# Chapter 2:

# Background of Proposed Development



#### 2 BACKGROUND TO THE PROPOSED DEVELOPMENT

#### 2.1 SITE OF THE PROPOSED DEVELOPMENT

#### 2.1.1 Site Location

The overall study area, which covers the River Lee between Kennedy Quay in Cork City and Innishcarra Dam extends across both Cork City and County. The site of the proposed flood relief works is located within both the environs of Cork City and within the townlands of Curraghbeg, Garravagh, Coolroe, Great Island, Coolyduff, Lackenshoneen, Coolymurraghue, Carrigrohane, Inchigaggin and Mount Desert, County Cork. Site location maps are presented in Figures 1.1 and 2.1. Figure 2.2 shows an aerial view of the proposed development site. Where the 'site' is referred to in this Environmental Impact Statement (EIS), this refers to the Study Area for the assessments undertaken in order to prepare the EIS. During the course of the assessment process, the Study Area was refined to account for the more specific area within which impacts were likely to arise, on the basis of the proposed scheme. For the purposes of this Environmental Impact Statement (EIS) document the wider Study Area is presented, but within the introduction to each chapter the specific and relevant parts of the Study Area to each chapter are further defined. For the purposes of providing background information on the project in this chapter, the 'study area' relates to the section of the River Lee between Cork City and Innishcarra Dam.

The population density is generally varied within the study area with the eastern side including Cork City having the highest density, while the more rural western side has lower population densities. The land within the Study Area falls generally towards the River Lee and its tributaries. The River has a relatively flat gradient within the Cork City area where the proposed works will take place, with the exception of weirs at the Kingsley Hotel area and on the South Channel of the river.

#### 2.1.2 Site Access

The proposed development site is accessed via several routes along the length of the works. Various local roads provide most of the direct site access, while the N22 national road runs in a general east-west direction near the site. In addition, the R618 regional road runs alongside the eastern side of the study area. The wider area and Cork City are served by the M8 motorway, and the N8, N40, N20, N71, N27 and N28 national roads.

#### 2.1.3 Physical Characteristics of Site and Surrounding Lands

The proposed works area is located within the Landscape Character Areas: Cork City and Harbour (LCA No. 19), River Bride West (LCA No. 27) and Lee Reservoir (LCA No. 56) as set out in the Draft Landscape Strategy for County Cork. The Cork City and Harbour LCA forms part of the general Landscape Type: City, Harbour and Estuary (Type 1), while the River Bride West (LCA No. 27) and Lee Reservoir (LCA No. 56) form part of the Broad Fertile Lowland Valleys (Type 6) and Hilly River and Reservoir Valleys (Type 8). The City, Harbour and Estuary Landscape Type extends east and southeast from Cork City and in the areas surrounding Cork Harbour. The proposed works area is found in the western-most areas of this LCA. The Broad Fertile Lowland Valleys Landscape Type extends southwest from Ballincollig to the Dunmanway area. The proposed works area is found across the north of this LCA. The Hilly River and Reservoir Valleys Landscape Type extends be to the Macroom area, with the proposed works found in the eastern end of this LCA.



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The topography of the proposed works area varies between approximately 16.5mOD near Innishcarra Bridge and 2mOD in Cork City at the easternmost end of the proposed works area. It is undulating in most areas, and highest in the west, north and south.

Current land-use in the area surrounding the proposed works comprises mainly agricultural, residential and commercial development with some areas of recreational ground. The western half of the proposed works area is of a rural nature, while the eastern half is of mainly urban fabric. The greater catchment land-use comprises mainly intensive agriculture, with most urban areas being found in the east. Forestry is more common in the uplands and western side of the catchment.

There are no sites designated for nature conservation of European importance within or adjacent to the area of proposed works. The nearest site of national importance is the proposed Natural Heritage Area (pNHA) of Lee Valley, located directly adjacent to the works areas at a number of locations (Cork Lough is located <1 kilometre south of the proposed works). The nearest site of international importance is Cork Harbour Special Protection Area (SPA), located approximately 2 kilometres to the southeast of the study area (approximately 4 kilometres east of the proposed works). Further details regarding the designated areas are provided in Chapter 5 of this EIS on Flora and Fauna.

