent and distribution of spawning habitat** - No decline in extent and distribution of spawning beds **Population structure of juveniles** - At least three age/size groups present **Juvenile density in fine sediment** - at least 1/m² **Availability of juvenile habitat** - More than 50% of sample sites positive Brook & River Lamprey: **Distribution** - Access to all water courses down to first order streams **Extent and distribution of spawning habitat** - No decline in extent and distribution of spawning beds **Population structure of juveniles** - At least three age/size groups present **Juvenile density in fine sediment** - at least 2/m² **Availability of juvenile habitat** - More than 50% of sample sites positive	Damage to Juvenile Lamprey habitat during construction of control structure on the watercourse Excavation of Juvenile Lamprey in river bed material within the footprint of the control structure Barrier to young lamprey migration when control structure is restricting flows	The construction of the control structure is likely to result in the permanent loss of juvenile Lamprey habitat. Control structures are sized relative to the river channel width. Channel width at the proposed location is approximately 10m. A structure 40m in length would be necessary for such a channel, equating to a loss of habitat of 400m^2. Given the availability of suitable juvenile Lamprey habitat within the Dalua River and also within the River Blackwater SAC, the loss of habitat within the footprint of the control structure will not significantly impact the target for the 'Availability of Juvenile Habitat' of more than 50% of sample sites positive. Excavation of juvenile Lamprey will result in a reduction in overall density within the SAC. However given the high prevalence of fine sediment within the Dalua River and within the entire SAC, the excavation of lamprey from a 400m^2 area will not significantly impact the overall density within the SAC. The control structure will form an artificial barrier to lamprey movement when it is in operation. This will temporarily impede the attainment of the Distribution target for Sea, River and Brook Lamprey. This would be significant where it occurs during upstream migration to spawning habitat however it has been determined that this is not a likely impact. **No Significant Impacts Determined**
Otter	**Distribution** - FCS target is 88% in SACs. Current range in south-west estimated at 74.5% **Extent of terrestrial habitat** - No significant decline. Area mapped and calculated as 1165.7ha along river banks/ around ponds. **Extent of freshwater (river) habitat** - No significant decline. Length mapped and calculated as 599.54km **Extent of freshwater (lake) habitat** – No significant decline. Area mapped and calculated as 25.06ha **Couching sites and holts** - No significant decline **Fish biomass available** – No significant decline **Barriers to connectivity** - No significant decline	Possible damage to holt / couch	Otter territories have been documented to range from 1km to 20km and are dependent on the quality of foraging habitat. Otter territories in the Blackwater Catchment are likely to be towards the smaller scale given the quality of fishery habitat in the Blackwater and its tributaries. The removal of resting places from a smaller territory is a more significant impact as it is likely that there will be a lesser number of resting places established in a smaller territory. **This is a significant Impact.**
Floating river vegetation	The full distribution of this habitat and its sub-types in this site are currently unknown. Also the sub-types of this habitat are poorly understood and their typical species in Ireland have not yet been defined. Significance of impact cannot be determined in the absence of such information. **Significant Impacts Uncertain**		

Table 5.4: Assessment of Significance of Impacts for Weir Removal on the Dalua River in Kanturk AFA

Qualifying Feature	Conservation Objectives	Impact Type	Significance of Impact
Lamprey	Sea Lamprey: **Distribution** - Greater than 75% of the main stem length of rivers in the SAC should be accessible from the estuary. Artificial barriers can block or cause difficulties to lampreys' upstream migration. **Extent and distribution of spawning habitat** - No decline in extent and distribution of spawning beds **Population structure of juveniles** - At least three age/size groups present **Juvenile density in fine sediment** - at least 1/m² **Availability of juvenile habitat** - More than 50% of sample sites positive Brook & River Lamprey: **Distribution** - Access to all water courses down to first order streams **Extent and distribution of spawning habitat** - No decline in extent and distribution of spawning beds **Population structure of juveniles** - At least three age/size groups present **Juvenile density in fine sediment** - at least 2/m² **Availability of juvenile habitat** - More than 50% of sample sites positive	Damage to Juvenile Lamprey habitat Displacement of Juvenile Lamprey	The removal of the weirs is likely to result in the permanent loss of juvenile Lamprey habitat which will have built up behind the weirs. Given the availability of suitable juvenile Lamprey habitat within the Dalua River and also within the River Blackwater SAC, the loss of habitat from behind the weirs will not significantly impact the target for the 'Availability of Juvenile Habitat' of more than 50% of sample sites positive. Displacement of juvenile Lamprey will not result in a reduction in overall density within the SAC. There is a high prevalence of fine sediment within the Dalua River and within the entire SAC, there is available suitable habitat downstream for displaced lamprey. The weir is an artificial barrier to lamprey movement. This will be removed and will have a positive effect on the attainment of the Distribution target for Sea, River and Brook Lamprey. **No Significant Impacts Determined**
Floating river vegetation	The full distribution of this habitat and its sub-types in this site are currently unknown. Also the sub-types of this habitat are poorly understood and their typical species in Ireland have not yet been defined. Significance of impact cannot be determined in the absence of such information. **Significant Impacts Uncertain**		

Table 5.5: Assessment of Significance of Impacts for Flood Warning in Kanturk AFA

Qualifying Feature	Conservation Objectives	Impact Type	Significance of Impact
Freshwater Pearl Mussel	**Distribution** – Maintain at 161km which equates to the length of channel from the most upstream records of the freshwater pearl mussel to the most downstream records of live mussels. **Population** - Restore to 35,000 adult Mussels. Current population is estimated at less than 10,000 for the Blackwater main channel. **Recruitment** - The Blackwater population is believed to be composed entirely of aged adults, with no evidence of recruitment for at least 20 Years. The objective is to restore to 20% of the population equating to young mussels and %5 juvenile mussels. **Adult mortality** - No more than 5% decline from previous number of live adults counted; dead shells less than 1% of the adult population and scattered in distribution (considered to be natural loss). **Habitat extent** - data for the Blackwater and its tributaries is poor. The target is to restore suitable habitat in more than 35km **Water quality** - restore high Water Framework Directive biological quality elements. **Substratum quality** – target is <5% filamentous Algae and macrophytes and achieve stable cobble and gravel substrate with very little fine material; no artificially elevated levels of fine sediment and good redox potential. **Hydrological regime** - Restore appropriate hydrological regimes such that 1) high flows can wash fine sediments from the substratum, 2) low flows do not exacerbate the deposition of fines and 3) low flows do not cause stress to mussels in terms of exposure, water temperatures, food availability or aspects of the reproductive cycle **Host fish** - Fish presence is considered sufficient in the catchment. The conservation objective is to maintain sufficient juvenile salmonids to host glochidial larvae.	Sedimentation of the watercourse	An escape of sediment into the Allow River during installation of gauge stations could result in deposition of sediment upon adult mussels. There is an associated risk of mussel death through oxygen deprivation or starvation. This will significantly impact the population target and adult mortality target for pearl mussel and also suitability of pearl mussel habitat within the Allow River. **This is a significant impact**

Table 5.6: Assessment of Significance of Impacts for Tidal Barrage (a) in Youghal AFA

Qualifying Feature	Conservation Objectives	Impact Type	Significance of Impact
Estuaries	**Habitat area-** the permanent habitat area is stable or increasing, subject to natural processes **Community extent-** maintain the extent of the *Mytilus edulis*-dominated community subject to natural processes **Community structure –** conserve the high quality of the *Mytilus edulis*-dominated community subject to natural processes **Community distribution**- conserve the following community; intertidal estuarine sandy mud community complex; subtidal estuarine fine sand with *Bathyporeia spp*. Community complex; sand and mixed sediment with polychaetes and crustaceans community complex; coarse sediment community complex	Damage to Annex I habitat Sedimentation of the watercourse during construction phase	The control structure will result in direct loss of Annex I habitat. **This is a significant impact.** The construction activities have the potential to re-suspended sediments which could be transported outside the works area by tidal currents and subsequently settle out and impact on benthic habitats and species in other locations within the estuary The proposed structure will result in short term influx of freshwater upstream of the barrage *Mytilus edulis* occur within the estuary, these are tolerant to temporary changes to salinity and the proposed measure will not significantly impact on the population extent or community structure of the species. The proposed measure will likely be a short term impact on the community distribution of coastal communities however recovery will occur and the measure is not expected to affect the long term community distribution which is derived over 12 year period**. No Significant Impacts Determined**
Mudflats and Sandflats not covered by seawater at low tide	**Habitat area-** the permanent habitat area is stable or increasing, subject to natural processes **Community extent-** maintain the extent of the *Zostera* and *Mytilus edulis*-dominated community subject to natural processes **Community structure –** conserve the high quality of the *Mytilus edulis*-dominated community subject to natural processes **Community distribution**- the following community types should be conserved in a natural condition; intertidal estuarine sandy mud community complex and sand and mixed sediment with polychaetes and crustaceeans community complex.	Damage to Annex I habitat Sedimentation of the watercourse during construction phase	The construction activities have the potential to re-suspended sediments which could be transported outside the works area by tidal currents and subsequently settle out and impact on benthic habitats and species in other locations upstream of the works. The control structure will result in direct loss of Annex I habitat. **This is a significant impact** The proposed structure will result in short term influx of freshwater upstream of the barrage when its closed during a flood event. *Mytilus edulis* occur within the estuary, these are tolerant to temporary changes to salinity and the proposed measure will not significantly impact on the population extent or community structure of the species. The proposed measure will likely be a temporary impact on the community distribution of coastal communities however recovery will occur and the measure is not expected to affect the long term community distribution which is derived over 12 year period. The hydrodynamic response to the closure of the barrage is temporary and will result in temporary influx of freshwater upstream of the measures. The proposed measure will not significantly change the tidal range or community distribution within the estuary **No Significant Impacts Determined**
Salicornia and other annuals colonising mud and sand	**Habitat area-** area stable or increasing subject to natural processes, including erosion and succession **Habitat distribution**- no decline, or change in habitat distribution subject to natural processes **Physical structure-** maintain natural circulation of sediments and organic matter without any physical obstructions **Physical structure creeks and pans-**maintain creek and pan structure subject to natural processes including erosion and succession **Physical structure-** flooding regime- maintain natural tidal regime **Vegetation structure zonation**- maintain the range of coastal habitats including transitional zones subject to natural processes including erosion and succession	Changes to tidal range and community structure	The proposed measure will not result in direct damage on this Annex I habitat. Salicornia community is known to occur upstream within the Youghal estuary at the eastern side of the townland of Foxbole above Youghal, at Blackbog, along the Tourig and Kinsalebeg estuaries. They are ephemeral and transient in nature. The habitat is mainly associated with bays and estuaries where accretion is on-going. Its distribution can vary considerably from year to year and it can move in response to changing conditions. These species are used to saline conditions during tidal inundation at high tide and less tolerant to freshwater influences. **This is a significant impact** The closure of the tidal barrage will result in indirect impacts on Annex I habitats upstream of the estuary due to alteration of tidal inundation and the influx of freshwater, changes in the nutrient loading and water salinity during the flood event. This in combination with changes in suspended sediments may alter the biodiversity and species range for the Salicornia, and other annuals

Qualifying Feature	Conservation Objectives	Impact Type	Significance of Impact
	Vegetation structure vegetation height- maintain structural variation within sward **Vegetation structure ; vegetation cover-** maintain more than 90% of area outside creek vegetation **Vegetation composition ; typical species and sub-communities –** maintain the presence of species poor communities with typical species listed in saltmarsh monitoring project **Vegetation structure; negative indicator species *spartina anglica* –** no significant expansion of common cordgrass (spartina anglica) with an annual spread of less than 1%		colonising mudflats and sandflats and saltmarsh communities. **This is a significant impact**
Atlantic salt meadows (*Glauco-puccinellietialia Maritimae)*	**Vegetation composition;** typical species and sub communities -maintain range of sub communities with typical species listed in Saltmarsh Monitoring Project **Vegetation structure;** negative indicator species spartina anglica- no significant expansion of common cordgrass (Spartina anglica) with an annual spread of less than 1%.	Changes to tidal range and community structure	The proposed measure will not result in direct damage on this Annex I habitat. Erosion and accretion affects this habitat. Both of these are natural processes and ASM as a coastal habitat will attempt to adjust or reach equilibrium in response to local changes. Typically Salicornia and sea arrowgrass species occur within the lower marsh and are less tolerant of freshwater influences. The proposed tidal barrage will change the tidal inundation with freshwater influx over a 7 hour period during a flood event. **This is a significant impact**
Freshwater Pearl Mussel	**Distribution** – Maintain at 161km which equates to the length of channel from the most upstream records of the freshwater pearl mussel to the most downstream records of live mussels. **Population** - Restore to 35,000 adult Mussels. Current population is estimated at less than 10,000 for the Blackwater main channel. **Recruitment** - The Blackwater population is believed to be composed entirely of aged adults, with no evidence of recruitment for at least 20 Years. The objective is to restore to 20% of the population equating to young mussels and %5 juvenile mussels. **Adult mortality** - No more than 5% decline from previous number of live adults counted; dead shells less than 1% of the adult population and scattered in distribution (considered to be natural loss). **Habitat extent** - data for the Blackwater and its tributaries is poor. The target is to restore suitable habitat in more than 35km **Water quality** - restore high Water Framework Directive biological quality elements. **Substratum quality** – target is <5% filamentous Algae and macrophytes and achieve stable cobble and gravel substrate with very little fine material; no artificially elevated levels of fine sediment and good redox potential. **Hydrological regime** - Restore appropriate hydrological regimes such that 1) high flows can wash fine sediments from the substratum, 2) low flows do not exacerbate the deposition of fines and 3) low flows do not cause stress to mussels in terms of exposure, water temperatures, food availability or aspects of the reproductive cycle **Host fish** - Fish presence is considered sufficient in the catchment. The conservation objective is to maintain sufficient juvenile salmonids to host glochidial larvae	Barrier to young migration of host fish	Impediment to movement of host fish upstream to pearl mussel populations during glochidia release impacting reproductive success**. This is significant impact**
Sea Lamprey,	<u>Sea Lamprey:</u> **Distribution** - Greater than 75% of the main stem length of rivers in the SAC should be accessible from the estuary. Artificial barriers can block or cause difficulties to lampreys' upstream migration. **Extent and distribution of spawning habitat** - No decline in extent and distribution of spawning beds **Population structure of juveniles** - At least three age/size groups present **Juvenile density in fine sediment** - at least 1/m² **Availability of juvenile habitat** - More than 50% of sample sites positive	Barrier to young lamprey migration when control structure is restricting flows.	The control structure will form an artificial barrier to lamprey movement when it is in operation. Whilst the barrage is a permanent structure within the bay it has a gate approximately 50m wide to facilitate passage within the estuary, this measure will not have a considerable permanent obstruction when the gate is open. The barrage will temporarily impede the attainment of the Distribution target for Sea Lamprey during a flood event. Adults sea lamprey begin entering fresh water as early as April but chiefly during late May and early June. This would be significant where it occurs during upstream migration to spawning habitat. **This is a significant impact**
Salmon	**Distribution –** 100% of river channels down to 2nd order accessible from estuary **Adult spawning fish** –conservation limit (CL) for each system consistently exceeded **Salmon fry abundance –** maintain or exceed 0+ fry mean catchment wide abundance threshold value. Currently set at 17 salmon fry/ 5 min sampling **Out-migrating smolt abundance** = no significant decline **structure of juveniles** –more than one age class present **Water quality – at least Q4 at all sites sampled by EPA**	Barrier to young migration and smolt out-migrating when control structure is restricting flows	The control structure will form an artificial barrier to salmon movement when it is in operation. This will temporarily impede the attainment of the Distribution target for salmon and out-migrating smolt abundance. This would be significant if it were to occur during inland migration of salmon during spring /summer or seaward migration of salmon smolts between April and June . This would be significant where it occurs during upstream migration to spawning habitat, out migrating of smolts. Whilst the barrage is a permanent structure within the bay it has a gate approximately 50m wide to facilitate passage within the estuary, this measure will not have a significant permanent obstruction when the gate is open. **This is a significant impact**

Qualifying Feature	Conservation Objectives	Impact Type	Significance of Impact
Twait Shad	**Distribution -** Greater than 75% of the main stem length of rivers in the SAC should be accessible from the estuary. Artificial barriers can block or cause difficulties to lampreys' upstream migration **Extent and distribution of spawning habitat** - No decline in extent and distribution of spawning beds **Population structure of juveniles** –more than one age class present **Water quality oxygen levels-** no lower than 5mg/l **Spawning habitat quality** – maintain stable gravel substrate with very little fine material, free of filamentous algal growth and macrophyte growth	Barrier to young migration and smolt out-migrating when control structure is restricting flows	The control structure will form an artificial barrier to shad movement when it is in operation. This will temporarily impede the attainment of the Distribution target for salmon and out-migrating smolt abundance. This would be significant where it occurs during upstream migration to spawning habitat, out migrating of smolts. **This is a significant impact**
Wetland Birds of the Blackwater Estuary SPA	**Population trend-** long term population trend stable or increasing **Distribution –**there should be no significant decrease in the range, timing or intensity of use of areas by qualifying species other than that occurring from natural patterns of variation	Localised changes in available feeding habitat Temporary noise disturbance	Construction activities will cause temporary disturbance to birds in commuting upstream to the SPA which may cause them to temporarily displacement to alternative suitable feeding areas. The disturbance to other areas may temporary increase feeding competition in these areas, however the construction of the flood risk management measures will unlikely impact on the population sizes and success rates and conservation status of the qualifying interests of the SPA in the long term. The long term population trends are derived over 12 year period. The barrage will remain closed until the tide level outside is lower than the maximum water level within the barrage (1.6m OD Malin). Therefore, the barrage should remain closed for approx. 7 hours. The birds will still have availability of roosting areas Barrage will potentially will cause temporary localised impact feeding habitat for the waterbirds for approximately 3 hours. The closure of the barrage will occur during a 0.5% AEP flood event is extremely unlikely to result in change in roosting area distribution fluvial influence is up to high water mark. Birds feed on a mixture of crustaceans and worms there will be temporary reoccurring reduction of biomass availability to the influence of freshwater on infauna on the mudflat habitat (breeding area). However this will not be deemed significant due the temporary nature of the measure. **No Significant Impacts Determined** Construction activities will cause temporary disturbance to birds in the SPA which may cause them to temporarily move to alternative suitable feeding areas. The disturbance to other areas may increase feeding competition in these areas in the short term, however the construction of the flood risk management measures will unlikely impact on the population sizes and success rates and conservation status of the qualifying interests of the SPA in the long term. **No Significant Impacts Determined**

Table 5.7: Assessment of Significance of Impacts for Tidal Barrage (b) in Youghal AFA

Qualifying Feature	Conservation Objectives	Impact Type	Significance of Impact
Estuaries	**Habitat area-** the permanent habitat area is stable or increasing, subject to natural processes **Community extent-** maintain the extent of the *Mytilus edulis*-dominated community subject to natural processes **Community structure –** conserve the high quality of the *Mytilus edulis*-dominated community subject to natural processes **Community distribution**- conserve the following community; intertidal estuarine sandy mud community complex; subtidal estuarine fine sand with *Bathyporeia spp*. Community complex; sand and mixed sediment with polychaetes and crustaceans community complex; coarse sediment community complex	Damage to Annex I habitat Sedimentation of the watercourse Changes to tidal range within the estuary	The construction activities have the potential to re-suspended sediments which could be transported outside the works area by tidal currents and subsequently settle out and impact on benthic habitats and species in other locations within the estuary. The control structure will not result in direct loss of Annex I habitat. **No Significant Impacts Determined** The proposed structure will result in short term influx of freshwater upstream of the barrage when its closed during a flood event. *Mytilus edulis* occur within the estuary, these are tolerant to short term changes to salinity and the proposed measure will not significantly impact on the population extent or community structure of the species. The proposed measure will likely be a short term impact on the community distribution of coastal communities however recovery will occur and the measure is not expected to affect the long term community distribution which is derived over 12 year period**.** The hydrodynamic response to the closure of the barrage is temporary and will result in temporary influx of freshwater upstream of the measures. The proposed measure will not significantly change the tidal range or community distribution within the estuary. **No Significant Impacts Determined**
Mudflats and Sandflats not covered by seawater at low tide	**Habitat area-** the permanent habitat area is stable or increasing, subject to natural processes **Community extent-** maintain the extent of the *Zostera* and *Mytilus edulis*-dominated community subject to natural processes **Community structure –** conserve the high quality of the *Mytilus edulis*-dominated community subject to natural processes **Community distribution**- the following community types should be conserved in a natural condition; intertidal estuarine sandy mud community complex and sand and mixed sediment with polychaetes and crustaceeans community complex.	Damage to Annex I habitat	The construction activities have the potential to re-suspended sediments which could be transported outside the works area by tidal currents and subsequently settle out and impact on benthic habitats and species in other locations upstream of the works. The control structure will not result in direct loss of Annex I habitat. **No Significant Impacts Determined** The proposed structure will result in short term influx of freshwater upstream of the barrage when its closed during a flood event. *Mytilus edulis* occur within the estuary, these are tolerant to short term changes to salinity and the proposed measure will not significantly impact on the population extent or community structure of the species. The proposed measure will likely be a short term impact on the community distribution of coastal communities however recovery will occur and the measure is not expected to affect the long term community distribution which is derived over 12 year period. The hydrodynamic response to the closure of the barrage is temporary and will result in temporary influx of freshwater upstream of the measures. The proposed measure will not significantly change the tidal range or community distribution within the estuary **No Significant Impacts Determined**
Salicornia and other annuals colonising mud	**Habitat area-** area stable or increasing subject to natural processes, including erosion and succession	Changes to tidal range and community structure	The proposed measure will not result in direct damage on this Annex I habitat. Salicornia community is known to occur upstream within the Youghal estuary at the eastern side of

Qualifying Feature	Conservation Objectives	Impact Type	Significance of Impact
and sand	**Habitat distribution**- no decline, or change in habitat distribution subject to natural processes **Physical structure-** maintain natural circulation of sediments and organic matter without any physical obstructions **Physical structure creeks and pans-**maintain creek and pan structure subject to natural processes including erosion and succession **Physical structure-** flooding regime- maintain natural tidal regime **Vegetation structure zonation**- maintain the range of coastal habitats including transitional zones subject to natural processes including erosion and succession **Vegetation structure vegetation height-** maintain structural variation within sward **Vegetation structure ; vegetation cover-** maintain more than 90% of area outside creek vegetation **Vegetation composition ; typical species and sub-communities –** maintain the presence of species poor communities with typical species listed in saltmarsh monitoring project **Vegetation structure; negative indicator species *spartina anglica* –** no significant expansion of common cordgrass (*spartina anglica*) with an annual spread of less than 1%		the townland of Foxbole above Youghal, at Blackbog, along the Tourig and Kinsalebeg estuaries. They are ephemeral and transient in nature. The habitat is mainly associated with bays and estuaries where accretion is on-going. They typically occur on the fringes of saltmarsh. Its distribution can vary considerably from year to year and it can move in response to changing conditions. These species are used to saline conditions during tidal inundation at high tide and are less tolerant to freshwater influences. **This is a significant impact** The closure of the tidal barrage will result in indirect impacts on Annex I habitats upstream of the estuary due to alteration of tidal inundation and the influx of freshwater, changes in the nutrient loading and water salinity during the flood event. This in combination with changes in suspended sediments may alter the biodiversity and species range for the Salicornia, and other annuals colonising mudflats and sandflats and saltmarsh communities. **This is a significant impact**
Altantic salt meadows (*Glauco-puccinellietialia Maritimae)*	**Vegetation composition;** typical species and sub communities -maintain range of sub communities with typical species listed in Saltmarsh Monitoring Project **Vegetation structure;** negative indicator species spartina anglica- no significant expansion of common cordgrass (*Spartina anglica*) with an annual spread of less than 1%.	Changes to tidal range and community structure	The proposed measure will not result in direct damage on this Annex I habitat. Erosion and accretion affects this habitat. Both of these are natural processes and ASM as a coastal habitat will attempt to adjust or reach equilibrium in response to local changes. Typically Salicornia and sea arrowgrass species occur within the lower marsh and are less tolerant of freshwater influences. The proposed tidal barrage will change the tidal inundation with freshwater influx over a 7 hour period during a flood event. **This is a significant impact**
Freshwater Pearl Mussel	**Distribution** – Maintain at 161km which equates to the length of channel from the most upstream records of the freshwater pearl mussel to the most downstream records of live mussels. **Population** - Restore to 35,000 adult Mussels. Current population is estimated at less than 10,000 for the Blackwater main channel. **Recruitment** - The Blackwater population is believed to be composed entirely of aged adults, with no evidence of recruitment for at least 20 Years. The objective is to restore to 20% of the population equating to young mussels and %5 juvenile mussels. **Adult mortality** - No more than 5% decline from previous number of live adults counted; dead shells less than 1% of the adult population and scattered in distribution (considered to be natural loss). **Habitat extent** - data for the Blackwater and its tributaries is poor. The target is to restore suitable habitat in more than 35km **Water quality** - restore high Water Framework Directive biological quality elements. **Substratum quality** – target is <5% filamentous Algae and macrophytes and achieve stable cobble and gravel substrate with very little fine material; no artificially elevated levels of fine sediment and good redox potential. **Hydrological regime** - Restore appropriate hydrological regimes such that 1) high flows can wash fine sediments from the substratum, 2) low flows do not exacerbate the deposition of fines and 3) low flows do not cause stress to mussels in terms of exposure, water temperatures, food availability or aspects of the reproductive cycle **Host fish** - Fish presence is considered sufficient in the catchment. The conservation objective is to maintain sufficient juvenile salmonids to host glochidial larvae	Barrier to young migration of host fish	Impediment to movement of host fish upstream to pearl mussel populations during glochidia release impacting reproductive success. **This is significant impact**
Sea Lamprey Sea	<u>Sea Lamprey:</u> **Distribution** - Greater than 75% of the main stem length of rivers in the SAC should be accessible from the estuary. Artificial barriers can block or cause difficulties to lampreys' upstream migration. **Extent and distribution of spawning habitat** - No decline in extent and distribution of spawning beds **Population structure of juveniles** - At least three age/size groups present **Juvenile density in fine sediment** - at least 1/m² **Availability of juvenile habitat** - More than 50% of sample sites positive	Barrier to young lamprey migration when control structure is restricting flows.	The control structure will form an artificial barrier to lamprey movement when it is in operation. Whilst the barrage is a permanent structure within the bay it has a gate approximately 50m wide to facilitate passage within the estuary, this measure will not have a considerable permanent obstruction when the gate is open. The barrage will temporarily impede the attainment of the Distribution target for Sea Lamprey during a flood event. Adults sea lamprey begin entering fresh water as early as April but chiefly during late May and early June. This would be significant where it occurs during upstream migration to spawning habitat. **This is a significant impact**
Salmon	**Distribution –** 100% of river channels down to 2nd order accessible from estuary **Adult spawning fish** –conservation limit (CL) for each system consistently	Barrier to young migration and smolt out-migrating when	The control structure will form an artificial barrier to salmon movement when it is in operation. This will temporarily impede the attainment of the Distribution target for salmon and out-migrating smolt