The study area is entirely within the Lee catchment and its tributaries.

## 2.2 NEED FOR THE PROPOSED DEVELOPMENT

There is a long history of flooding in Cork City and the River Lee valley. A number of severe floods have affected the city in the past. Since construction of the two dams at Innishcarra and Carrigadrohid in the 1950's, fluvial flooding in Cork has generally been less severe although there has been frequent flooding of land, roads and small numbers of properties. The flood event of November 2009 was an exception, with major damage caused to commercial and residential buildings in Cork City.

Tidal flooding in the east of Cork City centre is more frequent, with some flooding of the lowest lying parts occurring at least every other year with more significant tidal flooding occurring on average every ten years. Notable recent tidal floods occurred in 1994, 2004 and 2014. Appendix 2A shows the extent of flooding in the area surrounding the proposed works.

The risk of flooding may increase with time. Future changes, which have the potential to affect the risk of flooding include:

- Climate change resulting in higher rainfall;
- Geomorphological processes, such as (i) Sedimentation transport, which affects the area of conveyance of the river channel and (ii) Erosion;
- Development within the catchment of the River Lee, which does not conform with the principles of Sustainable Drainage, and which adversely affect the response of the catchment to rainfall;
- Changes in land use, including forestation and land drainage.



#### 2.3 STRATEGIC PLANNING AND DEVELOPMENT CONTEXT

#### 2.3.1 National Level

#### **National Flood Policy**

The Office of Public Works has the main responsibility for devising and implementing measures to deal with flooding. This responsibility is assigned by Government Decision S 28507 of 7 March 1995. In addition, the Arterial Drainage (Amendment) Act, 1995 enables the OPW to undertake local flood relief work schemes.

The National Flood Policy that was adopted by Government in 2004 identified OPW as the lead agency in coordinating the management of flood risk in the State. The Policy introduced a shift away from solely structural measures to a range of measures including non-structural measures to protect against flooding. The report prepared by the Flood Management Review Group decided that future Flood Management policy in Ireland would be:

> "to minimise the national level of exposure to flood damages through the identification and management of existing, and particularly potential future, flood risks in an integrated, proactive and river basin based manner".

It encompasses a series of measures regarding sustainable flood prevention, protection and mitigation. An implementation plan of work programmes and associated resources that would be required to put the new policy into effect was developed by OPW.

In November 2007 the EU Floods Directive (Directive on the Assessment and Management of Flood Risks - 2007/60/EC) came into effect. The existing national Flood Policy described above is in line with the Directive.

#### 2.3.2 Regional Level

#### Regional Planning Guidelines for the South West 2010 – 2022

The Regional Planning Guidelines (RPGs) for the South West Region 2010 – 2022 provide a framework for long-term strategic development in the South West Region, which comprises the administrative areas of Cork County Council, Cork City Council and Kerry County Council. The RPGs aim to ensure the successful implementation of the National Spatial Strategy at regional, county and local level. A key aspect of the RPGs is to maintain a balance between protecting and enhancing the environment and sustainable economic development of the South West Region. Flood protection is identified in Chapter 1 of the guidelines as a priority for the 2010 to 2022 period. Flood Risk Management is highlighted as an important issue for the region.

#### Cork City Development Plan 2015 - 2021

The Cork County Development Plan 2015 - 2021 sets out the overall strategy for the proper planning and sustainable development of the administrative area of Cork City Council. It recognises that rivers within the city are an important asset to the city with many functions including provision of habitats, public amenity, drainage and flood water storage. One of the strategic goals identified in the plan is to "Tackle climate change through reducing energy usage, reducing emissions, adapt to climate change and mitigate against flood risk". Open spaces within the city are noted as playing a large role in flood risk management. Chapter 12 of the Plan deals with the issues of Environmental Infrastructure and Management and also contains a



subsection on Flood Risk Management. One of the key needs in terms of surface water drainage identified in the plan is the construction of a major drainage scheme on the Lower Lee. It is noted that the responsibility for such schemes rests with the Office of Public Works (OPW). The specific Objectives of the Cork City Council Planning Authority with regards to flooding include:

i): Restrict land use or require appropriate design as necessary to reduce risk of hazard, including those arising from flooding and controlled substances in industrial processes

**ii):** Cork City Council shall have regard to the recommendations of the Draft Lee Catchment Flood Risk Assessment and Management Plan and shall incorporate the updated hydraulic modelling, mapping data and recommendations of South West CFRMP / Lee CRFMP (River Catchment Framework Management Plan) and the Lower Lee (Cork City) Drainage Scheme as each plan progresses.