Qualifying Feature	Conservation Objectives	Impact Type	Significance of Impact
	exceeded **Salmon fry abundance –** maintain or exceed 0+ fry mean catchment wide abundance threshold value. Currently set at 17 salmon fry/ 5 min sampling **Out-migrating smolt abundance** = no significant decline **structure of juveniles** –more than one age class present **Water quality – at least Q4 at all sites sampled by EPA**	control structure is restricting flows	abundance. This would be significant if it were to occur during inland migration of salmon during spring /summer or seaward migration of salmon smolts between April and June . This would be significant where it occurs during upstream migration to spawning habitat, out migrating of smolts. Whilst the barrage is a permanent structure within the bay it has a gate approximately 50m wide to facilitate passage within the estuary, this measure will not have a significant permanent obstruction when the gate is open. **This is a significant impact**
Twait Shad	**Distribution -** Greater than 75% of the main stem length of rivers in the SAC should be accessible from the estuary. Artificial barriers can block or cause difficulties to lampreys' upstream migration **Extent and distribution of spawning habitat** - No decline in extent and distribution of spawning beds **Population structure of juveniles** –more than one age class present **Water quality oxygen levels-** no lower than 5mg/l **Spawning habitat quality** – maintain stable gravel substrate with very little fine material, free of filamentous algal growth and macrophyte growth	Barrier to young migration and smolt out-migrating when control structure is restricting flows	The control structure will form an artificial barrier to shad movement when it is in operation. This will temporarily impede the attainment of the Distribution target for salmon and out-migrating smolt abundance. This would be significant where it occurs during upstream migration to spawning habitat, out migrating of smolts. **This is a significant impact**
Wetland Birds of the Blackwater Estuary SPA	**Population trend-** long term population trend stable or increasing **Distribution –**there should be no significant decrease in the range, timing or intensity of use of areas by qualifying species other than that occurring from natural patterns of variation**.**	Localised changes in available feeding habitat	Construction activities will cause temporary disturbance to birds in commuting upstream to the SPA which may cause them to temporarily displacement to alternative suitable feeding areas. The disturbance to other areas may temporary increase feeding competition in these areas, however the construction of the flood risk management measures will unlikely impact on the population sizes and success rates and conservation status of the qualifying interests of the SPA in the long term. The long term population trends are derived over 12 year period. The barrage will remain closed until the tide level outside is lower than the maximum water level within the barrage (1.6m OD Malin). Therefore, the barrage should remain closed for approx. 7 hours. The birds will still have availability of roosting Barrage will not alter tidal range landward of the barrage, potentially will cause temporary localised impact feeding habitat for the waterbirds for approximately 3 hours. The closure of the barrage will occur during a 0.5% AEP flood event is extremely unlikely to result in change in roosting area distribution fluvial influence is up to high water mark. Birds feed on a mixture of crustaceans and worms there will be temporary reduction of biomass availability to the influence of freshwater on infauna on the mudflat habitat (breeding area). However this will not be deemed significant due the temporary nature of the measure. **No Significant Impacts Determined** Construction activities will cause temporary disturbance to birds in the SPA which may cause them to temporarily move to alternative suitable feeding areas. The disturbance to other areas may increase feeding competition in these areas in the short term, however the construction of the flood risk management measures will unlikely impact on the population sizes and success rates and conservation status of the qualifying interests of the SPA in the long term. **No Significant Impacts Determined**

6 Conclusions and Screening Statement

The assessment of impacts of flood risk management options in UoM 18 on Natura 2000 sites has determined that **significant impacts are likely or uncertain** for the Blackwater River SAC and Blackwater Callow SPA and Blackwater Estuary SPA

Table 6.1: Screening Matrix for UoM18

Screening Matrix	
Project	
Brief description of the project or plan	**Ballyduff AFA** Option 1 - Flood Defences Works -This option considers the mitigation of flood risk through the construction of fluvial flood defences within the town. These defences include walls, embankments and road raising. **Kanturk AFA structural options** : Option 1 – Flood Defences/Localised Protection Works- this option considers the mitigation of flood risk through the construction of flood defences and localised protection works. These defences include a combination of walls and embankments on both rivers ranging in height from 0.8m to 2.6m. Option 2 - Storage and Flood Defences - a viable location for the storage of fluvial flows was identified upstream on the River Dalua. A potential storage area of 330,000m2 was identified used in combination with localised defence works within the town ranging in height from 0.5m to 1.9m. Option 3- Flood Defences & Conveyance - This option would involve the removal of existing constructed weirs within the River Dalua at Church Street Footbridge in combination with localised protection works ranging in height from 0.5m to 2.5m. Non structural option includes a forecast warning system within the Allow River. **Youghal AFA** Tidal Barrage (a) – This option considers the mitigation of tidal flood risk through the construction of a tidal barrage at the narrowest part of the estuary within the Blackwater River SAC . The barrage will be approximately 715m in length. The elevation of the barrage will be 3.63m O.D. Malin. Tidal Barrage (b)- This option considers the mitigation of tidal flood risk through the construction of a tidal barrage outside the SAC boundary. The barrage will be approximately 1.4km in length. The elevation of the barrage will be 3.63m O.D. Malin.
Natura 2000 Site	
Brief description of the Natura 2000 site(s)	**The Blackwater River SAC** The River Blackwater is one of the largest rivers in Ireland, draining a major part of Co. Cork and parts of Counties Kerry, Limerick, Tipperary and Waterford. The site consists of most of the freshwater stretches of the system as well as the estuarine component at Youghal. ▪ Annex I habitats occurring within the site include estuaries, intertidal mudflats and sandflats, perennial vegetation of stony

Screening Matrix	
	banks, salt meadows, floating river vegetation, alluvial forests, yew woodland and oak woodlands. ▪ Aquatic species include: Lamprey (Lampetra planeri, L. fluviatilis, Petromyzon marinus) Twaite shad (Alosa fallax fallax), and Atlantic Salmon (Salmo salar). Substantial populations of Freshwater pearl mussel (Margaritifera margaritifera) occur. White-clawed crayfish (Austropotamobius pallipes) are confined to the Awbeg River. ▪ Otter (Lutra lutra) is widespread throughout the SAC. ▪ Killarney fern (Trichomanes speciosum) occurs near Lismore. **The Blackwater Callows SPA** The site comprises a 23 km stretch of the River Blackwater, running in a west to east direction between Fermoy and Lismore. It includes the river channel and strips of seasonally flooded grassland within the flood plain. The site is of high importance for wintering waterfowl. It supports an internationally important population of Whooper Swan (Cygnus Cygnus) and nationally important populations of Wigeon (Anas Penelope),Teal (Anas crecca) and Black-tailed Godwit (Limosa limosa). The population of Limosa limosa has exceeded the threshold for international importance at times. Little Egret also uses the site. **The Blackwater Estuary SPA** The Blackwater Estuary SPA is a relatively small, sheltered south-facing estuary, which extends from below Youghal Bridge to the Ferry Point peninsula. It comprises a section of the main channel of the River Blackwater. At low tide, intertidal flats are exposed. The intertidal sediments are mostly muds or sandy muds. Salt marshes occur along the sheltered inlets. A low-lying field which provides an important roost is included. The Blackwater Estuary is of high ornithological importance for wintering waterfowl, providing good quality feeding areas for a diversity of waterfowl species. At high tide, the birds roost along the shoreline and salt marsh fringe. The site supports an internationally important population of Black-tailed Godwit Limosa limosa (over 5% of the national total). It supports a further eight species in numbers of national importance: Wigeon (Anas Penelope, Golden Plover (Pluvialis apricaria), Lapwing (Vanellus vanellus), Dunlin (Calidris alpine), Curlew (Numenius arquata), and Redshank (Tringa totanus). A population of Bar-tailed Godwit Limosa lapponica exceeds the threshold for national importance in some winters. Egretta garzetta breeds locally and the Blackwater Estuary is a main feeding area.
Assessment Criteria	
Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the Natura 2000 site.	Construction of flood walls and embankments within ballyduff AFA within the Blackwater River SAC and the Blackwater Callows SPA. Construction of flood walls and embankments, construction of storage area and convegance measure on the Dalua and Allow Rivers are considered as part of the Blackwater Valley SAC. Construction of tidal barrage (a) within Youghal AFA which is within Blackwater River SAC and Blackwater Esturary SPA. Construction of tidal barrage (b) outside Natura 2000 site boundary and hydrologically connected to the Blackwater River SAC and Blackwater Estuary SPA.

Screening Matrix	
Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the Natura 2000 site by virtue of: Size and scale; Land-take; Distance from the Natura 2000 site or key features of the site; Resource requirements (water abstraction etc); Emissions (disposal to land, water or air); Excavation requirements; Transportation requirements; Duration of construction, operation, decommissioning etc; Other.	Sedimentation of the watercourse and pollution by accidental spills and leaks of fuel / oils from machinery. Sedimentation of spawning gravels Noise and physical disturbance Destruction of Annex I habitat due to in-stream works, Temporary changes in the tidal communities upstream, Barrier to young migration and smolt out-migrating when control structure is restricting flows and indirect impact on the reproductive success of Freshwater pearl mussels Damage to otter holt/couch
Describe any likely changes to the site arising as a result of: Reduction in habitat area; Disturbance to key species; Habitat or species fragmentation; Reduction in species density; Changes in key indicators of conservation value (water quality etc); Climate change.	Ballyduff AFA- impacts on extent and distribution of lamprey and salmon spawning gravels are possible and possible impact of sedimentation on floating river vegetation Kanturk AFA- storage area : possible impacts on otter holts/couch and possible impact of sedimentation on floating river vegetation Flood warning system- possible sedimentation and deposition of sediment upon adult Freshwater Pearl Mussels Youghal AFA: Tidal barrage (a)- direct and indirect damage to Annex I habitat possible, sedimentation of the estuary during the works, changes in the tidal inundation during a flood event resulting in an influx of freshwater conditions on lower marsh saltmarsh communities. Barrier to migration upstream and out migration of sea lamprey and salmon and twaite shad during flood event Impediment to movement of host fish upstream to pearl mussel populations during glochidia release due to sedimentation of the watercourse impacting reproductive success Tidal barrage (b)- indirect damage to Annex I habitat possible, sedimentation of the estuary during the works, changes in the tidal inundation during a flood event resulting in an influx of freshwater conditions on lower marsh saltmarsh communites. Barrier to migration upstream and out migration of sea lamprey and salmon and twaite shad during flood event Impediment to movement of host fish upstream to pearl mussel populations during glochidia release due to sedimentation of the watercourse impacting reproductive success .
Describe any likely impacts on the Natura 2000 site as a whole in terms of: Interference with the key relationships that define the structure of the site; Interference with key relationships that define the function of the site.	Sedimentation of the watercourse and pollution by accidental spills and leaks of fuel / oils from machinery. Sedimentation of spawning gravels Noise and physical disturbance Destruction of Annex I habitat due to in-stream works, Temporary changes in the tidal communities upstream, Barrier to young migration and smolt out-migrating when control

Screening Matrix	
	structure is restricting flows and indirect impact on the reproductive success of Freshwater pearl mussels Damage to otter holt/couch
Provide indicators of significance as a result of the identification of effects set out above in terms of: Loss; Fragmentation; Disruption; Disturbance; Change to key elements of the site.	Ballyduff AFA- impacts on extent and distribution of lamprey and salmon spawning gravels and loss on floating river vegetation habitat Kanturk AFA- storage area : loss foraging habitat and disturbance and removal of otter holts/couch loss of floating river vegetation Flood warning system- impact on population target and adult mortality of Freshwater Pearl Mussels Youghal AFA- Tidal barrage (a)- direct and indirect damage to Annex I habitat, sedimentation of the estuary during the works, changes in the tidal inundation during a flood event resulting in an influx of freshwater conditions on lower marsh saltmarsh communities'. Barrier to migration upstream and out migration of sea lamprey and salmon and twaite shad during flood event Impediment to reproductive success of Freshwater Pearl Mussel Tidal barrage (b)- indirect damage to Annex I habitat possible, sedimentation of the estuary during the works, changes in the tidal inundation during a flood event resulting in an influx of freshwater conditions on lower marsh saltmarsh communites. Barrier to migration upstream and out migration of sea lamprey and salmon and twaite shad during flood event Impediment to reproductive success of Freshwater Pearl Mussel
Describe from the above those elements of the project or plan, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.	Loss of Annex I habitat , loss of habitat and disruption of Annex II and IV species Floating water vegetation habitat are poorly understood and their typical species in Ireland have not yet been defined. Significance of impact cannot be determined.

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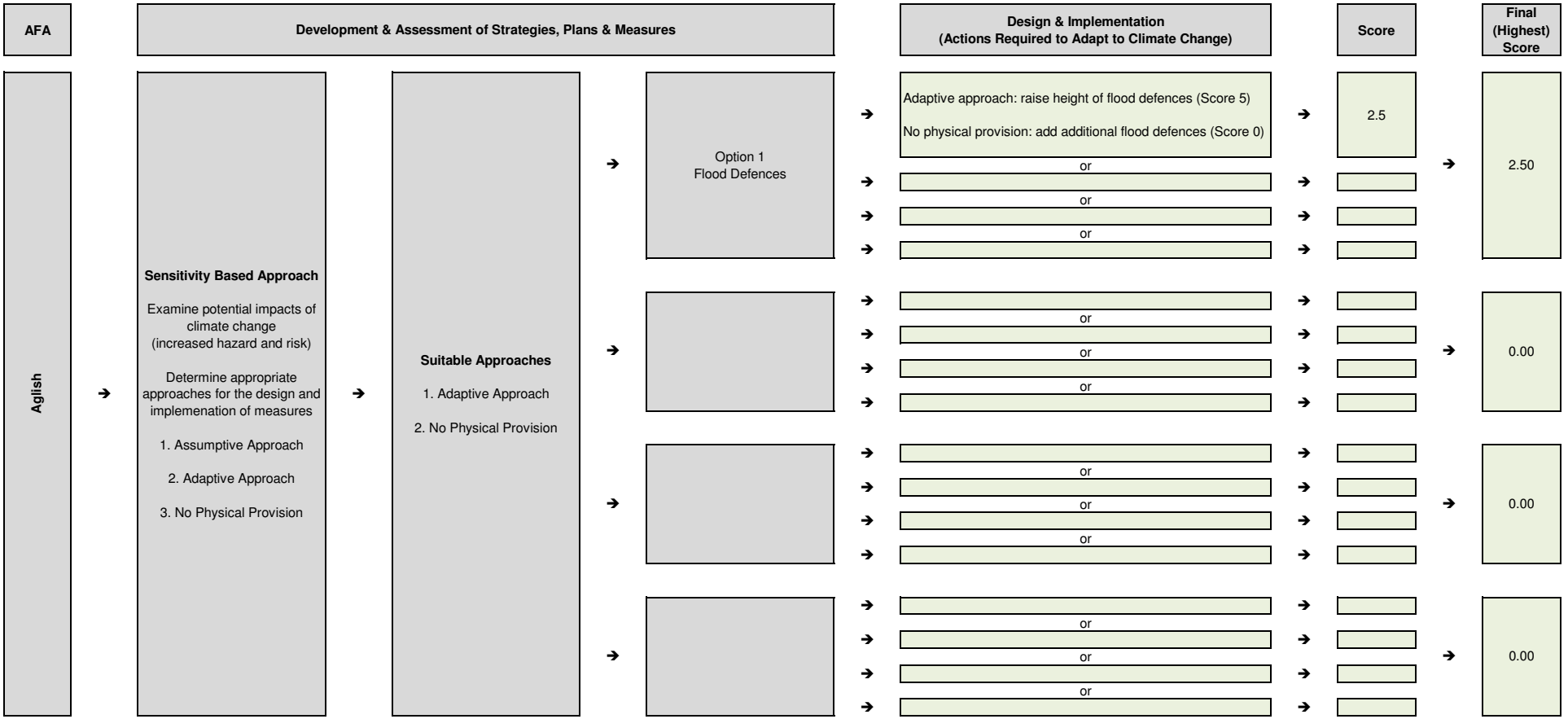
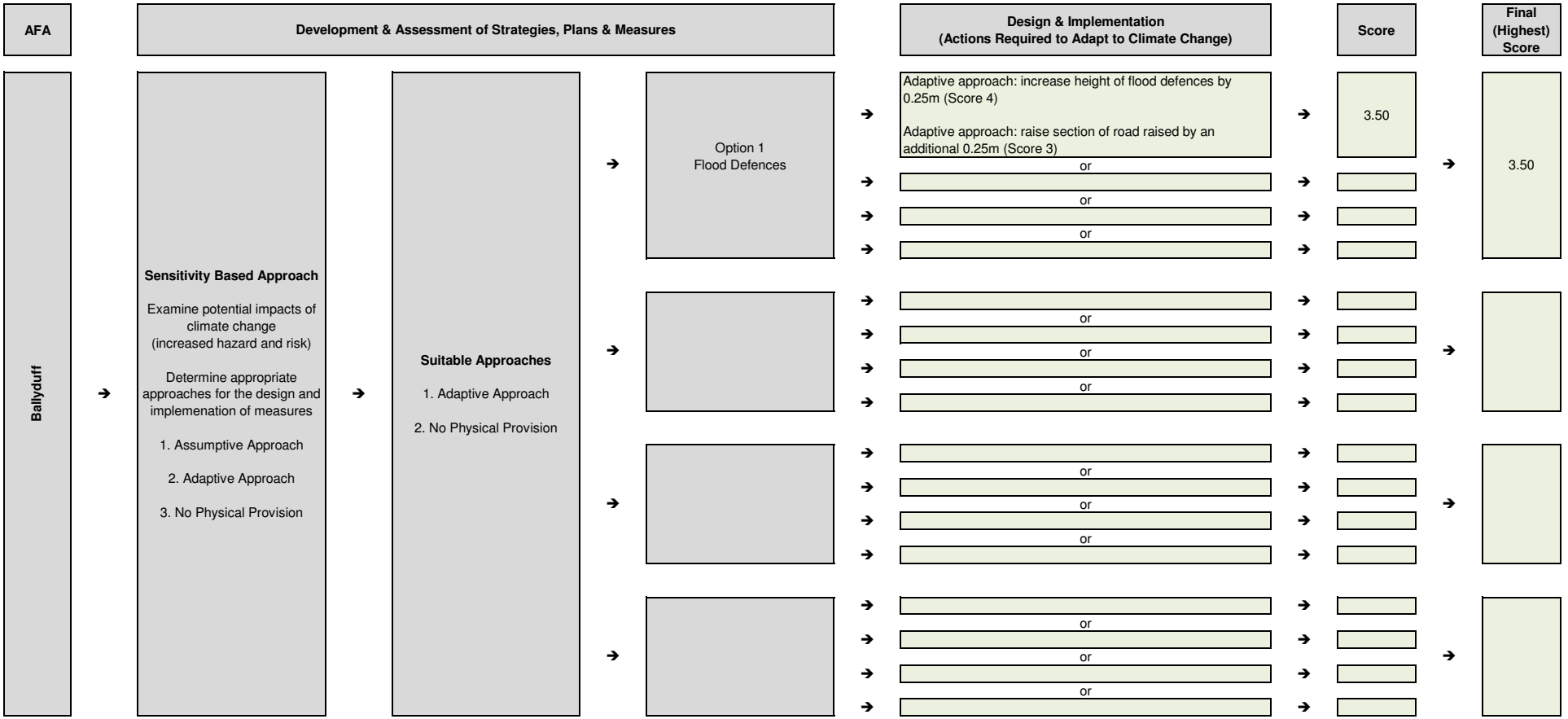
Appendix E. Climate Change Adaptability

Climate Change Adaptability



Climate Change Adaptability



Climate Change Adaptability

AFA	Development & Assessment of Strategies, Plans & Measures			Design & Implementation (Actions Required to Adapt to Climate Change)	Score	Final (Highest) Score
Kanturk	**Sensitivity Based Approach** Examine potential impacts of climate change (increased hazard and risk) Determine appropriate approaches for the design and implemenation of measures 1. Assumptive Approach 2. Adaptive Approach 3. No Physical Provision	**Suitable Approaches** 1. Adaptive Approach 2. No Physical Provision	Option 1 Flood Defences	Increase height of existing flood defences by 0.2m. Note: additional increase in height of existing defences may be accommodated by freeboard. (Score 4) No physical provision: construct an additional 800m of new flood walls. (Score 0)	2.00	2.00
			Option 2 Storage & Flood Defences	Adaptive approach: increase size and capacity of storage embankment heights (Score 3) Adaptive approach: increase height of flood defences by 0.2m (Score 4) No physical provision: construct an additional 900m of flood defence walls (Score 0)	2.33	2.33
			Option 3 Conveyance & Flood Defences	Adaptive approach: increase height of flood defences by 0.2m (Score 4) No physical provision: construct an additional 900m of flood defence walls (Score 0)	2.00	2.00
						0.00

Climate Change Adaptability

AFA	Development & Assessment of Strategies, Plans & Measures			Design & Implementation (Actions Required to Adapt to Climate Change)	Score	Final (Highest) Score
Rathcormack	**Sensitivity Based Approach** Examine potential impacts of climate change (increased hazard and risk) Determine appropriate approaches for the design and implemenation of measures 1. Assumptive Approach 2. Adaptive Approach 3. No Physical Provision	**Suitable Approaches** 1. Adaptive Approach 2. No Physical Provision	Option 1 Storage	Adaptive approach: increase size and capacity of storage area by increasing embankment heights (Score 3)	3	3.00
				or		
				or		
				or		
			Option 2 Flow Diversion	Adaptive approach: increase size of flow diversion culvert heights (Score 1)	1	1.00
				or		
				or		
				or		
			Option 3 Flood Defences	Adaptive approach: increase height of flood defences by 0.25m, note additional height may be accomodated by freeboard (Score 4) No physical provision: add an additional 150m of flood defence walls (Score 0)	2	2.00
				or		
				or		
				or		
						0.00
				or		
				or		
				or		

Climate Change Adaptability

AFA	Development & Assessment of Strategies, Plans & Measures			Design & Implementation (Actions Required to Adapt to Climate Change)	Score	Final (Highest) Score
Youghal	**Sensitivity Based Approach** Examine potential impacts of climate change (increased hazard and risk) Determine appropriate approaches for the design and implemenation of measures 1. Assumptive Approach 2. Adaptive Approach 3. No Physical Provision	**Suitable Approaches** 1. Adaptive Approach 2. No Physical Provision	Option 1 Flood Defences	Adaptive approach: increase height of flood defences by 0.3m (Score 4) No physical provision: construct an additional 400m of flood defence walls (Score 0) No physical provision: raise road by 0.3m at industrial park (Score 0)	1.33	1.33
				or		
				or		
				or		
			Option 2 (a) Tidal Barrage	Adaptive approach: raise height of tidal barrage (Score 3)	3.00	3.00
				or		
				or		
				or		
			Option 2 (b) Tidal Barrage	Adaptive approach: raise height of tidal barrage (Score 3)	3.00	3.00
				or		
				or		
				or		
						0.00
				or		
				or		
				or		

Appendix F. Multi Criteria Assessment

F.1 Local Weighting Data

AFA: Aglish

Objective	Local Weighting	Code	Rationale
Technical			
Ensure flood risk management options are operationally robust	5.00	1a1	Constant, as per Guidance Note 29
Reduce and where possible eliminate health and safety risks associated with the construction and operation of flood risk management options	5.00	1b1	Constant, as per Guidance Note 29
Ensure flood risk management options are adaptable to future flood risk	5.00	1c1	Constant, as per Guidance Note 29
Economy			
Minimise economic risk	0.16	2a1	11959/75000
Minimise risk to transport infrastructure	5.00	2b2	Motorway 250() + National Primary 150( ) + (National Secondary 75( ) + Regional 25( ) + Local Rural 10( ) + Local Urban 20(.5)
Minimise risk to utility infrastructure	0.00	2c3	Power Stations 500( ) + HV Sub-Stations 250( ) + Gas Assets - High Priority 100( ) + Gas Assets - Medium Priority 25( ) + Water Treatment Plants 250( ) + WwTP and Primary Pumping Facilities 250( ) + Core Telecommunications Exchanges 100( ) + Non-Core Telecommunications Exchanges 25( )
Manage Risk to Agricultue	0.00	2d1	Based on agriculture at risk
Social			
Minimise risk to human health and life of residents	1.25	3a1	Nr. at risk from 50% AEP 2*.5(1) + Nr. at risk from 20% AEP 2*.2( ) + Nr. at risk from 10% AEP 2*.1(1) + Nr. at risk from 5% AEP 2*.05( ) + Nr. at risk from 2% AEP 2*.02( ) + Nr. at risk from 1% AEP 2*.01(1) + Nr. at risk from .5% AEP 2*.005(3) + Nr. at risk from .1% AEP 2*.001(2)
Minimise risk to high vulnerability properties	0.00	3a2	Nr. at risk from 50% AEP 0.5*( ) + Nr. at risk from 20% AEP 0.2*( ) + Nr. at risk from 10% AEP 0.1*( ) + Nr. at risk from 5% AEP 0.05*( ) + Nr. at risk from 2% AEP 0.02*( ) + Nr. at risk from 1% AEP 0.01*( ) + Nr. at risk from .5% AEP 0.005*( ) + Nr. at risk from .1% AEP 0.001( )
Minimise risk to social infrastructure and amenity	0.00	3b1	Nr. at risk from 50% AEP 25*.5( ) + Nr. at risk from 20% AEP 25*.2( ) + Nr. at risk from 10% AEP 25*.1( ) + Nr. at risk from 5% AEP 25*.05( ) + Nr. at risk from 2% AEP 25*.02( ) + Nr. at risk from 1% AEP 25*.01( ) + Nr. at risk from .5% AEP 25*.005( ) + Nr. at risk from .1% AEP 25*.001( )
Minimise risk to local employment	1.11	3b2	Nr. at risk from 50% AEP 5*.5( ) + Nr. at risk from 20% AEP 5*.2(1) + Nr. at risk from 10% AEP 5*.1( ) + Nr. at risk from 5% AEP 5*.05( ) + Nr. at risk from 2% AEP 5*.02(1) + Nr. at risk from 1% AEP 5*.01( ) + Nr. at risk from .5% AEP 5*.005( ) + Nr. at risk from .1% AEP 5*.001(2)
Environmental			
Provide no impediment to the achievement of water body objectives and, if possible, contribute to the achievement of water body objectives.	5.00	4a1	Constant, as per Guidance Note 28
Avoid detrimental effects to, and where possible enhance, Natura 2000 network, protected species and their key habitats, recognising relevant landscape features and stepping stones.	0.00	4b1	The AFA does not occur within the boundary of the SAC
Avoid damage to and where possible enhance the flora and fauna of the catchment	2.00	4c1	The environs of Aglish have a high potential to support bat species. Natterer's, long-eared, pipistrelle and Daubenton's bats have been recorded in the area
Maintain existing, and where possible create new, fisheries habitat including the maintenance or improvement of conditions that allow upstream migration for fish species.	0.00	4d1	Stream is heavily channelized and engineered. No fisheries amenity or habitat potential along the stream
Protect, and where possible enhance, visual amenity, landscape protection zones and views into / from designated scenic areas within the river corridor.	0.00	4'e1	There are no sensitivity landscapes or designated amenity sites at risk
Avoid damage to or loss of features, institutions and collections of architectural value and their settin and improve their protection from extreme floods.	0.00	4f1	There are no architectural features at risk within the 1% AEP flood Extent.
Avoid damage to or loss of features, institutions and collections of archaeological value and their setting and improve their protection from extreme floods where this is beneficial.	0.00	4f2	There are no recorded monuments or sites at risk within 1% AEP flood extent