**iii):** Cork City Council will implement The Planning System and Flood Risk Management: Guidelines for Planning Authorities, 2009 in the preparation of land-use plans and determining planning applications.

**iv):** To restrict development in identified flood risk areas, in particular, floodplains, except where the applicant satisfies the Justification Test as outlined in The Planning System and Flood Risk Management: Guidelines for Planning Authorities 2009.

v): To protect, enhance and manage the City's floodplains, wetlands and coastal habitat areas that are subject to flooding as vital 'green infrastructure' which provides space for storage and conveyance of floodwater, enabling flood risk to be more effectively managed and reduce the need to provide flood defence infrastructures.

**vi):** All significant developments impacting on flood risk areas will be required to provide a Flood Impact Assessment to accompany the planning application to identify potential loss of floodplain storage and proposals for the storage or attenuation (e.g. SUDS) of run-off discharges (including foul drains) to ensure development does not increase the flood risk in the relevant catchment.

## 2.3.3 Local Level

## South Docks Local Area Plan 2008

The South Docks Local Area Plan 2008 relates to the southern bank of the Lee at the easternmost end of the proposed works area. It makes specific reference to flood risk, citing flooding as one of the main issues for the area. The plan states that works such as raising of levels in the area and the provision of perimeter protection to deal with the flooding will be critical to facilitating the redevelopment of the area.

## North Docks Local Area Plan 2005

The North Docks Local Area Plan 2005 relates to the northern bank of the Lee at the easternmost end of the proposed works area. The plan does not discuss flooding in this area, but discusses the development of amenity/recreation areas around Horgan's Quay.



## 2.4 SCHEME DESIGN PROCESS

The design process comprises a number of steps involving co-ordination of project engineering and environmental teams. The following steps have been completed in the design and assessment process:

- Constraints Study
- Hydrology Study
- Hydraulic Modelling
- Preliminary Site Investigation
- Flood Risk Assessments
- Selection of Preferred Option
- Appropriate Assessment Screening
- Cost Benefit Analyses
- Environmental Impact Assessment

The consultation and outcome of the above assessments are discussed below and within the various relevant EIS chapters in this document.

## 2.5 CONSTRAINTS STUDY

An environmental constraints study was completed at the outset of the project to identify the key environmental issues relating to the Lower Lee (Cork City) Drainage Scheme Study Area. These included features which had the potential to be effected by the possible flood alleviation measures and/or impose constraints on the viability or the design of the measures proposed.

Environmental constraints were investigated under the following headings:

- Human Beings
- Ecology
- Water
- Soils and Geology
- Archaeology and Cultural Heritage
- Landscape
- Air and Climate
- Material Assets

Desk studies on the status of the receiving environment under each heading were undertaken and a summary of the key constraints and implications of any proposed scheme was completed. In addition to the assessments undertaken, public consultation was undertaken and is outlined in more detail below. A summary of the key constraints identified for the Lower Lee (Cork City) Drainage Scheme is summarised in Table 2.1 below. The full constraints document is available to access online at <a href="http://www.lowerleefrs.ie">http://www.lowerleefrs.ie</a>

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# Table 2.1Summary of the key constraints identified for the Lower Lee (Cork City)Drainage Scheme

#### **Human Beings**

In designing the proposed scheme, the value (both cultural and economic) of any buildings (Residential, Retail, etc) close to river edge or likely to be adversely affected by the scheme should be taken into account. In addition, adverse impacts on buildings or structures of conservation interest should be minimised or avoided where possible.

Any design proposals should ensure that bridge links between north and south sides of the River Lee and any bridges over other watercourses are maintained so that temporary or permanent disruption on transport links and access to homes and businesses in the study area are minimised.

The design of the scheme should consider the public amenity value of the study area. Impacts on public amenity areas adjacent to river such as the riverside walks in town, parks and playground adjacent to the river should be considered, with replacement mitigation proposed if necessary. Similarly, specialist amenity areas including angling and water sports should be given consideration

Impacts on especially sensitive receptors e.g. schools, crèches, nursing homes, hospital should be considered in the flood risk assessment.

The proposed scheme should take consideration of the proposed zoning objectives and relevant specific objectives set out in the relevant Development Plan or Local Area Plan.

#### Ecology

Given the sensitivity of the river habitat, factors that materially affect the function of the river under normal flow conditions such as water depth, velocity and changes to the shape of the bed should be given consideration, so that the existing function of the river can be maintained. Impacts to areas up and downstream of the Study Area should also be considered as part of the assessment.

In design of the proposed scheme, consultation with both the IFI and NPWS will be necessary, together with an appropriate amount of survey work (including electro-fishing) to establish baseline conditions in the river. Constraints may be placed on the times of year that in-stream works may be carried out depending on the results of the various surveys and the requirements of the IFI and NPWS. Constraints may also be placed on the time of year/weather conditions that the surveys may be undertaken.

In salmonid spawning areas (such as are located throughout the study area), in-stream works are generally not permitted during the period October – March (inclusive), as this is the sensitive time for spawning. Given that the river is also an important angling and nursery area, it is likely that further constraints will need to be considered regarding the times of year that works can be undertaken.

Pearl Mussel Surveys and Otter surveys can be undertaken at any time of year but are dependant on water levels. Pearl Mussel surveys require that there is good visibility in the water column and can only be undertaken in sunny, bright weather when water levels are not high and sediment loading on the river is low. Where such surveys are required, climatic conditions will constrain the timing of these.

Kingfisher surveys should be carried out during the summer nesting period (April – September)

It must be ensured that there are no significant impacts on Natura 2000 sites (SAC/SPA). Negative impacts on migrating fish have the potential to negatively affect the status of designated sites.



The woodlands, wetlands and riparian vegetation along the river corridor within the study area add greatly to the biodiversity. Damage to these riparian habitats should be minimised insofar as is practical so that the existing biodiversity in the area can be maintained.

Where possible works within the areas designated as pNHAs (located directly adjacent to the works areas at several locations), the woodlands and areas with wetlands fringing the river should be minimised as these are likely to be the terrestrial areas of highest ecological sensitivity. The urban areas, arable and pastoral fields are likely to be the habitats of lesser ecological significance.

Appropriate measures should be taken to ensure that the spread of invasive species is not is not accelerated by any proposed works.

#### Water

The design of the proposed scheme should take into account the water requirements (both Quality and Quantity) of any existing or future abstractions from the River Lee at Innishcarra and Lee Road.

The design should also take into consideration the impact that any proposed Lower Lee (Cork City) drainage scheme will have on the yields of existing groundwater abstractions from the study area Ground Water Bodies, taking into account the extreme vulnerability ratings of the local aquifer and presence of productive gravel aquifer's in the area.

The design of the proposed scheme should take into account the main objectives of the Water Framework Directive River Basin District Management Plan (RBDMP) by ensuring that any works proposed do not result in the deterioration of water quality.

The design should also take into account the presence of protected and sensitive areas identified in the RBDMP. Appendix 3 of the Plan lists the Protected Areas in the South Western RBD. The Lee is listed in Appendix 3 under the following headings:

- Drinking Water Protected Area - River Waterbodies: Lee (River)

- Nutrient Sensitive Areas: Lee Estuary / Lough Mahon

#### Soils & Geology

It is recommended that a geotechnical investigation be carried out once the potential flood alleviation measures are developed in order to identify local geology and ground conditions.