AFA: Ballyduff

Objective	Local Weighting	Code	Rationale
Technical			
Ensure flood risk management options are operationally robust	5.00	1a1	Constant, as per Guidance Note 29
Reduce and where possible eliminate health and safety risks associated with the construction and operation of flood risk management options	5.00	1b1	Constant, as per Guidance Note 29
Ensure flood risk management options are adaptable to future flood risk	5.00	1c1	Constant, as per Guidance Note 29
Economy			
Minimise economic risk	5.00	2a1	489055/75000
Minimise risk to transport infrastructure	5.00	2b2	Motorway 250( ) + National Primary 150( ) + (National Secondary 75( ) + Regional 25( ) + Local Rural 10(.5) + Local Urban 20( )
Minimise risk to utility infrastructure	0.00	2c3	Power Stations 500( ) + HV Sub-Stations 250( ) + Gas Assets - High Priority 100( ) + Gas Assets - Medium Priority 25( ) + Water Treatment Plants 250( ) + WwTP and Primary Pumping Facilities 250( ) + Core Telecommunications Exchanges 100( ) + Non-Core Telecommunications Exchanges 25( )
Manage Risk to Agriculture	0.00	2d1	Based on agriculture at risk
Social			
Minimise risk to human health and life of residents	0.25	3a1	Nr. at risk from 50% AEP 2*.5( ) + Nr. at risk from 20% AEP 2*.2( ) + Nr. at risk from 10% AEP 2*.1(1) + Nr. at risk from 5% AEP 2*.05( ) + Nr. at risk from 2% AEP 2*.02( ) + Nr. at risk from 1% AEP 2*.01(2) + Nr. at risk from .5% AEP 2*.005(1) + Nr. at risk from .1% AEP 2*.001( )
Minimise risk to high vulnerability properties	0.00	3a2	Nr. at risk from 50% AEP 0.5*( ) + Nr. at risk from 20% AEP 0.2*( ) + Nr. at risk from 10% AEP 0.1*( ) + Nr. at risk from 5% AEP 0.05*( ) + Nr. at risk from 2% AEP 0.02*( ) + Nr. at risk from 1% AEP 0.01*( ) + Nr. at risk from .5% AEP 0.005*( ) + Nr. at risk from .1% AEP 0.001( )
Minimise risk to social infrastructure and amenity	1.25	3b1	Nr. at risk from 50% AEP 25*.5( ) + Nr. at risk from 20% AEP 25*.2( ) + Nr. at risk from 10% AEP 25*.1( ) + Nr. at risk from 5% AEP 25*.05(1) + Nr. at risk from 2% AEP 25*.02( ) + Nr. at risk from 1% AEP 25*.01( ) + Nr. at risk from .5% AEP 25*.005( ) + Nr. at risk from .1% AEP 25*.001( )
Minimise risk to local employment	5.00	3b2	Nr. at risk from 50% AEP 5*.5(5) + Nr. at risk from 20% AEP 5*.2(1) + Nr. at risk from 10% AEP 5*.1(1) + Nr. at risk from 5% AEP 5*.05(1) + Nr. at risk from 2% AEP 5*.02(2) + Nr. at risk from 1% AEP 5*.01( ) + Nr. at risk from .5% AEP 5*.005( ) + Nr. at risk from .1% AEP 5*.001(1)
Environmental			
Provide no impediment to the achievement of water body objectives and, if possible, contribute to the achievement of water body objectives.	5.00	4a1	Constant, as per Guidance Note 28
Avoid detrimental effects to, and where possible enhance, Natura 2000 network, protected species and their key habitats, recognising relevant landscape features and stepping stones.	5.00	4b1	
Avoid damage to and where possible enhance the flora and fauna of the catchment	5.00	4c1	
Maintain existing, and where possible create new, fisheries habitat including the maintenance or improvement of conditions that allow upstream migration for fish species.	3.00	4d1	
Protect, and where possible enhance, visual amenity, landscape protection zones and views into / from designated scenic areas within the river corridor.	3.00	4'e1	
Avoid damage to or loss of features, institutions and collections of architectural value and their setting and improve their protection from extreme floods.	3.00	4f1	
Avoid damage to or loss of features, institutions and collections of archaeological value and their setting and improve their protection from extreme floods where this is beneficial.	3.00	4f2	

AFA: Kanturk

Objective	Local Weighting	Code	Rationale
Technical			
Ensure flood risk management options are operationally robust	5.00	1a1	Constant, as per Guidance Note 29
Reduce and where possible eliminate health and safety risks associated with the construction and operation of flood risk management options	5.00	1b1	Constant, as per Guidance Note 29
Ensure flood risk management options are adaptable to future flood risk	5.00	1c1	Constant, as per Guidance Note 29
Economy			
Minimise economic risk	5.00	2a1	2723905/75000
Minimise risk to transport infrastructure	1.05	2b2	Motorway 250( ) + National Primary 150( ) + (National Secondary 75( ) + Regional 25(.02+.01) + Local Rural 10(.01) + Local Urban 20(.01)
Minimise risk to utility infrastructure	0.00	2c3	Power Stations 500( ) + HV Sub-Stations 250( ) + Gas Assets - High Priority 100( ) + Gas Assets - Medium Priority 25( ) + Water Treatment Plants 250( ) + WwTP and Primary Pumping Facilities 250( ) + Core Telecommunications Exchanges 100( ) + Non-Core Telecommunications Exchanges 25( )
Manage Risk to Agriculture	0.00	2d1	Based on agriculture at risk
Social			
Minimise risk to human health and life of residents	3.75	3a1	Nr. at risk from 50% AEP 2*.5(2) + Nr. at risk from 20% AEP 2*.2(0) + Nr. at risk from 10% AEP 2*.1(1) + Nr. at risk from 5% AEP 2*.05(1) + Nr. at risk from 2% AEP 2*.02(7) + Nr. at risk from 1% AEP 2*.01(42) + Nr. at risk from .5% AEP 2*.005(21) + Nr. at risk from .1% AEP 2*.001(58)
Minimise risk to high vulnerability properties	5.00	3a2	Nr. at risk from 50% AEP 0.5*( ) + Nr. at risk from 20% AEP 0.2*( ) + Nr. at risk from 10% AEP 0.1*( ) + Nr. at risk from 5% AEP 0.05*( ) + Nr. at risk from 2% AEP 0.02*( ) + Nr. at risk from 1% AEP 0.01*( ) + Nr. at risk from .5% AEP 0.005*50(1) + Nr. at risk from .1% AEP 0.001*50(1)
Minimise risk to social infrastructure and amenity	1.18	3b1	Nr. at risk from 50% AEP 25*.5( ) + Nr. at risk from 20% AEP 25*.2( ) + Nr. at risk from 10% AEP 25*.1( ) + Nr. at risk from 5% AEP 25*.05( ) + Nr. at risk from 2% AEP 25*.02(1) + Nr. at risk from 1% AEP 25*.01(2) + Nr. at risk from .5% AEP 25*.005(1) + Nr. at risk from .1% AEP 25*.001(2)
Minimise risk to local employment	5.00	3b2	Nr. at risk from 50% AEP 5*.5(19) + Nr. at risk from 20% AEP 5*.2(4) + Nr. at risk from 10% AEP 5*.1(2) + Nr. at risk from 5% AEP 5*.05(10) + Nr. at risk from 2% AEP 5*.02(20) + Nr. at risk from 1% AEP 5*.01(44) + Nr. at risk from .5% AEP 5*.005(40) + Nr. at risk from .1% AEP 5*.001(64)
Environmental			
Provide no impediment to the achievement of water body objectives and, if possible, contribute to the achievement of water body objectives.	5.00	4a1	All WB are given 5 local rating
Avoid detrimental effects to, and where possible enhance, Natura 2000 network, protected species and their key habitats, recognising relevant landscape features and stepping stones.	5.00	4b1	Allow and Dalua rivers are within the River Blackwater SAC.
Avoid damage to and where possible enhance the flora and fauna of the catchment	5.00	4c1	Otter, an Annex II and Annex IV species is common throughout the area. Margartifera populations are in the Allow River upstream of Kanturk. The Allow is salmonid and lamprey has also been recorded.
Maintain existing, and where possible create new, fisheries habitat including the maintenance or improvement of conditions that allow upstream migration for fish species.	4.00	4d1	Allow and Dalua rivers both form part of the River Blackwater SAC and sensitive waterbodies. The qualifying criteria for this Natura 2000 site include Salmon and river lamprey
Protect, and where possible enhance, visual amenity, landscape protection zones and views into / from designated scenic areas within the river corridor.	4.00	4'e1	The landscape in the Kanturk area is defined as "broad marginal middle ground valley" and is defined as high value
Avoid damage to or loss of features, institutions and collections of architectural value and their setting and improve their protection from extreme floods.	3.00	4f1	Kanturk is designated as an Architectural Conservation Area (ACA) County level
Avoid damage to or loss of features, institutions and collections of archaeological value and their setting and improve their protection from extreme floods where this is beneficial.	3.00	4f2	Number of RMP sites present moderate to high sensitivity

AFA: Rathcormack

Objective	Local Weighting	Code	Rationale
Technical			
Ensure flood risk management options are operationally robust	5.00	1a1	Constant, as per Guidance Note 29
Reduce and where possible eliminate health and safety risks associated with the construction and operation of flood risk management options	5.00	1b1	Constant, as per Guidance Note 29
Ensure flood risk management options are adaptable to future flood risk	5.00	1c1	Constant, as per Guidance Note 29
Economy			
Minimise economic risk	5.00	2a1	443072/75000
Minimise risk to transport infrastructure	5.00	2b2	Motorway 250( ) + National Primary 150( ) + (National Secondary 75( ) + Regional 25(.2) + Local Rural 10( ) + Local Urban 20(.2+.2+.2)
Minimise risk to utility infrastructure	2.50	2c3	Power Stations 500( ) + HV Sub-Stations 250( ) + Gas Assets - High Priority 100( ) + Gas Assets - Medium Priority 25( ) + Water Treatment Plants 250( ) + WwTP and Primary Pumping Facilities 250(.01) + Core Telecommunications Exchanges 100( ) + Non-Core Telecommunications Exchanges 25( )
Manage Risk to Agriculture	0.00	2d1	Based on agriculture at risk
Social			
Minimise risk to human health and life of residents	5.00	3a1	Nr. at risk from 50% AEP 2*.5(1) + Nr. at risk from 20% AEP 2*.2(15) + Nr. at risk from 10% AEP 2*.1(1) + Nr. at risk from 5% AEP 2*.05(2) + Nr. at risk from 2% AEP 2*.02( ) + Nr. at risk from 1% AEP 2*.01(1) + Nr. at risk from .5% AEP 2*.005( ) + Nr. at risk from .1% AEP 2*.001(1)
Minimise risk to high vulnerability properties	0.00	3a2	Nr. at risk from 50% AEP 0.5*( ) + Nr. at risk from 20% AEP 0.2*( ) + Nr. at risk from 10% AEP 0.1*( ) + Nr. at risk from 5% AEP 0.05*( ) + Nr. at risk from 2% AEP 0.02*( ) + Nr. at risk from 1% AEP 0.01*( ) + Nr. at risk from .5% AEP 0.005*( ) + Nr. at risk from .1% AEP 0.001( )
Minimise risk to social infrastructure and amenity	5.00	3b1	Nr. at risk from 50% AEP 25*.5( ) + Nr. at risk from 20% AEP 25*.2(1) + Nr. at risk from 10% AEP 25*.1( ) + Nr. at risk from 5% AEP 25*.05( ) + Nr. at risk from 2% AEP 25*.02( ) + Nr. at risk from 1% AEP 25*.01( ) + Nr. at risk from .5% AEP 25*.005( ) + Nr. at risk from .1% AEP 25*.001( )
Minimise risk to local employment	5.00	3b2	Nr. at risk from 50% AEP 5*.5(1) + Nr. at risk from 20% AEP 5*.2(9) + Nr. at risk from 10% AEP 5*.1( ) + Nr. at risk from 5% AEP 5*.05(1) + Nr. at risk from 2% AEP 5*.02( ) + Nr. at risk from 1% AEP 5*.01( ) + Nr. at risk from .5% AEP 5*.005( ) + Nr. at risk from .1% AEP 5*.001( )
Environmental			
Provide no impediment to the achievement of water body objectives and, if possible, contribute to the achievement of water body objectives.	5.00	4a1	Constant, as per Guidance Note 28
Avoid detrimental effects to, and where possible enhance, Natura 2000 network, protected species and their key habitats, recognising relevant landscape features and stepping stones.	3.00	4b1	The Kilbrien stream and Shanowen River flow into the River Bride which is part of the Blackwater River SAC. The Shanowen River has some potential to support the qualifying features of the SAC e.g. lamprey and Atlantic Salmon.
Avoid damage to and where possible enhance the flora and fauna of the catchment	2.00	4c1	Land use is dominated by agriculture. There are no records of Annex I habitats in the catchment. Otter (Annex IV species) has been recorded downstream of Rathcormac on the River Bride and also upstream of the town on the Shanowen River. Otter is likely to use the Shanowen for commuting to the Bride.
Maintain existing, and where possible create new, fisheries habitat including the maintenance or improvement of conditions that allow upstream migration for fish species.	0.00	4d1	Stream is heavily channelized and engineered. No fisheries potential along the stream
Protect, and where possible enhance, visual amenity, landscape protection zones and views into / from designated scenic areas within the river corridor.	0.00	4'e1	No specific landscape designations
Avoid damage to or loss of features, institutions and collections of architectural value and their setting and improve their protection from extreme floods.	1.00	4f1	No architectural features at risk
Avoid damage to or loss of features, institutions and collections of archaeological value and their setting and improve their protection from extreme floods where this is beneficial.	1.00	4f2	No archaeological features at risk

AFA: Youghal

Objective	Local Weighting	Code	Rationale
Technical			
Ensure flood risk management options are operationally robust	5.00	1a1	Constant, as per Guidance Note 29
Reduce and where possible eliminate health and safety risks associated with the construction and operation of flood risk management options	5.00	1b1	Constant, as per Guidance Note 29
Ensure flood risk management options are adaptable to future flood risk	5.00	1c1	Constant, as per Guidance Note 29
Economy			
Minimise economic risk	0.63	2a1	47517/75000
Minimise risk to transport infrastructure	5.00	2b2	Motorway 250( ) + National Primary 150(.5) + (National Secondary 75( ) + Regional 25(.5) + Local Rural 10(.005) + Local Urban 20(.001)
Minimise risk to utility infrastructure	0.00	2c3	Power Stations 500( ) + HV Sub-Stations 250( ) + Gas Assets - High Priority 100( ) + Gas Assets - Medium Priority 25( ) + Water Treatment Plants 250( ) + WwTP and Primary Pumping Facilities 250( ) + Core Telecommunications Exchanges 100( ) + Non-Core Telecommunications Exchanges 25( )
Manage Risk to Agricultue	2.66	2d1	Based on agriculture at risk
Social			
Minimise risk to human health and life of residents	2.03	3a1	Nr. at risk from 50% AEP 2*.5(0) + Nr. at risk from 20% AEP 2*.2(1) + Nr. at risk from 10% AEP 2*.1(1) + Nr. at risk from 5% AEP 2*.05(3) + Nr. at risk from 2% AEP 2*.02(17) + Nr. at risk from 1% AEP 2*.01(10) + Nr. at risk from .5% AEP 2*.005(13) + Nr. at risk from .1% AEP 2*.001(58)
Minimise risk to high vulnerability properties	0.00	3a2	Nr. at risk from 50% AEP 0.5*( ) + Nr. at risk from 20% AEP 0.2*( ) + Nr. at risk from 10% AEP 0.1*( ) + Nr. at risk from 5% AEP 0.05*( ) + Nr. at risk from 2% AEP 0.02*( ) + Nr. at risk from 1% AEP 0.01*( ) + Nr. at risk from .5% AEP 0.005*( ) + Nr. at risk from .1% AEP 0.001( )
Minimise risk to social infrastructure and amenity	2.63	3b1	Nr. at risk from 50% AEP 25*.5( ) + Nr. at risk from 20% AEP 25*.2( ) + Nr. at risk from 10% AEP 25*.1( ) + Nr. at risk from 5% AEP 25*.05( ) + Nr. at risk from 2% AEP 25*.02(4) + Nr. at risk from 1% AEP 25*.01(1) + Nr. at risk from .5% AEP 25*.005(2) + Nr. at risk from .1% AEP 25*.001(5)
Minimise risk to local employment	3.12	3b2	Nr. at risk from 50% AEP 5*.5(0) + Nr. at risk from 20% AEP 5*.2(1) + Nr. at risk from 10% AEP 5*.1( ) + Nr. at risk from 5% AEP 5*.05( ) + Nr. at risk from 2% AEP 5*.02(12) + Nr. at risk from 1% AEP 5*.01(7) + Nr. at risk from .5% AEP 5*.005(10) + Nr. at risk from .1% AEP 5*.001(63)
Environmental			
Provide no impediment to the achievement of water body objectives and, if possible, contribute to the achievement of water body objectives.	5.00	4a1	Constant, as per Guidance Note 28
Avoid detrimental effects to, and where possible enhance, Natura 2000 network, protected species and their key habitats, recognising relevant landscape features and stepping stones.	5.00	4b1	Youghal AFA occurs adjacent to Blackwater SAC/SPA
Avoid damage to and where possible enhance the flora and fauna of the catchment	5.00	4c1	Important fish and bird population
Maintain existing, and where possible create new, fisheries habitat including the maintenance or improvement of conditions that allow upstream migration for fish species.	5.00	4d1	Important fish migration route and fish habitat
Protect, and where possible enhance, visual amenity, landscape protection zones and views into / from designated scenic areas within the river corridor.	3.00	4'e1	Youghal has high landscape value and sensitivity at a county level
Avoid damage to or loss of features, institutions and collections of architectural value and their settin and improve their protection from extreme floods.	3.00	4f1	There are a number of architectural features at risk
Avoid damage to or loss of features, institutions and collections of archaeological value and their setting and improve their protection from extreme floods where this is beneficial.	3.00	4f2	There are a number of archaeological features at risk

F.2 MCA Matrices

AFA	Aglish

Multi-Criteria Assessment								Do Nothing		
Criteria	Objective	Sub-Objective	Indicator	Basic Requirement	Aspirational Target	Global Weighting	Local Weighting	Score	Rationale	Wtd Score
Technical	Ensure flood risk management options are operationally robust	Ensure flood risk management options are operationally robust	Level of operational risk of option- Degree of reliance on mechanical, electrical or electronic systems, or on human intervention, action or decision, for the option to operate or perform successfully, - Non-numeric			20.00	5.00		Do nothing option	0.00
	Minimise health and safety risk of flood risk management options	Reduce and where possible eliminate health and safety risks associated with the construction and operation of flood risk management options	Degree of health and safety risk during construction and operation	Moderate to high, but acceptable and manageable, level of health and safety risk during construction, maintenance or operation	Negligible risk to health and safety during construction, maintenance or operation	20.00	5.00		Do nothing option	0.00
	Ensure flood risk management options are adaptable to future flood risk, and the potential impacts of climate change	Ensure flood risk management options are adaptable to future flood risk	Sustainability and adaptability of the flood risk management measure in the face of potential future changes, including the potential impacts of climate change	Option should not hinder future interventions that may be required to manage potential future increases in risk	Option to provide for, or be adaptable to, the HEFS in terms of maintaining the standard of protection at no or negligible cost	20.00	5.00		Do nothing option	0.00
Technical Score							0.00			
Economic	Minimise economic risk	Minimise economic risk	Annual Average Damage (AAD) expressed in Euro / year	AAD is not increased	100% reduction in AAD	24.00	0.16	0.00	Do nothing option	0.00
	Minimise risk to transport infrastructure	Minimise risk to transport infrastructure	Length of infrastructure at risk from flooding in the 0.1% AEP event	Do not increase length of infrastructure at risk from flooding	Reduce the length of infrastructure at risk from flooding by 50%	10.00	5.00	0.00	Do nothing option	0.00
	Minimise risk to utility infrastructure	Minimise risk to utility infrastructure	Utilities at risk from flooding	No increase number of utility receptors at risk from flooding	Reduce number of utility receptors at risk to 0	14.00	0.00	0.00	Do nothing option	0.00
	Manage Risk to Agriculture	Manage Risk to Agriculture	Agricultural production	Do not increase in negative impact of flooding on agricultural production	Provide the potential for enhanced agricultural production	12.00	0.00	0.00	Do nothing option	0.00
Economic Score							0.00			
Social	Minimise risk to human health and life	Minimise risk to human health and life of residents	Annual Average number of residential properties at risk from flooding	Number of residential properties at risk from flooding does not increase	Reduce the number of residential properties at risk from flooding to 0	27.00	1.25	0.00	Do nothing option	0.00
		Minimise risk to high vulnerability properties	Number of high vulnerability properties at risk from flooding	Do not increase number of high vulnerability properties at risk from flooding	Reduce the number of high vulnerability properties at risk from flooding to 0	17.00	0.00	0.00	Do nothing option	0.00
	Minimise risk to community	Minimise risk to social infrastructure and amenity	Number of social infrastructure receptors at risk from flooding	Do not increase number of social infrastructure receptors at risk from flooding	Reduce the number of social infrastructure receptors at risk from flooding to 0	9.00	0.00	0.00	Do nothing option	0.00
		Minimise risk to local employment	Number of enterprises at risk from flooding	Do not increase number of enterprises at risk from flooding	Reduce the number of enterprises at risk from flooding to 0	7.00	1.11	0.00	Do nothing option	0.00
Social Score							0.00			
Environmental	Support the objectives of the WFD	Provide no impediment to the achievement of water body objectives and, if possible, contribute to the achievement of water body objectives.	Ecological status of water bodies	Provide no constraint to the achievement of water body objectives	Contribute to the achievement of water body objectives	16.00	5.00	0.00	This AFA occurs along the Aglish stream which is a tributary of the Goish River, these waterbodies are classified as having good water status under the WFD. These watercourses discharge into the River Blackwater SAC. The Aglish stream is channelised along the AFA. There are no significant polluting sources at risk from flooding.	0.00
	Support the objectives of the Habitats and Birds Directives	Avoid detrimental effects to, and where possible enhance, Natura 2000 network, protected species and their key habitats, recognising relevant landscape features and stepping stones.	Area of site at risk from flooding and qualitative Assessment of impact of option on habitat	No deterioration in the conservation status of designated sites as a result of flood risk management measures	Improvement in the conservation status of designated sites as a result of flood risk management measures	10.00	0.00	0.00	The Aglish Stream flows into the Goish River which is part of the Blackwater River SAC. The AFA does not occur within the boundary of the SAC. The stream has no capacity to support qualifying features of the Blackwater River SAC given its heavy modification (culverting and channelisation).	0.00
	Avoid damage to, and where possible enhance, the flora and fauna of the catchment	Avoid damage to and where possible enhance the flora and fauna of the catchment	Avoid damage to and where possible enhance, legally protected sites / habitats and other sites / habitats of national regional and local nature conservation importance	No deterioration on condition of existing sites due to implementation of option	Creation of new or improved condition of existing sites due to implementation of option	5.00	2.00	0.00	No impact on protected species or habitats (0)	0.00
	Protect, and where possible enhance, fisheries resource within the catchment	Maintain existing, and where possible create new, fisheries habitat including the maintenance or improvement of conditions that allow upstream migration for fish species.	Area of suitable habitat supporting fish. Number of upstream barriers	No loss of integrity of fisheries habitat. Maintenance of upstream accessibility	No loss of fishery habitat. Improvement of habitat quality / quantity. Enhanced upstream accessibility	13.00	0.00	0.00	Stream is heavily channelized and engineered. No fisheries amenity or habitat potential along the stream - flooding events will unlikely have a negative impact on the fisheries potential further downstream on the River Blackwater	0.00
	Protect, and where possible enhance, landscape character and visual amenity within the river corridor	Protect, and where possible enhance, visual amenity, landscape protection zones and views into / from designated scenic areas within the river corridor.	Changes to reported conservation status of designated sites relating to flood risk management Extent of affected Natura 2000 site, NHA/pNHA or other affected National or International designations (e.g. Nature reserves and Ramsar sites), i.e. Area of re	1. No significant impact on landscape designation (protected site, scenic route/amenity, natural landscape form) within zone of visibility of measures 2. No significant change in the quality of existing landscape characteristics of the receiving environment	1. No change to the existing landscape form. 2. Enhancement of existing landscape or landscape feature	8.00	0.00	0.00	No impacts on the landscape and visual amenity are envisaged in the do nothing scenario.	0.00
	Avoid damage to or loss of features, institutions and collections of cultural heritage importance and their setting	Avoid damage to or loss of features, institutions and collections of architectural value and their setting and improve their protection from extreme floods.	a) The number of architectural features, institutions and collections subject to flooding. b) The impact of flood risk management measures on architectural features, institutions and collections.	a) No increase in risk to architectural features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on architectural features, institutions and collections.	a) Complete removal of all relevant architectural features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of architectural features, institutions and collections importance arising from the implementation of the selected measures.	4.00	0.00	0.00	There are no architectural features at risk within the 1% AEP flood Extent.	0.00
		Avoid damage to or loss of features, institutions and collections of archaeological value and their setting and improve their protection from extreme floods where this is beneficial.	a) The number of archaeological features, institutions and collections subject to flooding. b) The impact of flood risk management measures on archaeological features, institutions and collections.	a) No increase in risk to archaeological features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on archaeological features, institutions and collections.	a) Complete removal of all relevant archaeological features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of archaeological features, institutions and collections importance arising from the implementation of the selected measures.	4.00	0.00	0.00	There are no recorded monuments or sites at risk within 1% AEP flood extent	0.00
Environmental Score										0.00
MCA Benefit Score										0.00
Option Selection MCA Score										0.00
MCA benefit Cost Ratio										0.00
Economic Benefit Cost Ratio										0.00