#### Archaeology & Cultural Heritage

Given the provisions of the National Monuments Acts, no disturbance or interference to any archaeological sites listed in the RMP can take place without prior consultation with the National Monuments Service. In the event that any ground works are required in the immediate vicinity of any of these archaeological sites, it is recommended that appropriate mitigation measures be designed in consultation with the National Monuments Service.

All features listed in the RPS have statutory protection and, where feasible, avoidance of these features is recommended. Should works be required in the vicinity of protected structures then the formulation of site specific mitigation strategies in consultation with the Cork City and County Council heritage staff is recommended. It is also recommended that the same strategy be adopted for architectural heritage features listed in the NIAH. It is envisioned that the mitigation strategies will conform to those outlined in the various Development and Local Area Plans within the study area and that the ElS for the scheme will present the various objectives and other relevant information presented in the local authority plans.



There is also the potential for the presence of unrecorded archaeological sites and artefacts within the study area. Any green field areas that may be impacted by ground disturbance works required by the proposed scheme (e.g. flood defences, access tracks, compounds, site clearance works, trial-pits) may require archaeological investigations. Depending on the nature and extent of the works the mitigation measures may take the form of pre-construction test trenching or monitoring of ground works carried out during the scheme. The appropriate mitigation measures will be determined during the Design Phase in consultation with the NMS and local authority archaeological staff.

In the event that works are required within the channels and banks of the River Lee, and its tributaries, then there will be the potential for negative impacts on both recorded and unrecorded cultural heritage riverine features, e.g. bridges, quays, weirs, fords, wrecks, fish-traps and landing/mooring features. It is recommended that the Underwater Archaeological Unit (NMS) should be consulted in order to agree the appropriate underwater archaeological assessment and mitigation strategies for proposed inchannel works. These may consist of licensed underwater archaeological surveys and archaeological monitoring of all sediment extraction works during the construction phase

#### Landscape

In the design of a proposed Lower Lee (Cork City) drainage scheme, the following recommendations of the Cork County Development Plan should be taken into account in relation to Broad Fertile Lowland Valley Landscape Type, in which the western half of the Study Area is located:

- Protect and preserve the River Lee and its surrounding floodplains as unique landscape features in this Landscape Character Type and as valuable resource for scenic and amenity values.
- Conserve and enhance the characteristics in this Landscape Character Type that are important to tourism.
- Have regard to the rich and diverse natural heritage in this Landscape Character Type and the concentration of pNHAs that are designated for protection. While protecting these areas it is also important to recognise their potential as key recreation and amenity sources.
- Protect the existing character and setting of villages and village nuclei which are under pressure from population growth particularly those villages which are located close to Cork City.
- Recognise that the lowlands are made up of a variety of working landscapes that are critical resources for sustaining the economic and social well-being of the county.

The relevant recommendations for the City Harbour and Estuary Landscape Type, in which the eastern half of the Study Area is located and to which regard should be had in designing the proposed scheme, include:

 Manage development that will adversely affect distinctive linear sections of the Lee River Valley, especially its open flood plains, when viewed from relevant scenic routes and settlements.



- Improve public access to the River Lee by enhancing it as a key recreational and amenity source.
- Recognise the potential constraints on development created by the River Lee flood plain and the value of this flood plain as an increasingly rare habitat.

In the design of a proposed Lower Lee (Cork City) drainage scheme, the following recommendations of the Cork County Development Plan should be taken into account in relation to Broad Indented Estuarine Coast Landscape Type, in the eastern-most section of the Study Area:

- Minimise disturbance of hedgerows in rural areas.
- Encourage appropriate landscaping and screen planting of proposed developments by using predominately indigenous/local species and groupings,
- Protect the existing character and setting of villages and village nuclei, which are under pressure from population growth.
- Continue to promote agriculture as a major land use in this LCT. This will help maintain the existing features of the landscape while also supporting the local economy and rural diversification.

Appropriate design, siting and mitigation measures will be required to integrate the proposed scheme within the landscape. Particular regard should also be had to the potential visual impact on views available from the three stretches of designated Scenic Route and the areas of Scenic Landscape, which are located within the Study Area.

#### Air Quality

Prior to the selection of a preferred Lower Lee (Cork City) drainage scheme as part of the Engineering Study, it is recommended that the short listed flood alleviation measures be assessed in relation to the impact of noise and vibration during the construction phase of the project.