AFA	Aglish

Multi-Criteria Assessment								Option 1 - Flood Defences		
Criteria	**Objective**	**Sub-Objective**	**Indicator**	**Basic Requirement**	**Aspirational Target**	**Global Weighting**	**Local Weighting**	**Score**	**Rationale**	**Wtd score**
Technical	Ensure flood risk management options are operationally robust	Ensure flood risk management options are operationally robust	Level of operational risk of option- Degree of reliance on mechanical, electrical or electronic systems, or on human intervention, action or decision, for the option to operate or perform successfully, - Non-numeric			20.00	5.00	5.00	Flood walls and embankments, no moving parts, little operational risk	500.00
	Minimise health and safety risk of flood risk management options	Reduce and where possible eliminate health and safety risks associated with the construction and operation of flood risk management options	Degree of health and safety risk during construction and operation	Moderate to high, but acceptable and manageable, level of health and safety risk during construction, maintenance or operation	Negligible risk to health and safety during construction, maintenance or operation	20.00	5.00	3.00	Risk of electrocution and falling from a height	300.00
	Ensure flood risk management options are adaptable to future flood risk, and the potential impacts of climate change	Ensure flood risk management options are adaptable to future flood risk	Sustainability and adaptability of the flood risk management measure in the face of potential future changes, including the potential impacts of climate change	Option should not hinder future interventions that may be required to manage potential future increases in risk	Option to provide for, or be adaptable to, the HEFS in terms of maintaining the standard of protection at no or negligible cost	20.00	5.00	2.50	Adaptive approach: increase height of flood defences by 0.25m (Score 4) Adaptive approach: raise section of road raised by an additional 0.25m (Score 3)	250.00
Technical Score							0.00			1050.00
Economic	Minimise economic risk	Minimise economic risk	Annual Average Damage (AAD) expressed in Euro / year	AAD is not increased	100% reduction in AAD	24.00	0.16	4.69	As calculated	18.00
	Minimise risk to transport infrastructure	Minimise risk to transport infrastructure	Length of infrastructure at risk from flooding in the 0.1% AEP event	Do not increase length of infrastructure at risk from flooding	Reduce the length of infrastructure at risk from flooding by 50%	10.00	5.00	0.00	As calculated	0.00
	Minimise risk to utility infrastructure	Minimise risk to utility infrastructure	Utilities at risk from flooding	No increase number of utility receptors at risk from flooding	Reduce number of utility receptors at risk to 0	14.00	0.00	0.00	As calculated	0.00
	Manage Risk to Agriculture	Manage Risk to Agriculture	Agricultural production	Do not increase in negative impact of flooding on agricultural production	Provide the potential for enhanced agricultural production	12.00	0.00	0.00	As calculated	0.00
Economic Score							0.00			18.00
Social	Minimise risk to human health and life	Minimise risk to human health and life of residents	Annual Average number of residential properties at risk from flooding	Number of residential properties at risk from flooding does not increase	Reduce the number of residential properties at risk from flooding to 0	27.00	1.25	4.74	As calculated	160.65
		Minimise risk to high vulnerability properties	Number of high vulnerability properties at risk from flooding	Do not increase number of high vulnerability properties at risk from flooding	Reduce the number of high vulnerability properties at risk from flooding to 0	17.00	0.00	0.00	As calculated	0.00
	Minimise risk to community	Minimise risk to social infrastructure and amenity	Number of social infrastructure receptors at risk from flooding	Do not increase number of social infrastructure receptors at risk from flooding	Reduce the number of social infrastructure receptors at risk from flooding to 0	9.00	0.00	0.00	As calculated	0.00
		Minimise risk to local employment	Number of enterprises at risk from flooding	Do not increase number of enterprises at risk from flooding	Reduce the number of enterprises at risk from flooding to 0	7.00	1.11	4.73	As calculated	36.75
Social Score							0.00			197.40
Environmental	Support the objectives of the WFD	Provide no impediment to the achievement of water body objectives and, if possible, contribute to the achievement of water body objectives.	Ecological status of water bodies	Provide no constraint to the achievement of water body objectives	Contribute to the achievement of water body objectives	16.00	5.00	-2.00	his AFA occurs along the Aglish stream which is a tributary of the Goish River, these waterbodies are classified as having good water status under the WFD. These watercourses discharge into the River Blackwater SAC. The Aglish stream is channelised along the AFA. There are no significant polluting sources at risk from flooding. (-2) There are short term negative impacts associated with the construction	-160.00
	Support the objectives of the Habitats and Birds Directives	Avoid detrimental effects to, and where possible enhance, Natura 2000 network, protected species and their key habitats, recognising relevant landscape features and stepping stones.	Area of site at risk from flooding and qualitative Assessment of impact of option on habitat	No deterioration in the conservation status of designated sites as a result of flood risk management measures	Improvement in the conservation status of designated sites as a result of flood risk management measures	10.00	0.00	0.00	The Aglish Stream flows into the Goish River which is part of the Blackwater River SAC. The AFA does not occur within the boundary of the SAC. The stream has no capacity to support qualifying features of the Blackwater River SAC given its heavy modification (culverting and channelisation). the construction of the local defences will therefore have no impact on availability of habitat to qualifying features (0).	0.00
	Avoid damage to, and where possible enhance, the flora and fauna of the catchment	Avoid damage to and where possible enhance the flora and fauna of the catchment	Avoid damage to and where possible enhance, legally protected sites / habitats and other sites / habitats of national regional and local nature conservation importance	No deterioration on condition of existing sites due to implementation of option	Creation of new or improved condition of existing sites due to implementation of option	5.00	2.00	-2.00	The footprint of the walls will be on road verges and agricultural grassland (0). The riparian habitat on the Aglish stream is considered sub-optimal habitat for otter and it is unlikely that otters have established holts in the area. The environs of Aglish have a high habitat suitability index to support bat species. Natterer's, long-eared, pipistrelle and Daubenton's bats have been recorded in the area Potential short term adverse impacts due to construction stage associated with flood walls (-2)	-20.00
	Protect, and where possible enhance, fisheries resource within the catchment	Maintain existing, and where possible create new, fisheries habitat including the maintenance or improvement of conditions that allow upstream migration for fish species.	Area of suitable habitat supporting fish. Number of upstream barriers	No loss of integrity of fisheries habitat. Maintenance of upstream accessibility	No loss of fishery habitat. Improvement of habitat quality / quantity. Enhanced upstream accessibility	13.00	0.00	-1.00	Potential short term adverse impacts due to construction stage associated with flood walls (-1). The stream is currently channelized and engineered in the area	0.00
	Protect, and where possible enhance, landscape character and visual amenity within the river corridor	Protect, and where possible enhance, visual amenity, landscape protection zones and views into / from designated scenic areas within the river corridor.	Changes to reported conservation status of designated sites relating to flood risk management Extent of affected Natura 2000 site, NHA/pNHA or other affected National or International designations (e.g. Nature reserves and Ramsar sites), i.e. Area of re	1. No significant impact on landscape designation (protected site, scenic route/amenity, natural landscape form) within zone of visibility of measures 2. No significant change in the quality of existing landscape characteristics of the receiving environment	1. No change to the existing landscape form. 2. Enhancement of existing landscape or landscape feature	8.00	0.00	-1.00	According to the Waterford Development Plan, there are no scenic or visually sensitive landscapes within the AFA. The propose measures includes the construction of low lying wall parallel to the local approach road adjacent to the local school and within the town at the rear of a dwelling. There is a currently a low lying boundary hedgerow. The construction of the wall and embankment are unlikely change the character of the area or change the existing views from the property. Temporary negative impacts are likely to occur during the construction phase (-1)	0.00
	Avoid damage to or loss of features, institutions and collections of cultural heritage importance and their setting	Avoid damage to or loss of features, institutions and collections of architectural value and their setting and improve their protection from extreme floods.	a) The number of architectural features, institutions and collections subject to flooding. b) The impact of flood risk management measures on architectural features, institutions and collections.	a) No increase in risk to architectural features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on architectural features, institutions and collections.	a) Complete removal of all relevant architectural features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of architectural features, institutions and collections importance arising from the implementation of the selected measures.	4.00	0.00	0.00	There are no architectural features at risk within the 1% AEP Flood Extent	0.00
		Avoid damage to or loss of features, institutions and collections of archaeological value and their setting and improve their protection from extreme floods where this is beneficial.	a) The number of archaeological features, institutions and collections subject to flooding. b) The impact of flood risk management measures on archaeological features, institutions and collections.	a) No increase in risk to archaeological features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on archaeological features, institutions and collections.	a) Complete removal of all relevant archaeological features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of archaeological features, institutions and collections importance arising from the implementation of the selected measures.	4.00	0.00	0.00	There are no recorded monuments or sites at risk within 1% AEP flood extent	0.00
Environmental Score										-180.00
MCA Benefit Score										35.40
Option Selection MCA Score										1085.40
MCA benefit Cost Ratio										0.0002
Economic Benefit Cost Ratio										1.14

AFA	Ballyduff

Multi-Criteria Assessment								Do Nothing		
Criteria	**Objective**	**Sub-Objective**	**Indicator**	**Basic Requirement**	**Aspirational Target**	**Global Weighting**	**Local Weighting**	**Score**	**Rationale**	**Wtd Score**
Technical	Ensure flood risk management options are operationally robust	Ensure flood risk management options are operationally robust	Level of operational risk of option- Degree of reliance on mechanical, electrical or electronic systems, or on human intervention, action or decision, for the option to operate or perform successfully, - Non-numeric			20.00	5.00	0.00	Do nothing option	0.00
	Minimise health and safety risk of flood risk management options	Reduce and where possible eliminate health and safety risks associated with the construction and operation of flood risk management options	Degree of health and safety risk during construction and operation	Moderate to high, but acceptable and manageable, level of health and safety risk during construction, maintenance or operation	Negligible risk to health and safety during construction, maintenance or operation	20.00	5.00	0.00	Do nothing option	0.00
	Ensure flood risk management options are adaptable to future flood risk, and the potential impacts of climate change	Ensure flood risk management options are adaptable to future flood risk	Sustainability and adaptability of the flood risk management measure in the face of potential future changes, including the potential impacts of climate change	Option should not hinder future interventions that may be required to manage potential future increases in risk	Option to provide for, or be adaptable to, the HEFS in terms of maintaining the standard of protection at no or negligible cost	20.00	5.00	0.00	Do nothing option	0.00
Technical Score							0.00			
Economic	Minimise economic risk	Minimise economic risk	Annual Average Damage (AAD) expressed in Euro / year	AAD is not increased	100% reduction in AAD	24.00	5.00	0.00	Do nothing option	0.00
	Minimise risk to transport infrastructure	Minimise risk to transport infrastructure	Length of infrastructure at risk from flooding in the 0.1% AEP event	Do not increase length of infrastructure at risk from flooding	Reduce the length of infrastructure at risk from flooding by 50%	10.00	5.00	0.00	Do nothing option	0.00
	Minimise risk to utility infrastructure	Minimise risk to utility infrastructure	Utilities at risk from flooding	No increase number of utility receptors at risk from flooding	Reduce number of utility receptors at risk to 0	14.00	0.00	0.00	Do nothing option	0.00
	Manage Risk to Agriculture	Manage Risk to Agriculture	Agricultural production	Do not increase in negative impact of flooding on agricultural production	Provide the potential for enhanced agricultural production	12.00	0.00	0.00	Do nothing option	0.00
Economic Score							0.00			
Social	Minimise risk to human health and life	Minimise risk to human health and life of residents	Annual Average number of residential properties at risk from flooding	Number of residential properties at risk from flooding does not increase	Reduce the number of residential properties at risk from flooding to 0	27.00	0.25	0.00	Do nothing option	0.00
		Minimise risk to high vulnerability properties	Number of high vulnerability properties at risk from flooding	Do not increase number of high vulnerability properties at risk from flooding	Reduce the number of high vulnerability properties at risk from flooding to 0	17.00	0.00	0.00	Do nothing option	0.00
	Minimise risk to community	Minimise risk to social infrastructure and amenity	Number of social infrastructure receptors at risk from flooding	Do not increase number of social infrastructure receptors at risk from flooding	Reduce the number of social infrastructure receptors at risk from flooding to 0	9.00	1.25	0.00	Do nothing option	0.00
		Minimise risk to local employment	Number of enterprises at risk from flooding	Do not increase number of enterprises at risk from flooding	Reduce the number of enterprises at risk from flooding to 0	7.00	5.00	0.00	Do nothing option	0.00
Social Score							0.00			
Environmental	Support the objectives of the WFD	Provide no impediment to the achievement of water body objectives and, if possible, contribute to the achievement of water body objectives.	Ecological status of water bodies	Provide no constraint to the achievement of water body objectives	Contribute to the achievement of water body objectives	16.00	5.00	0.00	Do nothing option	0.00
	Support the objectives of the Habitats and Birds Directives	Avoid detrimental effects to, and where possible enhance, Natura 2000 network, protected species and their key habitats, recognising relevant landscape features and stepping stones.	Area of site at risk from flooding and qualitative Assessment of impact of option on habitat	No deterioration in the conservation status of designated sites as a result of flood risk management measures	Improvement in the conservation status of designated sites as a result of flood risk management measures	10.00	5.00	0.00	Do nothing option	0.00
	Avoid damage to, and where possible enhance, the flora and fauna of the catchment	Avoid damage to and where possible enhance the flora and fauna of the catchment	Avoid damage to and where possible enhance, legally protected sites / habitats and other sites / habitats of national regional and local nature conservation importance	No deterioration on condition of existing sites due to implementation of option	Creation of new or improved condition of existing sites due to implementation of option	5.00	5.00	0.00	Do nothing option	0.00
	Protect, and where possible enhance, fisheries resource within the catchment	Maintain existing, and where possible create new, fisheries habitat including the maintenance or improvement of conditions that allow upstream migration for fish species.	Area of suitable habitat supporting fish. Number of upstream barriers	No loss of integrity of fisheries habitat. Maintenance of upstream accessibility	No loss of fishery habitat. Improvement of habitat quality / quantity. Enhanced upstream accessibility	13.00	3.00	0.00	Do nothing option	0.00
	Protect, and where possible enhance, landscape character and visual amenity within the river corridor	Protect, and where possible enhance, visual amenity, landscape protection zones and views into / from designated scenic areas within the river corridor.	Changes to reported conservation status of designated sites relating to flood risk management Extent of affected Natura 2000 site, NHA/pNHA or other affected National or International designations (e.g. Nature reserves and Ramsar sites), i.e. Area of re	1. No significant impact on landscape designation (protected site, scenic route/amenity, natural landscape form) within zone of visibility of measures 2. No significant change in the quality of existing landscape characteristics of the receiving environment	1. No change to the existing landscape form. 2. Enhancement of existing landscape or landscape feature	8.00	3.00	0.00	Do nothing option	0.00
	Avoid damage to or loss of features, institutions and collections of cultural heritage importance and their setting	Avoid damage to or loss of features, institutions and collections of architectural value and their setting and improve their protection from extreme floods.	a) The number of architectural features, institutions and collections subject to flooding. b) The impact of flood risk management measures on architectural features, institutions and collections.	a) No increase in risk to architectural features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on architectural features, institutions and collections.	a) Complete removal of all relevant architectural features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of architectural features, institutions and collections importance arising from the implementation of the selected measures.	4.00	3.00	0.00	Do nothing option	0.00
		Avoid damage to or loss of features, institutions and collections of archaeological value and their setting and improve their protection from extreme floods where this is beneficial.	a) The number of archaeological features, institutions and collections subject to flooding. b) The impact of flood risk management measures on archaeological features, institutions and collections.	a) No increase in risk to archaeological features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on archaeological features, institutions and collections.	a) Complete removal of all relevant archaeological features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of archaeological features, institutions and collections importance arising from the implementation of the selected measures.	4.00	3.00	0.00	Do nothing option	0.00
Environmental Score										0.00
MCA Benefit Score										0.00
Option Selection MCA Score										0.00
MCA benefit Cost Ratio										0.00
Economic Benefit Cost Ratio										0.00

AFA	Ballyduff

Multi-Criteria Assessment								Option 1 - Flood Defences		
Criteria	**Objective**	**Sub-Objective**	**Indicator**	**Basic Requirement**	**Aspirational Target**	**Global Weighting**	**Local Weighting**	**Score**	**Rationale**	**Wtd score**
Technical	Ensure flood risk management options are operationally robust	Ensure flood risk management options are operationally robust	Level of operational risk of option- Degree of reliance on mechanical, electrical or electronic systems, or on human intervention, action or decision, for the option to operate or perform successfully, - Non-numeric			20.00	5.00	5.00	No interventions required. Assume SW pumping is a matter for the Local Authority	500.00
	Minimise health and safety risk of flood risk management options	Reduce and where possible eliminate health and safety risks associated with the construction and operation of flood risk management options	Degree of health and safety risk during construction and operation	Moderate to high, but acceptable and manageable, level of health and safety risk during construction, maintenance or operation	Negligible risk to health and safety during construction, maintenance or operation	20.00	5.00	2.00	Walls are not high, no deep excavations, Two embankments are near water, risk of power lines..	200.00
	Ensure flood risk management options are adaptable to future flood risk, and the potential impacts of climate change	Ensure flood risk management options are adaptable to future flood risk	Sustainability and adaptability of the flood risk management measure in the face of potential future changes, including the potential impacts of climate change	Option should not hinder future interventions that may be required to manage potential future increases in risk	Option to provide for, or be adaptable to, the HEFS in terms of maintaining the standard of protection at no or negligible cost	20.00	5.00	3.50	Walls and embankments can be raised in the event of climate change leading to increased depths of flooding.	350.00
Technical Score							0.00			1050.00
Economic	Minimise economic risk	Minimise economic risk	Annual Average Damage (AAD) expressed in Euro / year	AAD is not increased	100% reduction in AAD	24.00	5.00	4.75	As calculated	570.37
	Minimise risk to transport infrastructure	Minimise risk to transport infrastructure	Length of infrastructure at risk from flooding in the 0.1% AEP event	Do not increase length of infrastructure at risk from flooding	Reduce the length of infrastructure at risk from flooding by 50%	10.00	5.00	4.95	As calculated	247.50
	Minimise risk to utility infrastructure	Minimise risk to utility infrastructure	Utilities at risk from flooding	No increase number of utility receptors at risk from flooding	Reduce number of utility receptors at risk to 0	14.00	0.00	0.00	As calculated	0.00
	Manage Risk to Agriculture	Manage Risk to Agriculture	Agricultural production	Do not increase in negative impact of flooding on agricultural production	Provide the potential for enhanced agricultural production	12.00	0.00	0.00	As calculated	0.00
Economic Score							0.00			817.87
Social	Minimise risk to human health and life	Minimise risk to human health and life of residents	Annual Average number of residential properties at risk from flooding	Number of residential properties at risk from flooding does not increase	Reduce the number of residential properties at risk from flooding to 0	27.00	0.25	4.20	As calculated	28.35
		Minimise risk to high vulnerability properties	Number of high vulnerability properties at risk from flooding	Do not increase number of high vulnerability properties at risk from flooding	Reduce the number of high vulnerability properties at risk from flooding to 0	17.00	0.00	0.00	As calculated	0.00
	Minimise risk to community	Minimise risk to social infrastructure and amenity	Number of social infrastructure receptors at risk from flooding	Do not increase number of social infrastructure receptors at risk from flooding	Reduce the number of social infrastructure receptors at risk from flooding to 0	9.00	1.25	4.50	As calculated	50.63
		Minimise risk to local employment	Number of enterprises at risk from flooding	Do not increase number of enterprises at risk from flooding	Reduce the number of enterprises at risk from flooding to 0	7.00	5.00	4.75	As calculated	166.08
Social Score							0.00			245.05
Environmental	Support the objectives of the WFD	Provide no impediment to the achievement of water body objectives and, if possible, contribute to the achievement of water body objectives.	Ecological status of water bodies	Provide no constraint to the achievement of water body objectives	Contribute to the achievement of water body objectives	16.00	5.00	-2.00	Ballyduff is located along the Blackwater and is at risk of fluvial flooding. There are no significant polluting sources at risk from flooding in 1% AEP. It is considered a sensitive waterbody. Flood protection measures can assist in contributing to maintaining the objectives of the WFD by preventing flooding , which if flooded could result in the deterioration of water quality, however current status is good, so flooding appears not be impacting WFD status. (-2) short term impacts associated with construction of walls and embankments	-160.00
	Support the objectives of the Habitats and Birds Directives	Avoid detrimental effects to, and where possible enhance, Natura 2000 network, protected species and their key habitats, recognising relevant landscape features and stepping stones.	Area of site at risk from flooding and qualitative Assessment of impact of option on habitat	No deterioration in the conservation status of designated sites as a result of flood risk management measures	Improvement in the conservation status of designated sites as a result of flood risk management measures	10.00	5.00	-1.00	Potential effects during construction on species identified as qualifying criteria of the River Blackwater SAC including lamprey, salmon and floating vegetation. However the introduction of effective mitigation measures during construction could minimise the potential for impact on these species.	-50.00
	Avoid damage to, and where possible enhance, the flora and fauna of the catchment	Avoid damage to and where possible enhance the flora and fauna of the catchment	Avoid damage to and where possible enhance, legally protected sites / habitats and other sites / habitats of national regional and local nature conservation importance	No deterioration on condition of existing sites due to implementation of option	Creation of new or improved condition of existing sites due to implementation of option	5.00	5.00	-1.00	Potential for localised impacts on flora and fauna during the construction phase of the project. However effective mitigation should minimise the potential for impacts.	-25.00
	Protect, and where possible enhance, fisheries resource within the catchment	Maintain existing, and where possible create new, fisheries habitat including the maintenance or improvement of conditions that allow upstream migration for fish species.	Area of suitable habitat supporting fish. Number of upstream barriers	No loss of integrity of fisheries habitat. Maintenance of upstream accessibility	No loss of fishery habitat. Improvement of habitat quality / quantity. Enhanced upstream accessibility	13.00	3.00	-2.00	Temporary impacts on sensitive waterbody during construction are considered likely. However effective mitigation should minimise the potential for impacts.	-78.00
	Protect, and where possible enhance, landscape character and visual amenity within the river corridor	Protect, and where possible enhance, visual amenity, landscape protection zones and views into / from designated scenic areas within the river corridor.	Changes to reported conservation status of designated sites relating to flood risk management Extent of affected Natura 2000 site, NHA/pNHA or other affected National or International designations (e.g. Nature reserves and Ramsar sites), i.e. Area of re	1. No significant impact on landscape designation (protected site, scenic route/amenity, natural landscape form) within zone of visibility of measures 2. No significant change in the quality of existing landscape characteristics of the receiving environment	1. No change to the existing landscape form. 2. Enhancement of existing landscape or landscape feature	8.00	3.00	-4.00	According to the Waterford County Development Plan, the approach road into Ballyduff are scenic routes. The proposed measures include construction of embankments of approximate height 1.5m to 2m. Currently there are wide open views of the river along the approach roads bound by 0.5m high stone walls. The proposed measures will potentially change the character of the landscape in the absence of appropriate design.	-96.00
	Avoid damage to or loss of features, institutions and collections of cultural heritage importance and their setting	Avoid damage to or loss of features, institutions and collections of architectural value and their setting and improve their protection from extreme floods.	a) The number of architectural features, institutions and collections subject to flooding. b) The impact of flood risk management measures on architectural features, institutions and collections.	a) No increase in risk to architectural features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on architectural features, institutions and collections.	a) Complete removal of all relevant architectural features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of architectural features, institutions and collections importance arising from the implementation of the selected measures.	4.00	3.00	1.00	RPS/NIAH structures and buildings at risk from flooding within the 1% AEP including a 17th Century house (castle) and the Ballyduff bridge. (2) The proposed measures will reduce the risk of flooding on the designated sites within the village but does not provide protection to the Ballyduff Castle downstream. However there is a minor setting impact on a number of buildings within the village due to the construction of walls 2.5m in height. (-1)	12.00
		Avoid damage to or loss of features, institutions and collections of archaeological value and their setting and improve their protection from extreme floods where this is beneficial.	a) The number of archaeological features, institutions and collections subject to flooding. b) The impact of flood risk management measures on archaeological features, institutions and collections.	a) No increase in risk to archaeological features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on archaeological features, institutions and collections.	a) Complete removal of all relevant archaeological features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of archaeological features, institutions and collections importance arising from the implementation of the selected measures.	4.00	3.00	0.00	No impact	0.00
Environmental Score										-397.00
MCA Benefit Score										665.92
Option Selection MCA Score										1715.92
MCA benefit Cost Ratio										0.0008
Economic Benefit Cost Ratio										3.54