It is recommended that mitigation measures be put in place to reduce the impacts on air quality and the noise environment during the construction phase of any proposed Lower Lee (Cork City) drainage scheme.

It is recommended that the affects of vibration during the construction phase be considered in the selection process for potential flood alleviation measures.

#### **Material Assets**

It is recommended that the existing and proposed location of watermains and underground services in the vicinity of any proposed flood alleviation scheme be ascertained as part of the Engineering Study. It is recommended that Cork City and County Councils and other utility providers with services in the area be consulted regarding the location and priority of existing and proposed services. It is further recommended that the services be protected as part of any proposed Lower Lee (Cork City) drainage scheme.

There is one Waste Water Treatment Plant in the Study Area, at Ballincollig. It is recommended that this is kept operational at all times.



The Waste Water Treatment Plant in Ballincollig is at risk of flooding, posing a serious risk to the environment within the Study Area. It is recommended that reducing this risk is given a high priority in choosing a Lower Lee (Cork City) drainage scheme from the Engineering Study.

It is recommended that any proposed change in the hydrological regime of the River Lee and its tributaries be assessed in relation to the assimilative capacity of the river at the locations of all discharges from Wastewater Infrastructure within the Study Area.

It is recommended that Cork City and County Council and the National Roads Authority be consulted in relation to any affects on the existing and proposed roads infrastructure in the Study Area from a proposed flood alleviation scheme.

It is recommended that the requirements of the Cork City and County Development Plans be observed in relation to Waste Management Assessments.

## 2.6 CONSIDERATION OF ALTERNATIVES

## 2.6.1 Options Report

This section of the EIS contains a description of the alternatives that were considered for the proposed works, in terms of flood alleviation works design and location of the works.

Article 5 of the Environmental Impact Assessment (EIA) Directive (85/337/EEC) states that the information provided in an Environmental Impact Statement (EIS) should include an outline of the main alternatives studied by the developer and an indication of the main reasons for the final choice, taking into account the environmental impacts. The consideration of alternatives typically refers to alternative sites, designs and processes.

The consideration of alternatives is an effective means of avoiding environmental impacts. The Environmental Protection Agency document 'Guidelines on the Information to be Contained in Environmental Impact Statements' (EPA, 2002) states that it is important to acknowledge however the existence of difficulties and limitations when considering alternatives. These include hierarchy, non-environmental factors and site-specific issues, as described below.

A copy of the Flood Risk Management Options Report is available to download on www.lowerleefrs.ie. There follows a summary of the information regarding alternatives considered as part of the options assessment.

The possible flood risk management (FRM) methods were initially screened to identify those that would be applicable and viable considering the risks to society, the environment, cultural heritage and the economy and the objectives of the flood risk management plan for the project. The potentially viable options were developed so that they could be evaluated in more detail. This involved hydraulic modeling of options where flood levels and extents had to be considered. The options were assessed against the flood risk management objectives with the use of local weightings. The preferred option was then identified following discussion with the OPW and steering group. The design standard to be adopted for the scheme, as instructed by the steering group is the 1 % AEP (Fluvial) or 0.5% (Tidal) levels with provision for adaptability to the Medium Range Future Scenario. The 1 % AEP (Fluvial) or 0.5% (Tidal) flood event has been used in this assessment of options. The construction of the proposed scheme will reduce the risk of flooding from the River Lee and the tide to below the 1 % AEP (Fluvial) or 0.5% (Tidal) levels.