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Multi-Criteria Assessment								Do Nothing		
Criteria	**Objective**	**Sub-Objective**	**Indicator**	**Basic Requirement**	**Aspirational Target**	**Global Weighting**	**Local Weighting**	**Score**	**Rationale**	**Wtd Score**
Technical	Ensure flood risk management options are operationally robust	Ensure flood risk management options are operationally robust	Level of operational risk of option- Degree of reliance on mechanical, electrical or electronic systems, or on human intervention, action or decision, for the option to operate or perform successfully, - Non-numeric			20.00	5.00	0.00	Do nothing option	0.00
	Minimise health and safety risk of flood risk management options	Reduce and where possible eliminate health and safety risks associated with the construction and operation of flood risk management options	Degree of health and safety risk during construction and operation	Moderate to high, but acceptable and manageable, level of health and safety risk during construction, maintenance or operation	Negligible risk to health and safety during construction, maintenance or operation	20.00	5.00	0.00	Do nothing option	0.00
	Ensure flood risk management options are adaptable to future flood risk, and the potential impacts of climate change	Ensure flood risk management options are adaptable to future flood risk	Sustainability and adaptability of the flood risk management measure in the face of potential future changes, including the potential impacts of climate change	Option should not hinder future interventions that may be required to manage potential future increases in risk	Option to provide for, or be adaptable to, the HEFS in terms of maintaining the standard of protection at no or negligible cost	20.00	5.00	0.00	Do nothing option	0.00
Technical Score							0.00			
Economic	Minimise economic risk	Minimise economic risk	Annual Average Damage (AAD) expressed in Euro / year	AAD is not increased	100% reduction in AAD	24.00	5.00	0.00	Do nothing option	0.00
	Minimise risk to transport infrastructure	Minimise risk to transport infrastructure	Length of infrastructure at risk from flooding in the 0.1% AEP event	Do not increase length of infrastructure at risk from flooding	Reduce the length of infrastructure at risk from flooding by 50%	10.00	1.05	0.00	Do nothing option	0.00
	Minimise risk to utility infrastructure	Minimise risk to utility infrastructure	Utilities at risk from flooding	No increase number of utility receptors at risk from flooding	Reduce number of utility receptors at risk to 0	14.00	0.00	0.00	Do nothing option	0.00
	Manage Risk to Agriculture	Manage Risk to Agriculture	Agricultural production	Do not increase in negative impact of flooding on agricultural production	Provide the potential for enhanced agricultural production	12.00	0.00	0.00	Do nothing option	0.00
Economic Score							0.00			
Social	Minimise risk to human health and life	Minimise risk to human health and life of residents	Annual Average number of residential properties at risk from flooding	Number of residential properties at risk from flooding does not increase	Reduce the number of residential properties at risk from flooding to 0	27.00	3.75	0.00	Do nothing option	0.00
		Minimise risk to high vulnerability properties	Number of high vulnerability properties at risk from flooding	Do not increase number of high vulnerability properties at risk from flooding	Reduce the number of high vulnerability properties at risk from flooding to 0	17.00	5.00	0.00	Do nothing option	0.00
	Minimise risk to community	Minimise risk to social infrastructure and amenity	Number of social infrastructure receptors at risk from flooding	Do not increase number of social infrastructure receptors at risk from flooding	Reduce the number of social infrastructure receptors at risk from flooding to 0	9.00	1.18	0.00	Do nothing option	0.00
		Minimise risk to local employment	Number of enterprises at risk from flooding	Do not increase number of enterprises at risk from flooding	Reduce the number of enterprises at risk from flooding to 0	7.00	5.00	0.00	Do nothing option	0.00
Social Score							0.00			
Environmental	Support the objectives of the WFD	Provide no impediment to the achievement of water body objectives and, if possible, contribute to the achievement of water body objectives.	Ecological status of water bodies	Provide no constraint to the achievement of water body objectives	Contribute to the achievement of water body objectives	16.00	5.00	-4.00	There are significant polluting sources (CSO and WWTP) within the 1% AEP. in the absence of measures this significant pullulating source in the town will result in recurring risk of flooding and impediment of ensuring good water status within the WFD	-320.00
	Support the objectives of the Habitats and Birds Directives	Avoid detrimental effects to, and where possible enhance, Natura 2000 network, protected species and their key habitats, recognising relevant landscape features and stepping stones.	Area of site at risk from flooding and qualitative Assessment of impact of option on habitat	No deterioration in the conservation status of designated sites as a result of flood risk management measures	Improvement in the conservation status of designated sites as a result of flood risk management measures	10.00	5.00	-3.00	Flooding in the Allow and Dalua can wash sediment downstream which is likely to be impacting salmonid habitat and pearl mussel habitat (-3). Note the FPM populations in the Allow occur above Kanturk. Flooding in the catchment can cause water pollution however given the absence of significant pollution sources in the flood zone no impacts on the SAC are likely (0)	-150.00
	Avoid damage to, and where possible enhance, the flora and fauna of the catchment	Avoid damage to and where possible enhance the flora and fauna of the catchment	Avoid damage to and where possible enhance, legally protected sites / habitats and other sites / habitats of national regional and local nature conservation importance	No deterioration on condition of existing sites due to implementation of option	Creation of new or improved condition of existing sites due to implementation of option	5.00	5.00	-3.00	Reoccurring flooding results in potential impacts on un-protected aquatic ecology	-75.00
	Protect, and where possible enhance, fisheries resource within the catchment	Maintain existing, and where possible create new, fisheries habitat including the maintenance or improvement of conditions that allow upstream migration for fish species.	Area of suitable habitat supporting fish. Number of upstream barriers	No loss of integrity of fisheries habitat. Maintenance of upstream accessibility	No loss of fishery habitat. Improvement of habitat quality / quantity. Enhanced upstream accessibility	13.00	4.00	-4.00	There are significant polluting sources (CSO and WWTP) within the 1% AEP. in the absence of measures this significant polluting source in the town will result in recurring risk of flooding with potential impacts on fishery populations.	-208.00
	Protect, and where possible enhance, landscape character and visual amenity within the river corridor	Protect, and where possible enhance, visual amenity, landscape protection zones and views into / from designated scenic areas within the river corridor.	Changes to reported conservation status of designated sites relating to flood risk management Extent of affected Natura 2000 site, NHA/pNHA or other affected National or International designations (e.g. Nature reserves and Ramsar sites), i.e. Area of re	1. No significant impact on landscape designation (protected site, scenic route/amenity, natural landscape form) within zone of visibility of measures 2. No significant change in the quality of existing landscape characteristics of the receiving environment	1. No change to the existing landscape form. 2. Enhancement of existing landscape or landscape feature	8.00	4.00	0.00	No significant effect	0.00
	Avoid damage to or loss of features, institutions and collections of cultural heritage importance and their setting	Avoid damage to or loss of features, institutions and collections of architectural value and their setting and improve their protection from extreme floods.	a) The number of architectural features, institutions and collections subject to flooding. b) The impact of flood risk management measures on architectural features, institutions and collections.	a) No increase in risk to architectural features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on architectural features, institutions and collections.	a) Complete removal of all relevant architectural features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of architectural features, institutions and collections importance arising from the implementation of the selected measures.	4.00	3.00	-3.00	The absence of flood protection will ensure flooding in an ACA and on NIAH/RPSs. .	-36.00
		Avoid damage to or loss of features, institutions and collections of archaeological value and their setting and improve their protection from extreme floods where this is beneficial.	a) The number of archaeological features, institutions and collections subject to flooding. b) The impact of flood risk management measures on archaeological features, institutions and collections.	a) No increase in risk to archaeological features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on archaeological features, institutions and collections.	a) Complete removal of all relevant archaeological features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of archaeological features, institutions and collections importance arising from the implementation of the selected measures.	4.00	3.00	-1.00	The absence of flood protection will ensure flooding at an RMP.	-12.00
Environmental Score										**-801.00**
MCA Benefit Score										**-801.00**
Option Selection MCA Score										**-801.00**
MCA benefit Cost Ratio										0.00
Economic Benefit Cost Ratio										0.00

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Multi-Criteria Assessment								Option 1 - Flood Defences		
Criteria	**Objective**	**Sub-Objective**	**Indicator**	**Basic Requirement**	**Aspirational Target**	**Global Weighting**	**Local Weighting**	**Score**	**Rationale**	**Wtd score**
Technical	Ensure flood risk management options are operationally robust	Ensure flood risk management options are operationally robust	Level of operational risk of option- Degree of reliance on mechanical, electrical or electronic systems, or on human intervention, action or decision, for the option to operate or perform successfully, - Non-numeric			20.00	5.00	5.00	Flood defences/ localised works consisting of walls and embankments, no moving parts, easy maintenance	500.00
	Minimise health and safety risk of flood risk management options	Reduce and where possible eliminate health and safety risks associated with the construction and operation of flood risk management options	Degree of health and safety risk during construction and operation	Moderate to high, but acceptable and manageable, level of health and safety risk during construction, maintenance or operation	Negligible risk to health and safety during construction, maintenance or operation	20.00	5.00	2.00	Risk of drowning, falling from a height and electrocution in the construction of works	200.00
	Ensure flood risk management options are adaptable to future flood risk, and the potential impacts of climate change	Ensure flood risk management options are adaptable to future flood risk	Sustainability and adaptability of the flood risk management measure in the face of potential future changes, including the potential impacts of climate change	Option should not hinder future interventions that may be required to manage potential future increases in risk	Option to provide for, or be adaptable to, the HEFS in terms of maintaining the standard of protection at no or negligible cost	20.00	5.00	2.00	Increase height of existing flood defences by 0.2m. Note: additional increase in height of existing defences may be accommodated by freeboard. (Score 4) No physical provision: construct an additional 800m of new flood walls. (Score 0)	200.00
Technical Score							0.00			900.00
Economic	Minimise economic risk	Minimise economic risk	Annual Average Damage (AAD) expressed in Euro / year	AAD is not increased	100% reduction in AAD	24.00	5.00	4.64	As calculated (92.75*.05)	556.50
	Minimise risk to transport infrastructure	Minimise risk to transport infrastructure	Length of infrastructure at risk from flooding in the 0.1% AEP event	Do not increase length of infrastructure at risk from flooding	Reduce the length of infrastructure at risk from flooding by 50%	10.00	1.05	3.10	As calculated	32.50
	Minimise risk to utility infrastructure	Minimise risk to utility infrastructure	Utilities at risk from flooding	No increase number of utility receptors at risk from flooding	Reduce number of utility receptors at risk to 0	14.00	0.00	0.00	As calculated	0.00
	Manage Risk to Agriculture	Manage Risk to Agriculture	Agricultural production	Do not increase in negative impact of flooding on agricultural production	Provide the potential for enhanced agricultural production	12.00	0.00	0.00	As calculated	0.00
Economic Score							0.00			589.00
Social	Minimise risk to human health and life	Minimise risk to human health and life of residents	Annual Average number of residential properties at risk from flooding	Number of residential properties at risk from flooding does not increase	Reduce the number of residential properties at risk from flooding to 0	27.00	3.75	3.86	As calculated	390.15
		Minimise risk to high vulnerability properties	Number of high vulnerability properties at risk from flooding	Do not increase number of high vulnerability properties at risk from flooding	Reduce the number of high vulnerability properties at risk from flooding to 0	17.00	5.00	4.95	As calculated	420.75
	Minimise risk to community	Minimise risk to social infrastructure and amenity	Number of social infrastructure receptors at risk from flooding	Do not increase number of social infrastructure receptors at risk from flooding	Reduce the number of social infrastructure receptors at risk from flooding to 0	9.00	1.18	2.66	As calculated	28.13
		Minimise risk to local employment	Number of enterprises at risk from flooding	Do not increase number of enterprises at risk from flooding	Reduce the number of enterprises at risk from flooding to 0	7.00	5.00	1.21	As calculated	42.18
Social Score							0.00			881.20
Environmental	Support the objectives of the WFD	Provide no impediment to the achievement of water body objectives and, if possible, contribute to the achievement of water body objectives.	Ecological status of water bodies	Provide no constraint to the achievement of water body objectives	Contribute to the achievement of water body objectives	16.00	5.00	2.00	Kanturk is located at the confluence of the Dalua and Allow Rivers in County Cork. Kanturk is at risk of fluvial flooding. Both rivers are classified as having good water status under the WFD. both are tributaries of the river blackwater. The rivers are considered to be sensitive. For flood protection measures can assist in achieving the objectives of the WFD by preventing flooding (4) , which if flooded could result in the deterioration of water quality. Short term impacts associated with construction of walls and embankments within the town (-2). . May require excavation of the bank of River during the construction stage This would result in significant emissions of sediment to the waterbody and downstream.	160.00
	Support the objectives of the Habitats and Birds Directives	Avoid detrimental effects to, and where possible enhance, Natura 2000 network, protected species and their key habitats, recognising relevant landscape features and stepping stones.	Area of site at risk from flooding and qualitative Assessment of impact of option on habitat	No deterioration in the conservation status of designated sites as a result of flood risk management measures	Improvement in the conservation status of designated sites as a result of flood risk management measures	10.00	5.00	-1.00	Construction of flood walls and embankments can cause temporary release of sediment and pollutants to the watercourse which can negatively impact fishery habitat (-1). Note: the FPM populations in the Allow occur upstream of Kanturk. There are no populations downstream of Kanturk in the Allow. Also habitat in the Blackwater River (between the Allow-Blackwater confluence and Lombardstown Bridge in Mallow) is assessed as sub-optimal for pearl mussel. There is no potential for impact (0). Otter are likely to commute along and feed within the Allow and Dalua. There is potential for temporary disturbance during construction. However given the urban location of the works, and the fact that otter will be most active outside of daylight hours, the potential for impact is low (0).	-50.00
	Avoid damage to, and where possible enhance, the flora and fauna of the catchment	Avoid damage to and where possible enhance the flora and fauna of the catchment	Avoid damage to and where possible enhance, legally protected sites / habitats and other sites / habitats of national regional and local nature conservation importance	No deterioration on condition of existing sites due to implementation of option	Creation of new or improved condition of existing sites due to implementation of option	5.00	5.00	-1.00	Construction of flood walls and embankments can cause temporary release of sediment and pollutants to the watercourse which can negatively impact fishery habitat. There is existing heavy sedimentation in the watercourse as noted during pearl mussel survey (-1). Himalayan balsam (Impatiens glandulifera), an invasive species has been documented in Kanturk at the pedestrian footbridge. There is potential for spread of this invasive species during the works (-1)	-25.00
	Protect, and where possible enhance, fisheries resource within the catchment	Maintain existing, and where possible create new, fisheries habitat including the maintenance or improvement of conditions that allow upstream migration for fish species.	Area of suitable habitat supporting fish. Number of upstream barriers	No loss of integrity of fisheries habitat. Maintenance of upstream accessibility	No loss of fishery habitat. Improvement of habitat quality / quantity. Enhanced upstream accessibility	13.00	4.00	-1.00	The Allow and Dalua rivers both form part of the River Blackwater SAC. The qualifying criteria for this Natura 2000 site include Salmon and river lamprey. As a result these rivers are considered to be sensitive water bodies. Short term minor impacts are likely during the construction phase as all the measures are in close proximity to the waterbodies. This means that any sediment or other materials lost during the construction could be washed into the river causing pollution (-2). The reduction in flood events will reduce the occurrence of recurring events where flood waters entrained sediment and other contaminants from roads and streets and washed them into the river. An improvement in water quality will benefit fish habitat present (1).	-52.00
	Protect, and where possible enhance, landscape character and visual amenity within the river corridor	Protect, and where possible enhance, visual amenity, landscape protection zones and views into / from designated scenic areas within the river corridor.	Changes to reported conservation status of designated sites relating to flood risk management Extent of affected Natura 2000 site, NHA/pNHA or other affected National or International designations (e.g. Nature reserves and Ramsar sites), i.e. Area of re	1. No significant impact on landscape designation (protected site, scenic route/amenity, natural landscape form) within zone of visibility of measures 2. No significant change in the quality of existing landscape characteristics of the receiving environment	1. No change to the existing landscape form. 2. Enhancement of existing landscape or landscape feature	8.00	4.00	-4.00	The landscape in the Kanturk area is defined as "broad marginal middle ground valley" and is defined as high value. The LCA recommends the requirement to "protect rivers Blackwater, Dulua and Allow and their surrounding floodplains. As a result this landscape is considered sensitive. There will be a permanent impact on the landscape and visual amenity in the town centre of Kanturk arising from the proposed measures, including an impact on a public park with amenity use (-4). Furthermore, there will be a requirement to remove existing vegetation and trees along the length of the river in the town centre. This will result in a temporary negative impact on the visual amenity in the town. (-1) , prior to the re-establishment of vegetation	-128.00
	Avoid damage to or loss of features, institutions and collections of cultural heritage importance and their setting	Avoid damage to or loss of features, institutions and collections of architectural value and their setting and improve their protection from extreme floods.	a) The number of architectural features, institutions and collections subject to flooding. b) The impact of flood risk management measures on architectural features, institutions and collections.	a) No increase in risk to architectural features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on architectural features, institutions and collections.	a) Complete removal of all relevant architectural features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of architectural features, institutions and collections importance arising from the implementation of the selected measures.	4.00	3.00	1.00	Kanturk is designated as an Architectural Conservation Area (ACA). In addition there are a number of NIAHs/RPS's in the town. These include three bridges over the River Allow. The provision of flood defences within the town centre will result in the protection of a number of NIAHs and RPS from possible flood damage in the future (3). However, the provision of flood defences in the town have potential to have a permanent setting impact on a number of RPSs/NIAH (-2)	12.00
		Avoid damage to or loss of features, institutions and collections of archaeological value and their setting and improve their protection from extreme floods where this is beneficial.	a) The number of archaeological features, institutions and collections subject to flooding. b) The impact of flood risk management measures on archaeological features, institutions and collections.	a) No increase in risk to archaeological features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on archaeological features, institutions and collections.	a) Complete removal of all relevant archaeological features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of archaeological features, institutions and collections importance arising from the implementation of the selected measures.	4.00	3.00	-1.00	There are three designated RMPs within the town centre. One of these is a site of a mill of which there is no above ground evidence. The remaining two RMPs are bridges. The provision of flood defences within the town centre will have a permanent impact on the setting of these RMPs (-2). There will be some protection of the RMPs listed in Kanturk from the future occurrence of flooding. However, as two of the designated sites are bridges, they will be afforded only limited protection by the proposed measures. (1)	-12.00
Environmental Score										**-95.00**
MCA Benefit Score										**1375.20**
Option Selection MCA Score										**2275.20**
MCA benefit Cost Ratio										0.0002
Economic Benefit Cost Ratio										1.39

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Multi-Criteria Assessment								Option 2 - Storage & Flood Defences		
Criteria	**Objective**	**Sub-Objective**	**Indicator**	**Basic Requirement**	**Aspirational Target**	**Global Weighting**	**Local Weighting**	**Score**	**Rationale**	**Wtd score**
Technical	Ensure flood risk management options are operationally robust	Ensure flood risk management options are operationally robust	Level of operational risk of option- Degree of reliance on mechanical, electrical or electronic systems, or on human intervention, action or decision, for the option to operate or perform successfully, - Non-numeric			20.00	5.00	4.00	Flood defences/ localised works consisting of walls and embankments and a storage area, no moving parts, may have silting of storage area	400.00
	Minimise health and safety risk of flood risk management options	Reduce and where possible eliminate health and safety risks associated with the construction and operation of flood risk management options	Degree of health and safety risk during construction and operation	Moderate to high, but acceptable and manageable, level of health and safety risk during construction, maintenance or operation	Negligible risk to health and safety during construction, maintenance or operation	20.00	5.00	2.00	Risk of drowning, falling from a height and electrocution in the construction of works	200.00
	Ensure flood risk management options are adaptable to future flood risk, and the potential impacts of climate change	Ensure flood risk management options are adaptable to future flood risk	Sustainability and adaptability of the flood risk management measure in the face of potential future changes, including the potential impacts of climate change	Option should not hinder future interventions that may be required to manage potential future increases in risk	Option to provide for, or be adaptable to, the HEFS in terms of maintaining the standard of protection at no or negligible cost	20.00	5.00	2.33	Adaptive approach: increase size and capacity of storage embankment heights (Score 3) Adaptive approach: increase height of flood defences by 0.2m (Score 4) No physical provision: construct an additional 900m of flood defence walls (Score 0)	233.00
Technical Score							0.00			833.00
Economic	Minimise economic risk	Minimise economic risk	Annual Average Damage (AAD) expressed in Euro / year	AAD is not increased	100% reduction in AAD	24.00	5.00	4.64	As calculated	556.50
	Minimise risk to transport infrastructure	Minimise risk to transport infrastructure	Length of infrastructure at risk from flooding in the 0.1% AEP event	Do not increase length of infrastructure at risk from flooding	Reduce the length of infrastructure at risk from flooding by 50%	10.00	1.05	3.10	As calculated	32.50
	Minimise risk to utility infrastructure	Minimise risk to utility infrastructure	Utilities at risk from flooding	No increase number of utility receptors at risk from flooding	Reduce number of utility receptors at risk to 0	14.00	0.00	0.00	As calculated	0.00
	Manage Risk to Agriculture	Manage Risk to Agriculture	Agricultural production	Do not increase in negative impact of flooding on agricultural production	Provide the potential for enhanced agricultural production	12.00	0.00	0.00	As calculated	0.00
Economic Score							0.00			589.00
Social	Minimise risk to human health and life	Minimise risk to human health and life of residents	Annual Average number of residential properties at risk from flooding	Number of residential properties at risk from flooding does not increase	Reduce the number of residential properties at risk from flooding to 0	27.00	3.75	3.86	As calculated	390.15
		Minimise risk to high vulnerability properties	Number of high vulnerability properties at risk from flooding	Do not increase number of high vulnerability properties at risk from flooding	Reduce the number of high vulnerability properties at risk from flooding to 0	17.00	5.00	4.95	As calculated	420.75
	Minimise risk to community	Minimise risk to social infrastructure and amenity	Number of social infrastructure receptors at risk from flooding	Do not increase number of social infrastructure receptors at risk from flooding	Reduce the number of social infrastructure receptors at risk from flooding to 0	9.00	1.18	2.66	As calculated	28.13
		Minimise risk to local employment	Number of enterprises at risk from flooding	Do not increase number of enterprises at risk from flooding	Reduce the number of enterprises at risk from flooding to 0	7.00	5.00	1.21	As calculated	42.18
Social Score							0.00			881.20
Environmental	Support the objectives of the WFD	Provide no impediment to the achievement of water body objectives and, if possible, contribute to the achievement of water body objectives.	Ecological status of water bodies	Provide no constraint to the achievement of water body objectives	Contribute to the achievement of water body objectives	16.00	5.00	2.00	Kanturk is located at the confluence of the Dalua and Allow Rivers in County Cork. Kanturk is at risk of fluvial flooding. Both rivers are classified as having good water status under the WFD, both are tributaries of the river blackwater. The rivers are considered to be sensitive. The provision of a storage area along the existing stream (in an area designated as an SAC), will have a negative impact on the rivers attainment of good status, due to the recurring flooding of this area and the negative impact that this will have in terms of increased pollution downstream, when the flood waters are released from the reservoir (-4) Flood protection measures can assist in achieving the objectives of the WFD by preventing flooding (4) , which could result in the deterioration of water quality. Short term impacts associated with construction of walls and embankments within the town (-2). . May require excavation of the bank of River during the construction stage This would result in significant emissions of sediment to the waterbody and downstream.	160.00
	Support the objectives of the Habitats and Birds Directives	Avoid detrimental effects to, and where possible enhance, Natura 2000 network, protected species and their key habitats, recognising relevant landscape features and stepping stones.	Area of site at risk from flooding and qualitative Assessment of impact of option on habitat	No deterioration in the conservation status of designated sites as a result of flood risk management measures	Improvement in the conservation status of designated sites as a result of flood risk management measures	10.00	5.00	-3.00	Otter are common throughout the area. There is potential for disturbance to otter on the Dalua in the rural location of the storage area (-3). Construction of flood walls and embankments can cause temporary release of sediment and pollutants to the watercourse which can negatively impact fishery habitat (-1). Note: the FPM populations in the Allow occur upstream of Kanturk. There are no populations downstream of Kanturk in the Allow. Also habitat in the Blackwater River (between the Allow-Blackwater confluence and Lombardstown Bridge in Mallow) is assessed as sub-optimal for pearl mussel. There is no potential for impact (0).	-150.00
	Avoid damage to, and where possible enhance, the flora and fauna of the catchment	Avoid damage to and where possible enhance the flora and fauna of the catchment	Avoid damage to and where possible enhance, legally protected sites / habitats and other sites / habitats of national regional and local nature conservation importance	No deterioration on condition of existing sites due to implementation of option	Creation of new or improved condition of existing sites due to implementation of option	5.00	5.00	-3.00	Construction of flood walls and embankments can cause temporary release of sediment and pollutants to the watercourse which can negatively impact fishery habitat. There is existing heavy sedimentation in the watercourse as noted during pearl mussel survey (-1). Himalayan balsam (Impatiens glandulifera), an invasive species has been documented in Kanturk at the pedestrian footbridge. There is potential for spread of this invasive species during the works (-1). Badger are likely to occur in the woodland west of the storage location. there eis potential for temporary disturbance during the works (-3)	-75.00
	Protect, and where possible enhance, fisheries resource within the catchment	Maintain existing, and where possible create new, fisheries habitat including the maintenance or improvement of conditions that allow upstream migration for fish species.	Area of suitable habitat supporting fish. Number of upstream barriers	No loss of integrity of fisheries habitat. Maintenance of upstream accessibility	No loss of fishery habitat. Improvement of habitat quality / quantity. Enhanced upstream accessibility	13.00	4.00	-3.00	The Allow and Dalua rivers both form part of the River Blackwater SAC. The qualifying criteria for this Natura 2000 site include Salmon and river lamprey. As a result these rivers are considered to be sensitive water bodies. Short term minor impacts are likely during the construction phase as all the measures are in close proximity to the waterbodies. This means that any sediment or other materials lost during the construction could be washed into the river causing pollution (-2). The provision of a storage area along the existing stream (in an area designated as an SAC), will have a negative impact on fisheries habitats, due to the recurring flooding of this area and the negative impact that this will have in terms of increased pollution downstream and the impacts of increased flow on spawning areas, when the flood waters are released from the reservoir (-4) The reduction in flood events will reduce the occurrence of recurring events where flood waters entrained sediment and other contaminants from roads and streets and washed them into the river. An improvement in water quality will benefit fish habitat present (1).	-156.00
	Protect, and where possible enhance, landscape character and visual amenity within the river corridor	Protect, and where possible enhance, visual amenity, landscape protection zones and views into / from designated scenic areas within the river corridor.	Changes to reported conservation status of designated sites relating to flood risk management Extent of affected Natura 2000 site, NHA/pNHA or other affected National or International designations (e.g. Nature reserves and Ramsar sites), i.e. Area of re	1. No significant impact on landscape designation (protected site, scenic route/amenity, natural landscape form) within zone of visibility of measures 2. No significant change in the quality of existing landscape characteristics of the receiving environment	1. No change to the existing landscape form. 2. Enhancement of existing landscape or landscape feature	8.00	4.00	-4.00	The landscape in the Kanturk area is defined as "broad marginal middle ground valley" and is defined as high value. The LCA recommends the requirement to "protect rivers Blackwater, Dulua and Allow and their surrounding floodplains. As a result this landscape is considered sensitive. There will be a permanent impact on the landscape and visual amenity in the town centre of Kanturk arising from the proposed measures, including an impact on a public park with amenity use, however the visual impact will be less than other options as the barriers will be lower (-3). Furthermore, there will be a requirement to remove existing vegetation and trees along the length of the river in the town centre. This will result in a temporary negative impact on the visual amenity in the town. (-1) , prior to the re-establishment of vegetation. The development of the reservoir will require the construction of large berms (up to 8m). These berms are in close proximity to residential receptors. As a result there is considered to be a significant permanent impact on the landscape and visual amenity (-4)	-128.00
	Avoid damage to or loss of features, institutions and collections of cultural heritage importance and their setting	Avoid damage to or loss of features, institutions and collections of architectural value and their setting and improve their protection from extreme floods.	a) The number of architectural features, institutions and collections subject to flooding. b) The impact of flood risk management measures on architectural features, institutions and collections.	a) No increase in risk to architectural features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on architectural features, institutions and collections.	a) Complete removal of all relevant architectural features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of architectural features, institutions and collections importance arising from the implementation of the selected measures.	4.00	3.00	2.00	Kanturk is designated as an Architectural Conservation Area (ACA). In addition there are a number of NIAHs/RPS's in the town. These include three bridges over the River Allow. The provision of flood defences within the town centre will result in the protection of a number of NIAHs and RPS from possible flood damage in the future (3). However, the provision of flood defences in the town have potential to have a permanent setting impact on a number of RPSs/NIAH, however these impacts are reduced when compared to other options as the flood walls and embankments will be lower (-1)	24.00
		Avoid damage to or loss of features, institutions and collections of archaeological value and their setting and improve their protection from extreme floods where this is beneficial.	a) The number of archaeological features, institutions and collections subject to flooding. b) The impact of flood risk management measures on archaeological features, institutions and collections.	a) No increase in risk to archaeological features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on archaeological features, institutions and collections.	a) Complete removal of all relevant archaeological features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of archaeological features, institutions and collections importance arising from the implementation of the selected measures.	4.00	3.00	0.00	There are three designated RMPs within the town centre. One of these is a site of a mill of which there is no above ground evidence. The remaining two RMPs are bridges. The provision of flood defences within the town centre will have a permanent impact on the setting of these RMPs. However the impacts will be less than for other options due to the reduced height of the barrier (-1). There will be some protection of the RMPs listed in Kanturk from the future occurrence of flooding. However, as two of the designated sites are bridges, they will be afforded only limited protection by the proposed measures. (1)	
Environmental Score										**-325.00**
MCA Benefit Score										**1145.20**
Option Selection MCA Score										**1978.20**
MCA benefit Cost Ratio										0.0001
Economic Benefit Cost Ratio										1.34