#### 2.6.2 Possible Flood Risk Management Methods

The possible flood risk management methods which could be utilized in a drainage scheme include:

- a) Do Nothing (i.e., implement no new flood risk management measures and abandon any existing practices)
- b) Continue Existing Regime (i.e. Flood Early Warning System and Flood Emergency Response Plan)
- c) Do Minimum (i.e. implement additional minimal measures to reduce the flood risk in specific problem areas without introducing a comprehensive strategy)
- d) Non-Structural Measures
  - Implement Planning and development control measures
  - Enact building regulations relating to floor levels, flood-proofing, flood resilience, sustainable drainage systems, prevention of reconstruction or redevelopment in flood-risk areas, etc.
  - Enact regulations for sustainable urban drainage systems
  - Carry out targeted public awareness and preparedness campaign
  - Individual property flood resistance
  - Land use management, including creation of wetlands, riparian buffer zones, etc.
- e) Structural Measures (potential future risk where necessary floodplain development may occur)
- f) Structural Measures (existing risk)
  - Upstream flood water storage
  - Upstream restriction on river flows
  - Flow diversion
  - Increase conveyance
  - Construct flood defences (e.g. walls, embankments, demountable defences, etc)
  - Rehabilitate and improve existing defences including localised protection works (e.g. minor raising of existing defences/levels, infilling gaps in defences, etc.)
  - Relocation of properties
- g) Channel or flood defence maintenance works/programme

The criteria used for the screening of the various options included:

- Applicability to Area
- Social
- Environmental
- Cultural
- Economic



#### Flood Risk Management Option Assessment

A number of flood relief options (which are all discussed in detail in the Flood Risk Management Options Report) were developed before choosing the most preferred option. These were:

- Option 1 Flow reduction of South Chanel and direct defences
- Option 2 Isolation of South Chanel and direct defences.
- Option 3 Direct defences only.
- Option 4 'Do-Minimum'.

The 'do-minimum' option (Option 4) was ruled out, as the flood risk in the catchment would remain at similar levels to the existing case. This option was primarily used as a baseline to compare with the other options.

#### **Option 1**

In the case on Options 1, 2 and 3, there are a number of prerequisite measures that must be implemented, including Optimised Dam Operating Procedures, Flood Forecasting and Early Warning System, and designation of Upland Storage (Washlands). In Area 1, west of the Waterworks Weir, only one measure - direct defences - is considered for Options 1, 2 and 3. The alignment is illustrated in Figure 2.3.

This differentiator in this option is the inclusion of a flow control structure proposed to be located on the South Channel of the River Lee, downstream of the Salmon Weir. The proposed structure will be closed when the River Lee is in flood to prevent (or reduce) flow entering the South Channel and divert a greater proportion of the flow to the North Channel which has greater capacity.

By reducing the flow to the South Channel, more flow is diverted to the North Channel and there is a resulting increase in water levels on this reach of between +0.1m and +0.4m in the western reach in comparison to Option 3 with no flow management. However there is little impact at the eastern end of the North Channel.

Conversely by reducing the flow to the South Channel, water levels are greatly reduced from between - 0.8m and -0.1m from Eamon De Valera Bridge all the way to Western Rd. This reduction on the South Channel simultaneously aids the Curraheen. The lower water level at the confluence increases the hydraulic gradient and lowers the water levels upstream on the Curraheen River from between -1.5m and -0.5m in comparison to Option 3 with no flow management.

Therefore in this option, there is no requirement for construction of new visually intrusive high defences within the Curraheen (Area 7). It is also not required to divert the Curraheen or Glasheen River during flood events as the South Channel has sufficient capacity for these flows once the flow control structure is in operation.

The reduction of flow to the South Channel is beneficial for Areas 5 and 6 (South Channel West and East), reducing the extent of defences required in the South Channel in comparison to Option 3 with no flow management.

This option results in the requirement of more significant flood defences in the North Channel West, Area 2, due to the increase in water levels in the western reach. The defences required within Area 4, North Channel East, are similar for all three options as this reach is tidally dominated. The alignment of the defences within the city centre is illustrated in Figure 2.4.

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Figure 2.3 Alignment of defences for Area 1 (West of Waterworks Weir) for Options 1, 2 and 3



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Figure 2.4 Alignment of defences for city centre for Option 1

# Option 2

This differentiator in this option is the inclusion of two flow control structures at the head and the mouth of the South Channel to prevent flow entering the South Channel from either the upstream or downstream ends.

The isolation of the channel is beneficial for the South Channel, Areas 5 and 6, as it will prevent flow entering the South Channel during both tidal and fluvial flood events, thus removing the requirement for raised defences and quay wall remedial works along the South Channel.