AFA	Kanturk

Multi-Criteria Assessment								Option 3 - Conveyance & Flood Defences		
Criteria	**Objective**	**Sub-Objective**	**Indicator**	**Basic Requirement**	**Aspirational Target**	**Global Weighting**	**Local Weighting**	**Score**	**Rationale**	**Wtd score**
Technical	Ensure flood risk management options are operationally robust	Ensure flood risk management options are operationally robust	Level of operational risk of option- Degree of reliance on mechanical, electrical or electronic systems, or on human intervention, action or decision, for the option to operate or perform successfully, - Non-numeric			20.00	5.00	5.00	Flood defences/ localised works consisting of walls and embankments and the removal of two weirs, no moving parts, easy maintenance	500.00
	Minimise health and safety risk of flood risk management options	Reduce and where possible eliminate health and safety risks associated with the construction and operation of flood risk management options	Degree of health and safety risk during construction and operation	Moderate to high, but acceptable and manageable, level of health and safety risk during construction, maintenance or operation	Negligible risk to health and safety during construction, maintenance or operation	20.00	5.00	2.00	Risk of drowning, falling from a height and electrocution in the construction of works	200.00
	Ensure flood risk management options are adaptable to future flood risk, and the potential impacts of climate change	Ensure flood risk management options are adaptable to future flood risk	Sustainability and adaptability of the flood risk management measure in the face of potential future changes, including the potential impacts of climate change	Option should not hinder future interventions that may be required to manage potential future increases in risk	Option to provide for, or be adaptable to, the HEFS in terms of maintaining the standard of protection at no or negligible cost	20.00	5.00	2.00	Adaptive approach: increase height of flood defences by 0.2m (Score 4) No physical provision: construct an additional 900m of flood defence walls (Score 0)	200.00
Technical Score							0.00			900.00
Economic	Minimise economic risk	Minimise economic risk	Annual Average Damage (AAD) expressed in Euro / year	AAD is not increased	100% reduction in AAD	24.00	5.00	4.64	As calculated	556.50
	Minimise risk to transport infrastructure	Minimise risk to transport infrastructure	Length of infrastructure at risk from flooding in the 0.1% AEP event	Do not increase length of infrastructure at risk from flooding	Reduce the length of infrastructure at risk from flooding by 50%	10.00	1.05	3.10	As calculated	32.50
	Minimise risk to utility infrastructure	Minimise risk to utility infrastructure	Utilities at risk from flooding	No increase number of utility receptors at risk from flooding	Reduce number of utility receptors at risk to 0	14.00	0.00	0.00	As calculated	0.00
	Manage Risk to Agriculture	Manage Risk to Agriculture	Agricultural production	Do not increase in negative impact of flooding on agricultural production	Provide the potential for enhanced agricultural production	12.00	0.00	0.00	As calculated	0.00
Economic Score							0.00			589.00
Social	Minimise risk to human health and life	Minimise risk to human health and life of residents	Annual Average number of residential properties at risk from flooding	Number of residential properties at risk from flooding does not increase	Reduce the number of residential properties at risk from flooding to 0	27.00	3.75	3.86	As calculated	390.15
		Minimise risk to high vulnerability properties	Number of high vulnerability properties at risk from flooding	Do not increase number of high vulnerability properties at risk from flooding	Reduce the number of high vulnerability properties at risk from flooding to 0	17.00	5.00	4.95	As calculated	420.75
	Minimise risk to community	Minimise risk to social infrastructure and amenity	Number of social infrastructure receptors at risk from flooding	Do not increase number of social infrastructure receptors at risk from flooding	Reduce the number of social infrastructure receptors at risk from flooding to 0	9.00	1.18	2.66	As calculated	28.13
		Minimise risk to local employment	Number of enterprises at risk from flooding	Do not increase number of enterprises at risk from flooding	Reduce the number of enterprises at risk from flooding to 0	7.00	5.00	1.21	As calculated	42.18
Social Score							0.00			881.20
Environmental	Support the objectives of the WFD	Provide no impediment to the achievement of water body objectives and, if possible, contribute to the achievement of water body objectives.	Ecological status of water bodies	Provide no constraint to the achievement of water body objectives	Contribute to the achievement of water body objectives	16.00	5.00	3.00	Kanturk is located at the confluence of the Dalua and Allow Rivers in County Cork. Kanturk is at risk of fluvial flooding. Both rivers are classified as having good water status under the WFD. both are tributaries of the river blackwater. The rivers are considered to be sensitive. Flood protection measures can assist in achieving the objectives of the WFD by preventing flooding (4) , which could result in the deterioration of water quality. Furthermore the removal of weirs will result in a more natural hydrological and morphological regime (5). Short term impacts associated with construction of walls and embankments within the town (-2). May require excavation of the bank of River during the construction stage This would result in significant emissions of sediment to the waterbody and downstream.	240.00
	Support the objectives of the Habitats and Birds Directives	Avoid detrimental effects to, and where possible enhance, Natura 2000 network, protected species and their key habitats, recognising relevant landscape features and stepping stones.	Area of site at risk from flooding and qualitative Assessment of impact of option on habitat	No deterioration in the conservation status of designated sites as a result of flood risk management measures	Improvement in the conservation status of designated sites as a result of flood risk management measures	10.00	5.00	0.00	Removing the weirs from the Dalua will result in the temporary release of high levels of sediment in to the watercourse during the works which can negatively impact fishery habitat (-3). Removal of the weirs is likely to allow permanent upstream migration of salmonids and lamprey (+3). Removal of the weirs will permanently alter the hydrology of the river at this location. Currently sediment builds up behind the weirs and is flushed out during flooding. The removal of the weirs will permit the more natural deposition of sediment in the watercourse (+1) Construction of flood walls and embankments can cause temporary release of sediment and pollutants to the watercourse which can negatively impact fishery habitat (-1). Note: the FPM populations in the Allow occur upstream of Kanturk. There are no populations downstream of Kanturk in the Allow. Also habitat in the Blackwater River (between the Allow-Blackwater confluence and Lombardstown Bridge in Mallow) is assessed as sub-optimal for pearl mussel. There is no potential for impact (0)	0.00
	Avoid damage to, and where possible enhance, the flora and fauna of the catchment	Avoid damage to and where possible enhance the flora and fauna of the catchment	Avoid damage to and where possible enhance, legally protected sites / habitats and other sites / habitats of national regional and local nature conservation importance	No deterioration on condition of existing sites due to implementation of option	Creation of new or improved condition of existing sites due to implementation of option	5.00	5.00	-1.00	Construction of flood walls and embankments and removal of weirs can cause temporary release of sediment and pollutants to the watercourse which can negatively impact fishery habitat. There is existing heavy sedimentation in the watercourse as noted during pearl mussel survey (-1). The weirs are a likely barrier to migration. Their removal will have a positive effect for fisheries (+1) Himalayan balsam (Impatiens glandulifera), an invasive species has been documented in Kanturk at the pedestrian footbridge. there is potential for spread of this invasive species during the works (-1)	-25.00
	Protect, and where possible enhance, fisheries resource within the catchment	Maintain existing, and where possible create new, fisheries habitat including the maintenance or improvement of conditions that allow upstream migration for fish species.	Area of suitable habitat supporting fish. Number of upstream barriers	No loss of integrity of fisheries habitat. Maintenance of upstream accessibility	No loss of fishery habitat. Improvement of habitat quality / quantity. Enhanced upstream accessibility	13.00	4.00	3.00	The Allow and Dalua rivers both form part of the River Blackwater SAC. The qualifying criteria for this Natura 2000 site include Salmon and river lamprey. As a result these rivers are considered to be sensitive water bodies. Short term minor impacts are likely during the construction phase as all the measures are either in or in close proximity to the waterbodies. This means that any sediment or other materials could be generated during the construction phase causing pollution (-2). The reduction in flood events will reduce the occurrence of recurring events where flood waters entrained sediment and other contaminants from roads and streets and washed them into the river. An improvement in water quality will benefit fish habitat present (1). Furthermore the removal of weirs will result in a more natural hydrological and morphological regime (5).	156.00
	Protect, and where possible enhance, landscape character and visual amenity within the river corridor	Protect, and where possible enhance, visual amenity, landscape protection zones and views into / from designated scenic areas within the river corridor.	Changes to reported conservation status of designated sites relating to flood risk management Extent of affected Natura 2000 site, NHA/pNHA or other affected National or International designations (e.g. Nature reserves and Ramsar sites), i.e. Area of re	1. No significant impact on landscape designation (protected site, scenic route/amenity, natural landscape form) within zone of visibility of measures 2. No significant change in the quality of existing landscape characteristics of the receiving environment	1. No change to the existing landscape form. 2. Enhancement of existing landscape or landscape feature	8.00	4.00	-3.00	The landscape in the Kanturk area is defined as "broad marginal middle ground valley" and is defined as high value. The LCA recommends the requirement to "protect rivers Blackwater, Dulua and Allow and their surrounding floodplains. As a result this landscape is considered sensitive. There will be a permanent impact on the landscape and visual amenity in the town centre of Kanturk arising from the proposed measures, including an impact on a public park with amenity use, however the visual impact will be less than other options as the barriers will be lower (-3). Furthermore, there will be a requirement to remove existing vegetation and trees along the length of the river in the town centre. This will result in a temporary negative impact on the visual amenity in the town. (-1) , prior to the re-establishment of vegetation.	-96.00
	Avoid damage to or loss of features, institutions and collections of cultural heritage importance and their setting	Avoid damage to or loss of features, institutions and collections of architectural value and their setting and improve their protection from extreme floods.	a) The number of architectural features, institutions and collections subject to flooding. b) The impact of flood risk management measures on architectural features, institutions and collections.	a) No increase in risk to architectural features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on architectural features, institutions and collections.	a) Complete removal of all relevant architectural features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of architectural features, institutions and collections importance arising from the implementation of the selected measures.	4.00	3.00	2.00	Kanturk is designated as an Architectural Conservation Area (ACA). In addition there are a number of NIAHs/RPS's in the town. These include three bridges over the River Allow. The provision of flood defences within the town centre will result in the protection of a number of NIAHs and RPS from possible flood damage in the future (3). However, the provision of flood defences in the town have potential to have a permanent setting impact on a number of RPSs/NIAH, however these impacts are reduced when compared to other options as the flood walls and embankments will be lower (-1).	24.00
		Avoid damage to or loss of features, institutions and collections of archaeological value and their setting and improve their protection from extreme floods where this is beneficial.	a) The number of archaeological features, institutions and collections subject to flooding. b) The impact of flood risk management measures on archaeological features, institutions and collections.	a) No increase in risk to archaeological features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on archaeological features, institutions and collections.	a) Complete removal of all relevant archaeological features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of archaeological features, institutions and collections importance arising from the implementation of the selected measures.	4.00	3.00	0.00	There are three designated RMPs within the town centre. One of these is a site of a mill of which there is no above ground evidence. The remaining two RMPs are bridges. The provision of flood defences within the town centre will have a permanent impact on the setting of these RMPs. However the impacts will be less than for other options due to the reduced height of the barrier (-1). There will be some protection of the RMPs listed in Kanturk from the future occurrence of flooding. However, as two of the designated sites are bridges, they will be afforded only limited protection by the proposed measures. (1)	0.00
Environmental Score										**299.00**
MCA Benefit Score										**1769.20**
Option Selection MCA Score										**2669.20**
MCA benefit Cost Ratio										0.0002
Economic Benefit Cost Ratio										1.48

Flood Risk Management Options Rathcormack

Multi-Criteria Assessment								Do Nothing		
Criteria	**Objective**	**Sub-Objective**	**Indicator**	**Basic Requirement**	**Aspirational Target**	**Global Weighting**	**Local Weighting**	**Score**	**Rationale**	**Wtd Score**
Technical	**Ensure flood risk management options are operationally robust**	Ensure flood risk management options are operationally robust	Level of operational risk of option- Degree of reliance on mechanical, electrical or electronic systems, or on human intervention, action or decision, for the option to operate or perform successfully, - Non-numeric			20.00	5.00	0.00	Do Nothing	0.00
	Minimise health and safety risk of flood risk management options	Reduce and where possible eliminate health and safety risks associated with the construction and operation of flood risk management options	Degree of health and safety risk during construction and operation	Moderate to high, but acceptable and manageable, level of health and safety risk during construction, maintenance or operation	Negligible risk to health and safety during construction, maintenance or operation	20.00	5.00	0.00	Do Nothing	0.00
	Ensure flood risk management options are adaptable to future flood risk, and the potential impacts of climate change	Ensure flood risk management options are adaptable to future flood risk	Sustainability and adaptability of the flood risk management measure in the face of potential future changes, including the potential impacts of climate change	Option should not hinder future interventions that may be required to manage potential future increases in risk	Option to provide for, or be adaptable to, the HEFS in terms of maintaining the standard of protection at no or negligible cost	20.00	5.00	0.00	Do Nothing	0.00
Technical Score							0.00			
Economic	**Minimise economic risk**	Minimise economic risk	Annual Average Damage (AAD) expressed in Euro / year	AAD is not increased	100% reduction in AAD	24.00	5.00	0.00	Do Nothing	0.00
	Minimise risk to transport infrastructure	Minimise risk to transport infrastructure	Length of infrastructure at risk from flooding in the 0.1% AEP event	Do not increase length of infrastructure at risk from flooding	Reduce the length of infrastructure at risk from flooding by 50%	10.00	5.00	0.00	Do Nothing	0.00
	Minimise risk to utility infrastructure	Minimise risk to utility infrastructure	Utilities at risk from flooding	No increase number of utility receptors at risk from flooding	Reduce number of utility receptors at risk to 0	14.00	2.50	0.00	Do Nothing	0.00
	Manage Risk to Agriculture	Manage Risk to Agriculture	Agricultural production	Do not increase in negative impact of flooding on agricultural production	Provide the potential for enhanced agricultural production	12.00	0.00	0.00	Do Nothing	0.00
Economic Score							0.00			
Social	**Minimise risk to human health and life**	Minimise risk to human health and life of residents	Annual Average number of residential properties at risk from flooding	Number of residential properties at risk from flooding does not increase	Reduce the number of residential properties at risk from flooding to 0	27.00	5.00	0.00	Do Nothing	0.00
		Minimise risk to high vulnerability properties	Number of high vulnerability properties at risk from flooding	Do not increase number of high vulnerability properties at risk from flooding	Reduce the number of high vulnerability properties at risk from flooding to 0	17.00	0.00	0.00	Do Nothing	0.00
	Minimise risk to community	Minimise risk to social infrastructure and amenity	Number of social infrastructure receptors at risk from flooding	Do not increase number of social infrastructure receptors at risk from flooding	Reduce the number of social infrastructure receptors at risk from flooding to 0	9.00	5.00	0.00	Do Nothing	0.00
		Minimise risk to local employment	Number of enterprises at risk from flooding	Do not increase number of enterprises at risk from flooding	Reduce the number of enterprises at risk from flooding to 0	7.00	5.00	0.00	Do Nothing	0.00
Social Score							0.00			
Environmental	**Support the objectives of the WFD**	Provide no impediment to the achievement of water body objectives and, if possible, contribute to the achievement of water body objectives.	Ecological status of water bodies	Provide no constraint to the achievement of water body objectives	Contribute to the achievement of water body objectives	16.00	5.00	-1.00	Continued maintenance of the existing culverts would led to short term and intermittent negative impacts on water status without prior treatment (-1).	-80.00
	Support the objectives of the Habitats and Birds Directives	Avoid detrimental effects to, and where possible enhance, Natura 2000 network, protected species and their key habitats, recognising relevant landscape features and stepping stones.	Area of site at risk from flooding and qualitative Assessment of impact of option on habitat	No deterioration in the conservation status of designated sites as a result of flood risk management measures	Improvement in the conservation status of designated sites as a result of flood risk management measures	10.00	3.00	0.00	The Kilbrien stream and Shanowen River flow into the River Bride which is part of the Blackwater River SAC. Flooding in the catchment can cause water pollution however given the absence of significand pollution sources in the flood zone no impacts on the SAC are likely (0)	0.00
	Avoid damage to, and where possible enhance, the flora and fauna of the catchment	Avoid damage to and where possible enhance the flora and fauna of the catchment	Avoid damage to and where possible enhance, legally protected sites / habitats and other sites / habitats of national regional and local nature conservation importance	No deterioration on condition of existing sites due to implementation of option	Creation of new or improved condition of existing sites due to implementation of option	5.00	2.00	0.00	No impact on protected species or habitats (0)	0.00
	Protect, and where possible enhance, fisheries resource within the catchment	Maintain existing, and where possible create new, fisheries habitat including the maintenance or improvement of conditions that allow upstream migration for fish species.	Area of suitable habitat supporting fish. Number of upstream barriers	No loss of integrity of fisheries habitat. Maintenance of upstream accessibility	No loss of fishery habitat. Improvement of habitat quality / quantity. Enhanced upstream accessibility	13.00	0.00	0.00	stream is heavily channelized and engineered. No fisheries potential along the stream - Continued recurrent flooding events will have not have a negative impact on the fisheries potential in the stream and further downstream on the Blackwater	0.00
	Protect, and where possible enhance, landscape character and visual amenity within the river corridor	Protect, and where possible enhance, visual amenity, landscape protection zones and views into / from designated scenic areas within the river corridor.	Changes to reported conservation status of designated sites relating to flood risk management Extent of affected Natura 2000 site, NHA/pNHA or other affected National or International designations (e.g. Nature reserves and Ramsar sites), i.e. Area of re	1. No significant impact on landscape designation (protected site, scenic route/amenity, natural landscape form) within zone of visibility of measures 2. No significant change in the quality of existing landscape characteristics of the receiving environment	1. No change to the existing landscape form. 2. Enhancement of existing landscape or landscape feature	8.00	0.00	0.00	No impacts on the landscape and visual amenity	0.00
	Avoid damage to or loss of features, institutions and collections of cultural heritage importance and their setting	Avoid damage to or loss of features, institutions and collections of architectural value and their setting and improve their protection from extreme floods.	a) The number of architectural features, institutions and collections subject to flooding. b) The impact of flood risk management measures on architectural features, institutions and collections.	a) No increase in risk to architectural features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on architectural features, institutions and collections.	a) Complete removal of all relevant architectural features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of architectural features, institutions and collections importance arising from the implementation of the selected measures.	4.00	1.00	0.00	There are no direct impacts on elements of archaeological heritage or their settings (0).	0.00
		Avoid damage to or loss of features, institutions and collections of archaeological value and their setting and improve their protection from extreme floods where this is beneficial.	a) The number of archaeological features, institutions and collections subject to flooding. b) The impact of flood risk management measures on archaeological features, institutions and collections.	a) No increase in risk to archaeological features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on archaeological features, institutions and collections.	a) Complete removal of all relevant archaeological features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of archaeological features, institutions and collections importance arising from the implementation of the selected measures.	4.00	1.00	0.00	There are no direct impacts on elements of architectural heritages or their settings (0)	0.00
Environmental Score										**-80.00**
MCA Benefit Score										**-80.00**
Option Selection MCA Score										**-80.00**
MCA benefit Cost Ratio										0.00
Economic Benefit Cost Ratio										0.00

Flood Risk Management Options Rathcormack

Multi-Criteria Assessment								Option 1 - Storage		
Criteria	**Objective**	**Sub-Objective**	**Indicator**	**Basic Requirement**	**Aspirational Target**	**Global Weighting**	**Local Weighting**	**Score**	**Rationale**	**Wtd score**
Technical	**Ensure flood risk management options are operationally robust**	Ensure flood risk management options are operationally robust	Level of operational risk of option- Degree of reliance on mechanical, electrical or electronic systems, or on human intervention, action or decision, for the option to operate or perform successfully, - Non-numeric			20.00	5.00	3.00	A sluice gate is utilised to allow water to attenuate in a storage area adjacent to the Kilbrien Stream	300.00
	Minimise health and safety risk of flood risk management options	Reduce and where possible eliminate health and safety risks associated with the construction and operation of flood risk management options	Degree of health and safety risk during construction and operation	Moderate to high, but acceptable and manageable, level of health and safety risk during construction, maintenance or operation	Negligible risk to health and safety during construction, maintenance or operation	20.00	5.00	3.00	Risk of drowning and falling from a height	300.00
	Ensure flood risk management options are adaptable to future flood risk, and the potential impacts of climate change	Ensure flood risk management options are adaptable to future flood risk	Sustainability and adaptability of the flood risk management measure in the face of potential future changes, including the potential impacts of climate change	Option should not hinder future interventions that may be required to manage potential future increases in risk	Option to provide for, or be adaptable to, the HEFS in terms of maintaining the standard of protection at no or negligible cost	20.00	5.00	3.00	Storage area could be increased by increasing land take or excavating existing attenuation area	300.00
Technical Score							0.00			900.00
Economic	**Minimise economic risk**	Minimise economic risk	Annual Average Damage (AAD) expressed in Euro / year	AAD is not increased	100% reduction in AAD	24.00	5.00	0.00	Calculated	0.00
	Minimise risk to transport infrastructure	Minimise risk to transport infrastructure	Length of infrastructure at risk from flooding in the 0.1% AEP event	Do not increase length of infrastructure at risk from flooding	Reduce the length of infrastructure at risk from flooding by 50%	10.00	5.00	4.57	Calculated	228.50
	Minimise risk to utility infrastructure	Minimise risk to utility infrastructure	Utilities at risk from flooding	No increase number of utility receptors at risk from flooding	Reduce number of utility receptors at risk to 0	14.00	2.50	2.50	Calculated	87.50
	Manage Risk to Agriculture	Manage Risk to Agriculture	Agricultural production	Do not increase in negative impact of flooding on agricultural production	Provide the potential for enhanced agricultural production	12.00	0.00	0.00	Calculated	0.00
Economic Score							0.00			316.00
Social	**Minimise risk to human health and life**	Minimise risk to human health and life of residents	Annual Average number of residential properties at risk from flooding	Number of residential properties at risk from flooding does not increase	Reduce the number of residential properties at risk from flooding to 0	27.00	5.00	4.80	Calculated	648.00
		Minimise risk to high vulnerability properties	Number of high vulnerability properties at risk from flooding	Do not increase number of high vulnerability properties at risk from flooding	Reduce the number of high vulnerability properties at risk from flooding to 0	17.00	0.00	0.00	Calculated	0.00
	Minimise risk to community	Minimise risk to social infrastructure and amenity	Number of social infrastructure receptors at risk from flooding	Do not increase number of social infrastructure receptors at risk from flooding	Reduce the number of social infrastructure receptors at risk from flooding to 0	9.00	5.00	4.87	Calculated	219.15
		Minimise risk to local employment	Number of enterprises at risk from flooding	Do not increase number of enterprises at risk from flooding	Reduce the number of enterprises at risk from flooding to 0	7.00	5.00	4.72	Calculated	165.20
Social Score							0.00			1032.35
Environmental	**Support the objectives of the WFD**	Provide no impediment to the achievement of water body objectives and, if possible, contribute to the achievement of water body objectives.	Ecological status of water bodies	Provide no constraint to the achievement of water body objectives	Contribute to the achievement of water body objectives	16.00	5.00	4.00	The stream is currently modified and channelized. The waterbody did not receive a WFD classification for the period 2010-2012. Previous classification identified the stream of being of "moderate status". There is potential for a short term negative impact during the construction of the sluice gate at the storage area. This could result in emissions of sediment to the waterbody if not managed (-1). Furthermore, there is potential for recurring eutrophication in the online reservoir which can impact water resources downstream (-1) The reservoir will have a permanent impact positive impact on the morphology and hydrology of the stream through the provision of a "natural" stream channel to replace the existing channelized (5). The reduction in flood events due to the measures will have an recurring positive effect on the water quality of the stream (3)	320.00
	Support the objectives of the Habitats and Birds Directives	Avoid detrimental effects to, and where possible enhance, Natura 2000 network, protected species and their key habitats, recognising relevant landscape features and stepping stones.	Area of site at risk from flooding and qualitative Assessment of impact of option on habitat	No deterioration in the conservation status of designated sites as a result of flood risk management measures	Improvement in the conservation status of designated sites as a result of flood risk management measures	10.00	3.00	-1.00	The Kilbrien stream and Shanowen River flow into the River Bride which is part of the Blackwater River SAC. The Kilbrien stream has no capacity to support qualifying features of the Blackwater River SAC given its heavy modification (culverting and channelization). Realigning the stream will therefore have no impact on availability of habitat to qualifying features (0). Construction works can result in loss of sediment to the stream which may ultimately enter the River Bride with potential to impact qualifying features of the SAC e.g. lamprey. The significance of impact can be mitigated against by staging of the works, working off line and provision of sediment controls on site (-1).	-30.00
	Avoid damage to, and where possible enhance, the flora and fauna of the catchment	Avoid damage to and where possible enhance the flora and fauna of the catchment	Avoid damage to and where possible enhance, legally protected sites / habitats and other sites / habitats of national regional and local nature conservation importance	No deterioration on condition of existing sites due to implementation of option	Creation of new or improved condition of existing sites due to implementation of option	5.00	2.00	0.00	Realignment of the Kilbrien stream and engineering of storage area will result in permanent loss of small sections of riparian habitat which is already compromised by adjacent lands (road and agriculture). This habitat is of low ecological value given the heavy modification to the stream and therefore low carrying capacity for protected species (0). There is no potential for otter to use this stream given its roadside location and size.	0.00
	Protect, and where possible enhance, fisheries resource within the catchment	Maintain existing, and where possible create new, fisheries habitat including the maintenance or improvement of conditions that allow upstream migration for fish species.	Area of suitable habitat supporting fish. Number of upstream barriers	No loss of integrity of fisheries habitat. Maintenance of upstream accessibility	No loss of fishery habitat. Improvement of habitat quality / quantity. Enhanced upstream accessibility	13.00	0.00	-1.00	There is potential for a short term negative impact during the construction of the sluice gate of the storage area. This would result in emissions of sediment to the waterbody downstream. (-1). Potential for short term/intermittent discharges of water from the reservoir, which may result in a reduced trophic status - however it is not considered that this will have a significant impact on the valuable fisheries habitat further d/s in the Blackwater catchment. (-1)	0.00
	Protect, and where possible enhance, landscape character and visual amenity within the river corridor	Protect, and where possible enhance, visual amenity, landscape protection zones and views into / from designated scenic areas within the river corridor.	Changes to reported conservation status of designated sites relating to flood risk management Extent of affected Natura 2000 site, NHA/pNHA or other affected National or International designations (e.g. Nature reserves and Ramsar sites), i.e. Area of re	1. No significant impact on landscape designation (protected site, scenic route/amenity, natural landscape form) within zone of visibility of measures 2. No significant change in the quality of existing landscape characteristics of the receiving environment	1. No change to the existing landscape form. 2. Enhancement of existing landscape or landscape feature	8.00	0.00	-1.00	The landscape in the area of the works is characterised as being of local landscape importance. The construction of the storage area will have a temporary impact on the landscape and visual amenity during the construction phase (-1).	0.00
	Avoid damage to or loss of features, institutions and collections of cultural heritage importance and their setting	Avoid damage to or loss of features, institutions and collections of architectural value and their setting and improve their protection from extreme floods.	a) The number of architectural features, institutions and collections subject to flooding. b) The impact of flood risk management measures on architectural features, institutions and collections.	a) No increase in risk to architectural features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on architectural features, institutions and collections.	a) Complete removal of all relevant architectural features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of architectural features, institutions and collections importance arising from the implementation of the selected measures.	4.00	1.00	0.00	There are no direct impacts on elements of archaeological heritage or their settings (0)	0.00
		Avoid damage to or loss of features, institutions and collections of archaeological value and their setting and improve their protection from extreme floods where this is beneficial.	a) The number of archaeological features, institutions and collections subject to flooding. b) The impact of flood risk management measures on archaeological features, institutions and collections.	a) No increase in risk to archaeological features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on archaeological features, institutions and collections.	a) Complete removal of all relevant archaeological features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of archaeological features, institutions and collections importance arising from the implementation of the selected measures.	4.00	1.00	0.00	There are no direct impacts on elements of architectural heritages or their settings (0).	0.00
Environmental Score										**290.00**
MCA Benefit Score										**1638.35**
Option Selection MCA Score										**2538.35**
MCA benefit Cost Ratio										0.0031
Economic Benefit Cost Ratio										8.60

Flood Risk Management Options Rathcormack

Multi-Criteria Assessment								Option 2 - Flow Diversion		
Criteria	**Objective**	**Sub-Objective**	**Indicator**	**Basic Requirement**	**Aspirational Target**	**Global Weighting**	**Local Weighting**	**Score**	**Rationale**	**Wtd score**
Technical	**Ensure flood risk management options are operationally robust**	Ensure flood risk management options are operationally robust	Level of operational risk of option- Degree of reliance on mechanical, electrical or electronic systems, or on human intervention, action or decision, for the option to operate or perform successfully, - Non-numeric			20.00	5.00	5.00	Divert flow from Kilbrien stream to Shanowen River via a new culvert	500.00
	Minimise health and safety risk of flood risk management options	Reduce and where possible eliminate health and safety risks associated with the construction and operation of flood risk management options	Degree of health and safety risk during construction and operation	Moderate to high, but acceptable and manageable, level of health and safety risk during construction, maintenance or operation	Negligible risk to health and safety during construction, maintenance or operation	20.00	5.00	4.00	Risk of falling from a height when constructing the culvert	400.00
	Ensure flood risk management options are adaptable to future flood risk, and the potential impacts of climate change	Ensure flood risk management options are adaptable to future flood risk	Sustainability and adaptability of the flood risk management measure in the face of potential future changes, including the potential impacts of climate change	Option should not hinder future interventions that may be required to manage potential future increases in risk	Option to provide for, or be adaptable to, the HEFS in terms of maintaining the standard of protection at no or negligible cost	20.00	5.00	1.00	This option is difficult to adapt should more capacity in culvert be required	100.00
Technical Score							0.00			1000.00
Economic	**Minimise economic risk**	Minimise economic risk	Annual Average Damage (AAD) expressed in Euro / year	AAD is not increased	100% reduction in AAD	24.00	5.00	0.00	Calculated	0.00
	Minimise risk to transport infrastructure	Minimise risk to transport infrastructure	Length of infrastructure at risk from flooding in the 0.1% AEP event	Do not increase length of infrastructure at risk from flooding	Reduce the length of infrastructure at risk from flooding by 50%	10.00	5.00	4.57	Calculated	228.50
	Minimise risk to utility infrastructure	Minimise risk to utility infrastructure	Utilities at risk from flooding	No increase number of utility receptors at risk from flooding	Reduce number of utility receptors at risk to 0	14.00	2.50	2.50	Calculated	87.50
	Manage Risk to Agriculture	Manage Risk to Agriculture	Agricultural production	Do not increase in negative impact of flooding on agricultural production	Provide the potential for enhanced agricultural production	12.00	0.00	0.00	Calculated	0.00
Economic Score							0.00			316.00
Social	**Minimise risk to human health and life**	Minimise risk to human health and life of residents	Annual Average number of residential properties at risk from flooding	Number of residential properties at risk from flooding does not increase	Reduce the number of residential properties at risk from flooding to 0	27.00	5.00	4.80	Calculated	648.00
		Minimise risk to high vulnerability properties	Number of high vulnerability properties at risk from flooding	Do not increase number of high vulnerability properties at risk from flooding	Reduce the number of high vulnerability properties at risk from flooding to 0	17.00	0.00	0.00	Calculated	0.00
	Minimise risk to community	Minimise risk to social infrastructure and amenity	Number of social infrastructure receptors at risk from flooding	Do not increase number of social infrastructure receptors at risk from flooding	Reduce the number of social infrastructure receptors at risk from flooding to 0	9.00	5.00	4.87	Calculated	219.15
		Minimise risk to local employment	Number of enterprises at risk from flooding	Do not increase number of enterprises at risk from flooding	Reduce the number of enterprises at risk from flooding to 0	7.00	5.00	4.72	Calculated	165.20
Social Score							0.00			1032.35
Environmental	**Support the objectives of the WFD**	Provide no impediment to the achievement of water body objectives and, if possible, contribute to the achievement of water body objectives.	Ecological status of water bodies	Provide no constraint to the achievement of water body objectives	Contribute to the achievement of water body objectives	16.00	5.00	-1.00	There is potential for a short term negative impact during the construction of the diversion works and inlet and outlets on existing rivers (-1). This would result in significant emissions of sediment to the Shanowen	-80.00
	Support the objectives of the Habitats and Birds Directives	Avoid detrimental effects to, and where possible enhance, Natura 2000 network, protected species and their key habitats, recognising relevant landscape features and stepping stones.	Area of site at risk from flooding and qualitative Assessment of impact of option on habitat	No deterioration in the conservation status of designated sites as a result of flood risk management measures	Improvement in the conservation status of designated sites as a result of flood risk management measures	10.00	3.00	-1.00	Construction works can result in loss of sediment and pollutants to the stream which may ultimately enter the River Bride with potential to impact qualifying features of the SAC e.g. lamprey. The significance of impact can be mitigated against by staging of the works, and provision of sediment controls on site (-1).	-30.00
	Avoid damage to, and where possible enhance, the flora and fauna of the catchment	Avoid damage to and where possible enhance the flora and fauna of the catchment	Avoid damage to and where possible enhance, legally protected sites / habitats and other sites / habitats of national regional and local nature conservation importance	No deterioration on condition of existing sites due to implementation of option	Creation of new or improved condition of existing sites due to implementation of option	5.00	2.00	0.00	Flood walls will be aligned such that riparian treelines are retained. The footprint of the walls will be on road verges and agricultural grassland (0). The stream is sub-optimal habitat for species protected under the Wildlife Act or Annex IV species.	0.00
	Protect, and where possible enhance, fisheries resource within the catchment	Maintain existing, and where possible create new, fisheries habitat including the maintenance or improvement of conditions that allow upstream migration for fish species.	Area of suitable habitat supporting fish. Number of upstream barriers	No loss of integrity of fisheries habitat. Maintenance of upstream accessibility	No loss of fishery habitat. Improvement of habitat quality / quantity. Enhanced upstream accessibility	13.00	0.00	-1.00	No fisheries potential along the stream. There is potential for a short term negative impact during the construction of the inlet and outlet on the waterbodies due to the release of sediment to the watercourses (-1). There is potential for recurring adverse impacts associated with diversion of flow into the Shanaowen River during storm events but this not considered to be significant.	0.00
	Protect, and where possible enhance, landscape character and visual amenity within the river corridor	Protect, and where possible enhance, visual amenity, landscape protection zones and views into / from designated scenic areas within the river corridor.	Changes to reported conservation status of designated sites relating to flood risk management Extent of affected Natura 2000 site, NHA/pNHA or other affected National or International designations (e.g. Nature reserves and Ramsar sites), i.e. Area of re	1. No significant impact on landscape designation (protected site, scenic route/amenity, natural landscape form) within zone of visibility of measures 2. No significant change in the quality of existing landscape characteristics of the receiving environment	1. No change to the existing landscape form. 2. Enhancement of existing landscape or landscape feature	8.00	0.00	-1.00	The landscape in the area is not designated for landscape and as such is considered of low value. The construction of the storage area will have a temporary impact on the landscape and visual amenity during the construction phase (-1).	0.00
	Avoid damage to or loss of features, institutions and collections of cultural heritage importance and their setting	Avoid damage to or loss of features, institutions and collections of architectural value and their setting and improve their protection from extreme floods.	a) The number of architectural features, institutions and collections subject to flooding. b) The impact of flood risk management measures on architectural features, institutions and collections.	a) No increase in risk to architectural features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on architectural features, institutions and collections.	a) Complete removal of all relevant architectural features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of architectural features, institutions and collections importance arising from the implementation of the selected measures.	4.00	1.00	0.00	There are no direct impacts on elements of archaeological heritage or their settings (0)	0.00
		Avoid damage to or loss of features, institutions and collections of archaeological value and their setting and improve their protection from extreme floods where this is beneficial.	a) The number of archaeological features, institutions and collections subject to flooding. b) The impact of flood risk management measures on archaeological features, institutions and collections.	a) No increase in risk to archaeological features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on archaeological features, institutions and collections.	a) Complete removal of all relevant archaeological features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of archaeological features, institutions and collections importance arising from the implementation of the selected measures.	4.00	1.00	0.00	There are no direct impacts on elements of architectural heritages or their settings (0).	0.00
Environmental Score										**-110.00**
MCA Benefit Score										**1238.35**
Option Selection MCA Score										**2238.35**
MCA benefit Cost Ratio										0.00
Economic Benefit Cost Ratio										3.99

Flood Risk Management Options Rathcormack

Multi-Criteria Assessment								Option 3 - Flood Defences		
Criteria	**Objective**	**Sub-Objective**	**Indicator**	**Basic Requirement**	**Aspirational Target**	**Global Weighting**	**Local Weighting**	**Score**	**Rationale**	**Wtd score**
Technical	**Ensure flood risk management options are operationally robust**	Ensure flood risk management options are operationally robust	Level of operational risk of option- Degree of reliance on mechanical, electrical or electronic systems, or on human intervention, action or decision, for the option to operate or perform successfully, - Non-numeric			20.00	5.00	5.00	Flood walls to contain high flows in Kilbrien Stream	500.00
	Minimise health and safety risk of flood risk management options	Reduce and where possible eliminate health and safety risks associated with the construction and operation of flood risk management options	Degree of health and safety risk during construction and operation	Moderate to high, but acceptable and manageable, level of health and safety risk during construction, maintenance or operation	Negligible risk to health and safety during construction, maintenance or operation	20.00	5.00	3.00	Risk of falling from a height and drowning when constructing the walls	300.00
	Ensure flood risk management options are adaptable to future flood risk, and the potential impacts of climate change	Ensure flood risk management options are adaptable to future flood risk	Sustainability and adaptability of the flood risk management measure in the face of potential future changes, including the potential impacts of climate change	Option should not hinder future interventions that may be required to manage potential future increases in risk	Option to provide for, or be adaptable to, the HEFS in terms of maintaining the standard of protection at no or negligible cost	20.00	5.00	2.00	Increasing the heights of walls would be relatively easy to undertake	200.00
Technical Score							0.00			1000.00
Economic	**Minimise economic risk**	Minimise economic risk	Annual Average Damage (AAD) expressed in Euro / year	AAD is not increased	100% reduction in AAD	24.00	5.00	0.00	Calculated	0.00
	Minimise risk to transport infrastructure	Minimise risk to transport infrastructure	Length of infrastructure at risk from flooding in the 0.1% AEP event	Do not increase length of infrastructure at risk from flooding	Reduce the length of infrastructure at risk from flooding by 50%	10.00	5.00	4.57	Calculated	228.50
	Minimise risk to utility infrastructure	Minimise risk to utility infrastructure	Utilities at risk from flooding	No increase number of utility receptors at risk from flooding	Reduce number of utility receptors at risk to 0	14.00	2.50	2.50	Calculated	87.50
	Manage Risk to Agriculture	Manage Risk to Agriculture	Agricultural production	Do not increase in negative impact of flooding on agricultural production	Provide the potential for enhanced agricultural production	12.00	0.00	0.00	Calculated	0.00
Economic Score							0.00			316.00
Social	**Minimise risk to human health and life**	Minimise risk to human health and life of residents	Annual Average number of residential properties at risk from flooding	Number of residential properties at risk from flooding does not increase	Reduce the number of residential properties at risk from flooding to 0	27.00	5.00	4.80	Calculated	648.00
		Minimise risk to high vulnerability properties	Number of high vulnerability properties at risk from flooding	Do not increase number of high vulnerability properties at risk from flooding	Reduce the number of high vulnerability properties at risk from flooding to 0	17.00	0.00	0.00	Calculated	0.00
	Minimise risk to community	Minimise risk to social infrastructure and amenity	Number of social infrastructure receptors at risk from flooding	Do not increase number of social infrastructure receptors at risk from flooding	Reduce the number of social infrastructure receptors at risk from flooding to 0	9.00	5.00	4.87	Calculated	219.15
		Minimise risk to local employment	Number of enterprises at risk from flooding	Do not increase number of enterprises at risk from flooding	Reduce the number of enterprises at risk from flooding to 0	7.00	5.00	4.72	Calculated	165.20
Social Score							0.00			1032.35
Environmental	**Support the objectives of the WFD**	Provide no impediment to the achievement of water body objectives and, if possible, contribute to the achievement of water body objectives.	Ecological status of water bodies	Provide no constraint to the achievement of water body objectives	Contribute to the achievement of water body objectives	16.00	5.00	-1.00	The stream is currently modified and channelized. The construction of the flood walls would result in significant emissions of sediment to the stream during construction (-1). The provision of new flood walls along the stream will have a permanent but not significant impact on the morphology of the stream.	-80.00
	Support the objectives of the Habitats and Birds Directives	Avoid detrimental effects to, and where possible enhance, Natura 2000 network, protected species and their key habitats, recognising relevant landscape features and stepping stones.	Area of site at risk from flooding and qualitative Assessment of impact of option on habitat	No deterioration in the conservation status of designated sites as a result of flood risk management measures	Improvement in the conservation status of designated sites as a result of flood risk management measures	10.00	3.00	-3.00	Construction works can result in loss of sediment and pollutants to the watercourses which may ultimately enter the River Bride with potential to impact qualifying features of the SAC e.g. lamprey. The significance of impact can be mitigated against by staging of the works, working off line and provision of sediment controls on site (-1). Permanent diversion of the Kilbrien Stream into the Shanowen River will increase flows in the Shanowen River. Increased flow velocity can result in scouring and increased sediment suspension which will increase the already high level of sediment deposition at the confluence with the River Bride. There will be an associated necessity for maintenance (dredging) and therefore a risk of significant sedimentation of the Bride (-3)	-90.00
	Avoid damage to, and where possible enhance, the flora and fauna of the catchment	Avoid damage to and where possible enhance the flora and fauna of the catchment	Avoid damage to and where possible enhance, legally protected sites / habitats and other sites / habitats of national regional and local nature conservation importance	No deterioration on condition of existing sites due to implementation of option	Creation of new or improved condition of existing sites due to implementation of option	5.00	2.00	-1.00	The diversion will be through improved agricultural grasslands and hedgerows which are managed and are of low ecological value. Trenching method can be such that hedgerows / treelines are retained where possible (0). There is potential that otter commute along the Shanowen River. There is potential for interruption of commuting route during construction works (-1)	-10.00
	Protect, and where possible enhance, fisheries resource within the catchment	Maintain existing, and where possible create new, fisheries habitat including the maintenance or improvement of conditions that allow upstream migration for fish species.	Area of suitable habitat supporting fish. Number of upstream barriers	No loss of integrity of fisheries habitat. Maintenance of upstream accessibility	No loss of fishery habitat. Improvement of habitat quality / quantity. Enhanced upstream accessibility	13.00	0.00	-1.00	Potential short term adverse impacts due to construction stage associated with flood walls (-1).	0.00
	Protect, and where possible enhance, landscape character and visual amenity within the river corridor	Protect, and where possible enhance, visual amenity, landscape protection zones and views into / from designated scenic areas within the river corridor.	Changes to reported conservation status of designated sites relating to flood risk management Extent of affected Natura 2000 site, NHA/pNHA or other affected National or International designations (e.g. Nature reserves and Ramsar sites), i.e. Area of re	1. No significant impact on landscape designation (protected site, scenic route/amenity, natural landscape form) within zone of visibility of measures 2. No significant change in the quality of existing landscape characteristics of the receiving environment	1. No change to the existing landscape form. 2. Enhancement of existing landscape or landscape feature	8.00	0.00	-1.00	The landscape in the area is not designated for landscape and as such is considered of low value. The construction of the storage area will have a temporary impact on the landscape and visual amenity during the construction phase (-1). In addition there is potential for a permanent impact on the landscape amenity along the local road where the flood walls are to be located (-1).	0.00
	Avoid damage to or loss of features, institutions and collections of cultural heritage importance and their setting	Avoid damage to or loss of features, institutions and collections of architectural value and their setting and improve their protection from extreme floods.	a) The number of architectural features, institutions and collections subject to flooding. b) The impact of flood risk management measures on architectural features, institutions and collections.	a) No increase in risk to architectural features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on architectural features, institutions and collections.	a) Complete removal of all relevant architectural features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of architectural features, institutions and collections importance arising from the implementation of the selected measures.	4.00	1.00	0.00	There are no direct impacts on elements of archaeological heritage or their settings (0)	0.00
		Avoid damage to or loss of features, institutions and collections of archaeological value and their setting and improve their protection from extreme floods where this is beneficial.	a) The number of archaeological features, institutions and collections subject to flooding. b) The impact of flood risk management measures on archaeological features, institutions and collections.	a) No increase in risk to archaeological features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on archaeological features, institutions and collections.	a) Complete removal of all relevant archaeological features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of archaeological features, institutions and collections importance arising from the implementation of the selected measures.	4.00	1.00	0.00	There are no direct impacts on elements of architectural heritages or their settings (0).	0.00
Environmental Score										**-180.00**
MCA Benefit Score										**1168.35**
Option Selection MCA Score										**2168.35**
MCA benefit Cost Ratio										0.00
Economic Benefit Cost Ratio										6.56

AFA	Youghal

Multi-Criteria Assessment								Do Nothing		
Criteria	**Objective**	**Sub-Objective**	**Indicator**	**Basic Requirement**	**Aspirational Target**	**Global Weighting**	**Local Weighting**	**Score**	**Rationale**	**Wtd Score**
Technical	Ensure flood risk management options are operationally robust	Ensure flood risk management options are operationally robust	Level of operational risk of option- Degree of reliance on mechanical, electrical or electronic systems, or on human intervention, action or decision, for the option to operate or perform successfully, - Non-numeric			20.00	5.00	0.00	Do nothing option	0.00
	Minimise health and safety risk of flood risk management options	Reduce and where possible eliminate health and safety risks associated with the construction and operation of flood risk management options	Degree of health and safety risk during construction and operation	Moderate to high, but acceptable and manageable, level of health and safety risk during construction, maintenance or operation	Negligible risk to health and safety during construction, maintenance or operation	20.00	5.00	0.00	Do nothing option	0.00
	Ensure flood risk management options are adaptable to future flood risk, and the potential impacts of climate change	Ensure flood risk management options are adaptable to future flood risk	Sustainability and adaptability of the flood risk management measure in the face of potential future changes, including the potential impacts of climate change	Option should not hinder future interventions that may be required to manage potential future increases in risk	Option to provide for, or be adaptable to, the HEFS in terms of maintaining the standard of protection at no or negligible cost	20.00	5.00	0.00	Do nothing option	0.00
Technical Score							0.00			0.00
Economic	Minimise economic risk	Minimise economic risk	Annual Average Damage (AAD) expressed in Euro / year	AAD is not increased	100% reduction in AAD	24.00	0.63	0.00	Do nothing option	0.00
	Minimise risk to transport infrastructure	Minimise risk to transport infrastructure	Length of infrastructure at risk from flooding in the 0.1% AEP event	Do not increase length of infrastructure at risk from flooding	Reduce the length of infrastructure at risk from flooding by 50%	10.00	5.00	0.00	Do nothing option	0.00
	Minimise risk to utility infrastructure	Minimise risk to utility infrastructure	Utilities at risk from flooding	No increase number of utility receptors at risk from flooding	Reduce number of utility receptors at risk to 0	14.00	0.00	0.00	Do nothing option	0.00
	Manage Risk to Agriculture	Manage Risk to Agriculture	Agricultural production	Do not increase in negative impact of flooding on agricultural production	Provide the potential for enhanced agricultural production	12.00	2.66	0.00	Do nothing option	0.00
Economic Score							0.00			0.00
Social	Minimise risk to human health and life	Minimise risk to human health and life of residents	Annual Average number of residential properties at risk from flooding	Number of residential properties at risk from flooding does not increase	Reduce the number of residential properties at risk from flooding to 0	27.00	2.03	0.00	Do nothing option	0.00
		Minimise risk to high vulnerability properties	Number of high vulnerability properties at risk from flooding	Do not increase number of high vulnerability properties at risk from flooding	Reduce the number of high vulnerability properties at risk from flooding to 0	17.00	0.00	0.00	Do nothing option	0.00
	Minimise risk to community	Minimise risk to social infrastructure and amenity	Number of social infrastructure receptors at risk from flooding	Do not increase number of social infrastructure receptors at risk from flooding	Reduce the number of social infrastructure receptors at risk from flooding to 0	9.00	2.63	0.00	Do nothing option	0.00
		Minimise risk to local employment	Number of enterprises at risk from flooding	Do not increase number of enterprises at risk from flooding	Reduce the number of enterprises at risk from flooding to 0	7.00	3.12	0.00	Do nothing option	0.00
Social Score							0.00			0.00
Environmental	Support the objectives of the WFD	Provide no impediment to the achievement of water body objectives and, if possible, contribute to the achievement of water body objectives.	Ecological status of water bodies	Provide no constraint to the achievement of water body objectives	Contribute to the achievement of water body objectives	16.00	5.00	0.00	Youghal is located in east Cork at the mouth of the Blackwater and is at risk of both fluvial and tidal flooding. However, the fluvial flood risk is minor and there are no receptors at risk. The AFA is located on the Blackwater Estuary SPA and the Blackwater River SAC. These watercourses are sensitive waterbodies. The estuary is considered a nutrient sensitive area. There are no significant polluting sources at risk from flooding. Youghal strand bathing waters are assigned a low/moderate status. These occur outside the AFA boundary.	0.00
	Support the objectives of the Habitats and Birds Directives	Avoid detrimental effects to, and where possible enhance, Natura 2000 network, protected species and their key habitats, recognising relevant landscape features and stepping stones.	Area of site at risk from flooding and qualitative Assessment of impact of option on habitat	No deterioration in the conservation status of designated sites as a result of flood risk management measures	Improvement in the conservation status of designated sites as a result of flood risk management measures	10.00	5.00	0.00	Youghal is located on the Blackwater Estuary SPA and the Blackwater River SAC. Do nothing has no potential for impact on the Natura 2000 sites	0.00
	Avoid damage to, and where possible enhance, the flora and fauna of the catchment	Avoid damage to and where possible enhance the flora and fauna of the catchment	Avoid damage to and where possible enhance, legally protected sites / habitats and other sites / habitats of national regional and local nature conservation importance	No deterioration on condition of existing sites due to implementation of option	Creation of new or improved condition of existing sites due to implementation of option	5.00	5.00	0.00	No Impacts	0.00
	Protect, and where possible enhance, fisheries resource within the catchment	Maintain existing, and where possible create new, fisheries habitat including the maintenance or improvement of conditions that allow upstream migration for fish species.	Area of suitable habitat supporting fish. Number of upstream barriers	No loss of integrity of fisheries habitat. Maintenance of upstream accessibility	No loss of fishery habitat. Improvement of habitat quality / quantity. Enhanced upstream accessibility	13.00	5.00	0.00	No Impacts	0.00
	Protect, and where possible enhance, landscape character and visual amenity within the river corridor	Protect, and where possible enhance, visual amenity, landscape protection zones and views into / from designated scenic areas within the river corridor.	Changes to reported conservation status of designated sites relating to flood risk management Extent of affected Natura 2000 site, NHA/pNHA or other affected National or International designations (e.g. Nature reserves and Ramsar sites), i.e. Area of re	1. No significant impact on landscape designation (protected site, scenic route/amenity, natural landscape form) within zone of visibility of measures 2. No significant change in the quality of existing landscape characteristics of the receiving environment	1. No change to the existing landscape form. 2. Enhancement of existing landscape or landscape feature	8.00	3.00	0.00	No Impacts	0.00
	Avoid damage to or loss of features, institutions and collections of cultural heritage importance and their setting	Avoid damage to or loss of features, institutions and collections of architectural value and their setting and improve their protection from extreme floods.	a) The number of architectural features, institutions and collections subject to flooding. b) The impact of flood risk management measures on architectural features, institutions and collections.	a) No increase in risk to architectural features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on architectural features, institutions and collections.	a) Complete removal of all relevant architectural features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of architectural features, institutions and collections importance arising from the implementation of the selected measures.	4.00	3.00	-3.00	There are a number of listed architectural features at risk from 0.5% AEP flood event.	-36.00
		Avoid damage to or loss of features, institutions and collections of archaeological value and their setting and improve their protection from extreme floods where this is beneficial.	a) The number of archaeological features, institutions and collections subject to flooding. b) The impact of flood risk management measures on archaeological features, institutions and collections.	a) No increase in risk to archaeological features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on archaeological features, institutions and collections.	a) Complete removal of all relevant archaeological features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of archaeological features, institutions and collections importance arising from the implementation of the selected measures.	4.00	3.00	-3.00	There are a number of listed archaeological features at risk from 0.5% AEP flood event.	-36.00
Environmental Score										**-72.00**
MCA Benefit Score										**-72.00**
Option Selection MCA Score										**-72.00**
MCA benefit Cost Ratio										0.00
Economic Benefit Cost Ratio										0.00

AFA	Youghal

Multi-Criteria Assessment								Option 1 - Flood Defences		
Criteria	**Objective**	**Sub-Objective**	**Indicator**	**Basic Requirement**	**Aspirational Target**	**Global Weighting**	**Local Weighting**	**Score**	**Rationale**	**Wtd score**
Technical	Ensure flood risk management options are operationally robust	Ensure flood risk management options are operationally robust	Level of operational risk of option- Degree of reliance on mechanical, electrical or electronic systems, or on human intervention, action or decision, for the option to operate or perform successfully, - Non-numeric			20.00	5.00	2.00	Flood walls and barriers, risk of barriers not being utilised during a flood event	200.00
	Minimise health and safety risk of flood risk management options	Reduce and where possible eliminate health and safety risks associated with the construction and operation of flood risk management options	Degree of health and safety risk during construction and operation	Moderate to high, but acceptable and manageable, level of health and safety risk during construction, maintenance or operation	Negligible risk to health and safety during construction, maintenance or operation	20.00	5.00	2.00	Risk of drowning falling from a height and electrocution	200.00
	Ensure flood risk management options are adaptable to future flood risk, and the potential impacts of climate change	Ensure flood risk management options are adaptable to future flood risk	Sustainability and adaptability of the flood risk management measure in the face of potential future changes, including the potential impacts of climate change	Option should not hinder future interventions that may be required to manage potential future increases in risk	Option to provide for, or be adaptable to, the HEFS in terms of maintaining the standard of protection at no or negligible cost	20.00	5.00	1.33	Adaptive approach: increase height of flood defences by 0.3m (Score 4) No physical provision: construct an additional 400m of flood defence walls (Score 0) No physical provision: raise road by 0.3m at industrial park (Score 0)	133.00
Technical Score							0.00			533.00
Economic	Minimise economic risk	Minimise economic risk	Annual Average Damage (AAD) expressed in Euro / year	AAD is not increased	100% reduction in AAD	24.00	0.63	4.84	As calculated	73.11
	Minimise risk to transport infrastructure	Minimise risk to transport infrastructure	Length of infrastructure at risk from flooding in the 0.1% AEP event	Do not increase length of infrastructure at risk from flooding	Reduce the length of infrastructure at risk from flooding by 50%	10.00	5.00	4.58	As calculated	228.75
	Minimise risk to utility infrastructure	Minimise risk to utility infrastructure	Utilities at risk from flooding	No increase number of utility receptors at risk from flooding	Reduce number of utility receptors at risk to 0	14.00	0.00	0.00	As calculated	0.00
	Manage Risk to Agriculture	Manage Risk to Agriculture	Agricultural production	Do not increase in negative impact of flooding on agricultural production	Provide the potential for enhanced agricultural production	12.00	2.66	0.00	As calculated	0.00
Economic Score							0.00			301.86
Social	Minimise risk to human health and life	Minimise risk to human health and life of residents	Annual Average number of residential properties at risk from flooding	Number of residential properties at risk from flooding does not increase	Reduce the number of residential properties at risk from flooding to 0	27.00	2.03	4.50	As calculated	246.78
		Minimise risk to high vulnerability properties	Number of high vulnerability properties at risk from flooding	Do not increase number of high vulnerability properties at risk from flooding	Reduce the number of high vulnerability properties at risk from flooding to 0	17.00	0.00	0.00	As calculated	0.00
	Minimise risk to community	Minimise risk to social infrastructure and amenity	Number of social infrastructure receptors at risk from flooding	Do not increase number of social infrastructure receptors at risk from flooding	Reduce the number of social infrastructure receptors at risk from flooding to 0	9.00	2.63	4.76	As calculated	112.73
		Minimise risk to local employment	Number of enterprises at risk from flooding	Do not increase number of enterprises at risk from flooding	Reduce the number of enterprises at risk from flooding to 0	7.00	3.12	4.56	As calculated	99.58
Social Score							0.00			459.08
Environmental	Support the objectives of the WFD	Provide no impediment to the achievement of water body objectives and, if possible, contribute to the achievement of water body objectives.	Ecological status of water bodies	Provide no constraint to the achievement of water body objectives	Contribute to the achievement of water body objectives	16.00	5.00	-2.00	Youghal is located in east Cork at the mouth of the Blackwater. The AFA is located on the Blackwater Estuary SPA and the Blackwater River SAC. These watercourses are of moderate WFD status and have been identified as nutrient sensitive areas. There are no significant polluting sources at risk from flooding. There is potential for a short term impact during construction (-2)	-160.00
	Support the objectives of the Habitats and Birds Directives	Avoid detrimental effects to, and where possible enhance, Natura 2000 network, protected species and their key habitats, recognising relevant landscape features and stepping stones.	Area of site at risk from flooding and qualitative Assessment of impact of option on habitat	No deterioration in the conservation status of designated sites as a result of flood risk management measures	Improvement in the conservation status of designated sites as a result of flood risk management measures	10.00	5.00	-1.00	Flood defence works will be confined to the urban fabric of the town. The Annex I habitats: Blackwater Estuary and mudflats and sandflats not covered by sea water at low tide and course sediments occur within the Blackwater Estuary in proximity to Youghal. There will be no requirement for machinery movement within these Annexed habitats. Likelihood of impact is low. Installation of flood walls along quays has the potential to cause disturbance to species of conservation concern through physical presence of construction machinery and personnel, noise generated by the works and possibly artificial lighting that may be used in the darker winter months, but it is possible to implement effective mitigation measures (-1) .	-50.00
	Avoid damage to, and where possible enhance, the flora and fauna of the catchment	Avoid damage to and where possible enhance the flora and fauna of the catchment	Avoid damage to and where possible enhance, legally protected sites / habitats and other sites / habitats of national regional and local nature conservation importance	No deterioration on condition of existing sites due to implementation of option	Creation of new or improved condition of existing sites due to implementation of option	5.00	5.00	-2.00	The proposed defences will be confined to the urban fabric of the town. There will be short term temporary construction impacts on the existing ecology around the quays	-50.00
	Protect, and where possible enhance, fisheries resource within the catchment	Maintain existing, and where possible create new, fisheries habitat including the maintenance or improvement of conditions that allow upstream migration for fish species.	Area of suitable habitat supporting fish. Number of upstream barriers	No loss of integrity of fisheries habitat. Maintenance of upstream accessibility	No loss of fishery habitat. Improvement of habitat quality / quantity. Enhanced upstream accessibility	13.00	5.00	0.00	The River Blackwater is renowned for its Salmon (salmon salar) fishing and lamprey. These are QI of the SAC. Fishing rights on the estuarine stretch of the River Blackwater and for Youghal Harbour are owned by the Duke of Devonshire, the rights dating back to 1753. The estuary provides good shore fishing for species such as Flounder, Bass and Codling; shore angling marks include the mouth of the Tourig River, Ferry Point upstream of the works area and the remains of the old bridge while charter boats are available from Youghal harbour. The proposed measures include the construction of flood defence wall ranging in height from 1.1-1.4m, the construction of the wall have potential to restrict access to the quays area . The proposed measures will have no impact on the fisheries habitat (0) .	0.00
	Protect, and where possible enhance, landscape character and visual amenity within the river corridor	Protect, and where possible enhance, visual amenity, landscape protection zones and views into / from designated scenic areas within the river corridor.	Changes to reported conservation status of designated sites relating to flood risk management Extent of affected Natura 2000 site, NHA/pNHA or other affected National or International designations (e.g. Nature reserves and Ramsar sites), i.e. Area of re	1. No significant impact on landscape designation (protected site, scenic route/amenity, natural landscape form) within zone of visibility of measures 2. No significant change in the quality of existing landscape characteristics of the receiving environment	1. No change to the existing landscape form. 2. Enhancement of existing landscape or landscape feature	8.00	3.00	-3.00	Youghal is designated a high value landscape. The town occurs within the Broad Bay Coast landscape character type. This landscape has a very high value and very high sensitivity on a county level. The proposed measures include the construction of low lying walls along the quays which will have a short term impact (-3).	-72.00
	Avoid damage to or loss of features, institutions and collections of cultural heritage importance and their setting	Avoid damage to or loss of features, institutions and collections of architectural value and their setting and improve their protection from extreme floods.	a) The number of architectural features, institutions and collections subject to flooding. b) The impact of flood risk management measures on architectural features, institutions and collections.	a) No increase in risk to architectural features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on architectural features, institutions and collections.	a) Complete removal of all relevant architectural features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of architectural features, institutions and collections importance arising from the implementation of the selected measures.	4.00	3.00	3.00	There are a number of listed architectural features at risk from 0.5% AEP flood event which will be protected from flooding . There will be no direct impacts on any of these features resulting from the provision of the low level flood walls.	36.00
		Avoid damage to or loss of features, institutions and collections of archaeological value and their setting and improve their protection from extreme floods where this is beneficial.	a) The number of archaeological features, institutions and collections subject to flooding. b) The impact of flood risk management measures on archaeological features, institutions and collections.	a) No increase in risk to archaeological features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on archaeological features, institutions and collections.	a) Complete removal of all relevant archaeological features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of archaeological features, institutions and collections importance arising from the implementation of the selected measures.	4.00	3.00	3.00	There are a number of listed archaeological features at risk from 0.5% AEP flood event which will be protected from flooding . There will be no direct impacts on any of these features resulting from the provision of the low level flood walls.	36.00
Environmental Score										**-260.00**
MCA Benefit Score										**500.94**
Option Selection MCA Score										**1033.94**
MCA benefit Cost Ratio										0.0001
Economic Benefit Cost Ratio										8.43

AFA	Youghal

Multi-Criteria Assessment								Option 2 - Tidal Barrage (a)		
Criteria	**Objective**	**Sub-Objective**	**Indicator**	**Basic Requirement**	**Aspirational Target**	**Global Weighting**	**Local Weighting**	**Score**	**Rationale**	**Wtd score**
Technical	Ensure flood risk management options are operationally robust	Ensure flood risk management options are operationally robust	Level of operational risk of option- Degree of reliance on mechanical, electrical or electronic systems, or on human intervention, action or decision, for the option to operate or perform successfully, - Non-numeric			20.00	5.00	5.00	Tidal barrier, minimal operational risk	500.00
	Minimise health and safety risk of flood risk management options	Reduce and where possible eliminate health and safety risks associated with the construction and operation of flood risk management options	Degree of health and safety risk during construction and operation	Moderate to high, but acceptable and manageable, level of health and safety risk during construction, maintenance or operation	Negligible risk to health and safety during construction, maintenance or operation	20.00	5.00	3.00	Risk of drowning and falling from a height	300.00
	Ensure flood risk management options are adaptable to future flood risk, and the potential impacts of climate change	Ensure flood risk management options are adaptable to future flood risk	Sustainability and adaptability of the flood risk management measure in the face of potential future changes, including the potential impacts of climate change	Option should not hinder future interventions that may be required to manage potential future increases in risk	Option to provide for, or be adaptable to, the HEFS in terms of maintaining the standard of protection at no or negligible cost	20.00	5.00	3.00	Adaptive approach: raise height of tidal barrage (Score 3)	300.00
Technical Score							0.00			1100.00
Economic	Minimise economic risk	Minimise economic risk	Annual Average Damage (AAD) expressed in Euro / year	AAD is not increased	100% reduction in AAD	24.00	0.63	4.84	As calculated	73.11
	Minimise risk to transport infrastructure	Minimise risk to transport infrastructure	Length of infrastructure at risk from flooding in the 0.1% AEP event	Do not increase length of infrastructure at risk from flooding	Reduce the length of infrastructure at risk from flooding by 50%	10.00	5.00	4.58	As calculated	228.75
	Minimise risk to utility infrastructure	Minimise risk to utility infrastructure	Utilities at risk from flooding	No increase number of utility receptors at risk from flooding	Reduce number of utility receptors at risk to 0	14.00	0.00	0.00	As calculated	0.00
	Manage Risk to Agriculture	Manage Risk to Agriculture	Agricultural production	Do not increase in negative impact of flooding on agricultural production	Provide the potential for enhanced agricultural production	12.00	2.66	0.00	As calculated	0.00
Economic Score							0.00			301.86
Social	Minimise risk to human health and life	Minimise risk to human health and life of residents	Annual Average number of residential properties at risk from flooding	Number of residential properties at risk from flooding does not increase	Reduce the number of residential properties at risk from flooding to 0	27.00	2.03	4.50	As calculated	246.78
		Minimise risk to high vulnerability properties	Number of high vulnerability properties at risk from flooding	Do not increase number of high vulnerability properties at risk from flooding	Reduce the number of high vulnerability properties at risk from flooding to 0	17.00	0.00	0.00	As calculated	0.00
	Minimise risk to community	Minimise risk to social infrastructure and amenity	Number of social infrastructure receptors at risk from flooding	Do not increase number of social infrastructure receptors at risk from flooding	Reduce the number of social infrastructure receptors at risk from flooding to 0	9.00	2.63	4.76	As calculated	112.73
		Minimise risk to local employment	Number of enterprises at risk from flooding	Do not increase number of enterprises at risk from flooding	Reduce the number of enterprises at risk from flooding to 0	7.00	3.12	4.56	As calculated	99.58
Social Score							0.00			459.08
Environmental	Support the objectives of the WFD	Provide no impediment to the achievement of water body objectives and, if possible, contribute to the achievement of water body objectives.	Ecological status of water bodies	Provide no constraint to the achievement of water body objectives	Contribute to the achievement of water body objectives	16.00	5.00	-5.00	These watercourses are of moderate WFD status and is classified as a nutrient sensitive area. There are no significant polluting sources at risk from flooding. There is potential for a short term impact during construction (-2). Tidal Barrage would have a permanent negative impact on the water status in the transitional water area. (-5)	-400.00
	Support the objectives of the Habitats and Birds Directives	Avoid detrimental effects to, and where possible enhance, Natura 2000 network, protected species and their key habitats, recognising relevant landscape features and stepping stones.	Area of site at risk from flooding and qualitative Assessment of impact of option on habitat	No deterioration in the conservation status of designated sites as a result of flood risk management measures	Improvement in the conservation status of designated sites as a result of flood risk management measures	10.00	5.00	-5.00	The Annex I habitats: Blackwater Estuary and mudflats and sandflats not covered by sea water at low tide and course sediments occur within the Blackwater Estuary in proximity to Youghal. Tidal Barrage occurs within the boundary of the SAC. To maximise the potential storage area for fluvial flows the barrage should be closed at the low tide preceding a tidal event. The lowest tide level within the bay preceding a 0.5% AEP tidal event is -1.19m OD Malin. The typical low bank level within the harbour is 1.6m OD Malin. If the barrage is closed at low tide, this gives an average depth of available storage for fluvial flows within the barrage of 2.49m. The barrage should remain closed until the tide level outside is lower than the maximum water level within the barrage (1.6m OD Malin). Therefore, the barrage should remain closed for approx. 7 hours. The mudflats provide sheltered feeding grounds for a diversity of wintering water birds. When exposed or partially exposed by the tide, intertidal habitats provide important foraging areas for many species of water birds, especially wading birds, as well as providing roosting/loafing areas. When the intertidal area is inundated by the tide it becomes available for benthic and surface feeding ducks and piscivorous/other water birds. During this tidal state this area can be used by various water birds as a loafing/roosting resource. For Blackwater Estuary SPA this is estimated to be 318 ha of intertidal area, the availability of suitable feeding habitat is further upstream. Tidal barrage will result in loss of relatively discrete area of sandflat/mudflat habitat from within the footprint of the barrage. Barrage may alter tidal regime landward of the barrage and may therefore alter habitat type, potentially feeding habitat for the water birds. Changes in tidal inundation may result at Annex I habitats and at lands surrounding the bay due to alteration of tidal inundation (-5). the construction of the tidal barrage has also potential negative impact on the migratory fish (Salmon, lamprey) these are QI within the SAC during a flood event. Construction activities will cause temporary disturbance to birds in the SPA which may cause them to temporarily move to alternative suitable feeding areas. The disturbance to other areas may increase feeding competition in these areas which can indirectly impact population sizes and success rates (-5)	-250.00
	Avoid damage to, and where possible enhance, the flora and fauna of the catchment	Avoid damage to and where possible enhance the flora and fauna of the catchment	Avoid damage to and where possible enhance, legally protected sites / habitats and other sites / habitats of national regional and local nature conservation importance	No deterioration on condition of existing sites due to implementation of option	Creation of new or improved condition of existing sites due to implementation of option	5.00	5.00	-3.00	Potential for localised impact on (overwintering) bird species not protected under the SPA designation.	-75.00
	Protect, and where possible enhance, fisheries resource within the catchment	Maintain existing, and where possible create new, fisheries habitat including the maintenance or improvement of conditions that allow upstream migration for fish species.	Area of suitable habitat supporting fish. Number of upstream barriers	No loss of integrity of fisheries habitat. Maintenance of upstream accessibility	No loss of fishery habitat. Improvement of habitat quality / quantity. Enhanced upstream accessibility	13.00	5.00	-5.00	The barrage will inhibit the migration of fish (including lamprey and salmon) to freshwaters to spawn during a flood event. The estuary provides good shore fishing for species such as Flounder, Bass and Codling, the construction of a tidal barrage has potential result in the disturbance of fish into the estuary.	-325.00
	Protect, and where possible enhance, landscape character and visual amenity within the river corridor	Protect, and where possible enhance, visual amenity, landscape protection zones and views into / from designated scenic areas within the river corridor.	Changes to reported conservation status of designated sites relating to flood risk management Extent of affected Natura 2000 site, NHA/pNHA or other affected National or International designations (e.g. Nature reserves and Ramsar sites), i.e. Area of re	1. No significant impact on landscape designation (protected site, scenic route/amenity, natural landscape form) within zone of visibility of measures 2. No significant change in the quality of existing landscape characteristics of the receiving environment	1. No change to the existing landscape form. 2. Enhancement of existing landscape or landscape feature	8.00	3.00	-5.00	The proposed tidal barrage has potential for a long term impact on the setting of the town and seascape of the bay (-5).	-120.00
	Avoid damage to or loss of features, institutions and collections of cultural heritage importance and their setting	Avoid damage to or loss of features, institutions and collections of architectural value and their setting and improve their protection from extreme floods.	a) The number of architectural features, institutions and collections subject to flooding. b) The impact of flood risk management measures on architectural features, institutions and collections.	a) No increase in risk to architectural features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on architectural features, institutions and collections.	a) Complete removal of all relevant architectural features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of architectural features, institutions and collections importance arising from the implementation of the selected measures.	4.00	3.00	3.00	There are a number of listed architectural features at risk from 0.5% AEP flood event which will be protected from flooding . There will be no direct impacts on any of these features resulting from the provision of the low level flood walls.	36.00
		Avoid damage to or loss of features, institutions and collections of archaeological value and their setting and improve their protection from extreme floods where this is beneficial.	a) The number of archaeological features, institutions and collections subject to flooding. b) The impact of flood risk management measures on archaeological features, institutions and collections.	a) No increase in risk to archaeological features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on archaeological features, institutions and collections.	a) Complete removal of all relevant archaeological features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of archaeological features, institutions and collections importance arising from the implementation of the selected measures.	4.00	3.00	3.00	There are a number of listed archaeological features at risk from 0.5% AEP flood event which will be protected from flooding . There will be no direct impacts on any of these features resulting from the provision of the low level flood walls.	36.00
Environmental Score										**-1098.00**
MCA Benefit Score										**-337.06**
Option Selection MCA Score										**762.94**
MCA benefit Cost Ratio										0.0000
Economic Benefit Cost Ratio										0.32

AFA	Youghal

Multi-Criteria Assessment								Option 3 - Tidal Barrage (b)		
Criteria	**Objective**	**Sub-Objective**	**Indicator**	**Basic Requirement**	**Aspirational Target**	**Global Weighting**	**Local Weighting**	**Score**	**Rationale**	**Wtd score**
Technical	Ensure flood risk management options are operationally robust	Ensure flood risk management options are operationally robust	Level of operational risk of option- Degree of reliance on mechanical, electrical or electronic systems, or on human intervention, action or decision, for the option to operate or perform successfully, - Non-numeric			20.00	5.00	5.00	Tidal barrier, minimal operational risk	500.00
	Minimise health and safety risk of flood risk management options	Reduce and where possible eliminate health and safety risks associated with the construction and operation of flood risk management options	Degree of health and safety risk during construction and operation	Moderate to high, but acceptable and manageable, level of health and safety risk during construction, maintenance or operation	Negligible risk to health and safety during construction, maintenance or operation	20.00	5.00	3.00	Risk of drowning and falling from a height	300.00
	Ensure flood risk management options are adaptable to future flood risk, and the potential impacts of climate change	Ensure flood risk management options are adaptable to future flood risk	Sustainability and adaptability of the flood risk management measure in the face of potential future changes, including the potential impacts of climate change	Option should not hinder future interventions that may be required to manage potential future increases in risk	Option to provide for, or be adaptable to, the HEFS in terms of maintaining the standard of protection at no or negligible cost	20.00	5.00	3.00	Adaptive approach: raise height of tidal barrage (Score 3)	300.00
Technical Score							0.00			1100.00
Economic	Minimise economic risk	Minimise economic risk	Annual Average Damage (AAD) expressed in Euro / year	AAD is not increased	100% reduction in AAD	24.00	0.63	4.84	As calculated	73.11
	Minimise risk to transport infrastructure	Minimise risk to transport infrastructure	Length of infrastructure at risk from flooding in the 0.1% AEP event	Do not increase length of infrastructure at risk from flooding	Reduce the length of infrastructure at risk from flooding by 50%	10.00	5.00	4.58	As calculated	228.75
	Minimise risk to utility infrastructure	Minimise risk to utility infrastructure	Utilities at risk from flooding	No increase number of utility receptors at risk from flooding	Reduce number of utility receptors at risk to 0	14.00	0.00	0.00	As calculated	0.00
	Manage Risk to Agriculture	Manage Risk to Agriculture	Agricultural production	Do not increase in negative impact of flooding on agricultural production	Provide the potential for enhanced agricultural production	12.00	2.66	0.00	As calculated	0.00
Economic Score							0.00			301.86
Social	Minimise risk to human health and life	Minimise risk to human health and life of residents	Annual Average number of residential properties at risk from flooding	Number of residential properties at risk from flooding does not increase	Reduce the number of residential properties at risk from flooding to 0	27.00	2.03	4.50	As calculated	246.78
		Minimise risk to high vulnerability properties	Number of high vulnerability properties at risk from flooding	Do not increase number of high vulnerability properties at risk from flooding	Reduce the number of high vulnerability properties at risk from flooding to 0	17.00	0.00	0.00	As calculated	0.00
	Minimise risk to community	Minimise risk to social infrastructure and amenity	Number of social infrastructure receptors at risk from flooding	Do not increase number of social infrastructure receptors at risk from flooding	Reduce the number of social infrastructure receptors at risk from flooding to 0	9.00	2.63	4.76	As calculated	112.73
		Minimise risk to local employment	Number of enterprises at risk from flooding	Do not increase number of enterprises at risk from flooding	Reduce the number of enterprises at risk from flooding to 0	7.00	3.12	4.56	As calculated	99.58
Social Score							0.00			459.08
Environmental	Support the objectives of the WFD	Provide no impediment to the achievement of water body objectives and, if possible, contribute to the achievement of water body objectives.	Ecological status of water bodies	Provide no constraint to the achievement of water body objectives	Contribute to the achievement of water body objectives	16.00	5.00	-5.00	The proposed barrage is located in the Coastal area and this water body is classified as being of good status . There are no significant polluting sources at risk from flooding. There is potential for a short term impact during construction (-2). Tidal Barrage would have a permanent negative impact on the water status in the coastal water area. (-5)	-400.00
	Support the objectives of the Habitats and Birds Directives	Avoid detrimental effects to, and where possible enhance, Natura 2000 network, protected species and their key habitats, recognising relevant landscape features and stepping stones.	Area of site at risk from flooding and qualitative Assessment of impact of option on habitat	No deterioration in the conservation status of designated sites as a result of flood risk management measures	Improvement in the conservation status of designated sites as a result of flood risk management measures	10.00	5.00	-4.00	Tidal Barrage (Option B) occurs outside the boundary of the Natura 2000 sites. the proposed measures are outside the boundary of the designated site, there will be no direct loss of annex 1 habitat during the construction works. To maximise the potential storage area for fluvial flows the barrage should be closed at the low tide preceding a tidal event. The barrage should remain closed until the tide level outside is lower than the maximum water level within the barrage (1.6m OD Malin). Therefore, the barrage should remain closed for approx. 7 hours. There is potential indirect impacts on the conservation objectives of the SAC. The mudflats provide sheltered feeding grounds for a diversity of wintering water birds. When exposed or partially exposed by the tide, intertidal habitats provide important foraging areas for many species of water birds, especially wading birds, as well as providing roosting/loafing areas. When the intertidal area is inundated by the tide it becomes available for benthic and surface feeding ducks and piscivorous/other water birds. During this tidal state this area can be used by various water birds as a loafing/roosting resource. Barrage will temporary change the tidal regime landward of the barrage and may therefore alter habitat type of habitats of conservation concern (i.e. mudflats and sandflats), and potentially feeding habitat for the water birds within the SAC/SPA. Changes in tidal inundation may result at Annex I habitats and at lands surrounding the bay due to alteration of tidal inundation (-5).	-200.00
	Avoid damage to, and where possible enhance, the flora and fauna of the catchment	Avoid damage to and where possible enhance the flora and fauna of the catchment	Avoid damage to and where possible enhance, legally protected sites / habitats and other sites / habitats of national regional and local nature conservation importance	No deterioration on condition of existing sites due to implementation of option	Creation of new or improved condition of existing sites due to implementation of option	5.00	5.00	-3.00	Potential for localised impact on (overwintering) bird species not protected under the SPA designation.	-75.00
	Protect, and where possible enhance, fisheries resource within the catchment	Maintain existing, and where possible create new, fisheries habitat including the maintenance or improvement of conditions that allow upstream migration for fish species.	Area of suitable habitat supporting fish. Number of upstream barriers	No loss of integrity of fisheries habitat. Maintenance of upstream accessibility	No loss of fishery habitat. Improvement of habitat quality / quantity. Enhanced upstream accessibility	13.00	5.00	-5.00	The barrage will inhibit the migration of fish (including lamprey and salmon) to freshwaters to spawn during a flood event. The estuary provides good shore fishing for species such as Flounder, Bass and Codling, the construction of a tidal barrage has potential result in the disturbance of fish into the estuary.	-325.00
	Protect, and where possible enhance, landscape character and visual amenity within the river corridor	Protect, and where possible enhance, visual amenity, landscape protection zones and views into / from designated scenic areas within the river corridor.	Changes to reported conservation status of designated sites relating to flood risk management Extent of affected Natura 2000 site, NHA/pNHA or other affected National or International designations (e.g. Nature reserves and Ramsar sites), i.e. Area of re	1. No significant impact on landscape designation (protected site, scenic route/amenity, natural landscape form) within zone of visibility of measures 2. No significant change in the quality of existing landscape characteristics of the receiving environment	1. No change to the existing landscape form. 2. Enhancement of existing landscape or landscape feature	8.00	3.00	-5.00	The proposed tidal barrage has potential for long term impact on the setting of the town (-5).	-120.00
	Avoid damage to or loss of features, institutions and collections of cultural heritage importance and their setting	Avoid damage to or loss of features, institutions and collections of architectural value and their setting and improve their protection from extreme floods.	a) The number of architectural features, institutions and collections subject to flooding. b) The impact of flood risk management measures on architectural features, institutions and collections.	a) No increase in risk to architectural features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on architectural features, institutions and collections.	a) Complete removal of all relevant architectural features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of architectural features, institutions and collections importance arising from the implementation of the selected measures.	4.00	3.00	3.00	There are a number of listed architectural features at risk from 0.5% AEP flood event which will be protected from flooding . There will be no direct impacts on any of these features resulting from the provision of the low level flood walls.	36.00
		Avoid damage to or loss of features, institutions and collections of archaeological value and their setting and improve their protection from extreme floods where this is beneficial.	a) The number of archaeological features, institutions and collections subject to flooding. b) The impact of flood risk management measures on archaeological features, institutions and collections.	a) No increase in risk to archaeological features, institutions and collections at risk from flooding. b) No detrimental impacts from flood risk management measures on archaeological features, institutions and collections.	a) Complete removal of all relevant archaeological features, institutions and collections from the risk of harm by extreme floods. b) Enhanced protection and value of archaeological features, institutions and collections importance arising from the implementation of the selected measures.	4.00	3.00	3.00	There are a number of listed archaeological features at risk from 0.5% AEP flood event which will be protected from flooding . There will be no direct impacts on any of these features resulting from the provision of the low level flood walls.	36.00
Environmental Score										**-1048.00**
MCA Benefit Score										**-287.06**
Option Selection MCA Score										**812.94**
MCA benefit Cost Ratio										0.0000
Economic Benefit Cost Ratio										0.32