However there is insufficient capacity within the South Channel to store the waters incoming from the Curraheen River, Glasheen River and the drainage from the city with the two flow control structures in operation. Taking account of these constraints, both the tidal and fluvial design flood events are to be considered.

In a tidal design event, both flow control structures will have to be closed, therefore diversion of the Curraheen and Glasheen towards the River Lee is required. Flow control structures are required at the confluence between the Curraheen and the Glasheen, and to divert the Curraheen through a culvert to the River Lee downstream of the Waterworks Weir, Figure 38.

The model results showed there is a significant increase in water levels on the Curraheen with levels between +1.2m and +2.5m upstream of the diversion structure. This will result in significant defences required up the Curragheen.

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This arrangement also results in the requirement of more significant flood defences in the North Channel West (Area 2) in comparison to Option 1. There is a resulting increase in water levels on this reach of up to +0.4m in the western reach in comparison to Option 3 with no flow management. The defence extents will be greater as the Curragheen and the Glasheen are also contributing to the flow. The defences required within North Channel West (Area 4) are similar for all three options as this reach is tidally dominated.

In a fluvial design event, the optimum solution is to operate the flow control structures as per Option 1, i.e. only closing the flow control structure at the head of the South Channel and allowing the Curraheen and Glasheen to discharge through the South Channel. This is because there is sufficient existing capacity within the South Channel for these flows and there will be no requirement for additional defences in South Channel, Areas 5 and 6. The alignment of the defences within the city centre is illustrated in Figure 2.5.



Figure 2.5 Alignment of defences for city centre for Option 2

## **Option 3**

This option comprises direct defences only and does not consider flow management measures within the South Channel. In this option, there is a requirement for direct defences within the Curragheen and the Glasheen River (Area 7).

There will be significant defences required within the South Channel (Areas 5 and 6) as there are no flow control structures in place.





The extents of the defence required for North Channel West (Area 2) will be reduced somewhat as the flow is reduced in comparison to Options 1 and 2. The defences required within North Channel East (Area 4) are similar for all three options as this reach is tidally dominated. The alignment of the defences within the city centre is illustrated in Figure 2.6.



Figure 2.6 Alignment of defences for city centre for Option 3

# **Flood Risk Management Options Conclusions**

The various options were appraised using a multi-criteria analysis (MCA) and Cost Benefit Analysis (CBA). The indicators, minimum requirements and aspirational targets, along with the global weightings and local weightings were agreed with the OPW for each objective to ensure consistency with the appraisal of options in other schemes nationally. The Cost Benefit Analysis shows that all options are cost-beneficial (excluding do-minimum). Therefore a decision on the preferred option was ultimately made by careful and holistic professional consideration of all of the various issues, resulting on Option 2 being chosen. Details of the proposed scheme are provided in Chapter 3 of this EIS.

# 2.7 SCOPING & CONSULTATION

Consultation in relation to the project has been completed on a number of occasions at various stages in the design process. These have included broad general consultation at the Constraints Study stage and an associated Public Information Event and Questionnaire. Subsequently, the emerging preferred option was



presented to the public in another Information event in Cork City (Cork City Hall) and formal scoping as part of the Environmental Impact Assessment process was undertaken. The following sections outline the consultation completed to date.

## 2.7.1 Constraints Study Scoping

Scoping was carried out with numerous public and private bodies to identify any constraints for the proposed Lower Lee (Cork City) Drainage Scheme. The replies to this scoping can be found in Appendix 2B.

## 2.7.2 First Public Information Day

The first public information day was initiated with a presentation to the Members of the OPW, Cork City Council and Cork County Council on the 17th of July 2013. The purpose of this was to present the Study Area to the elected members, prior to the Public Information Event, and to outline the process involved in the preparation for the Lower Lee (Cork City) Drainage Scheme.

The presentation was held in Cork City Hall, between 3.00pm and 9.00pm. Members of staff from the Office of Public Works, Cork County Council, Cork City Council, Environmental Team (Ryan Hanley and McCarthy Keville O'Sullivan) and Design Team (Arup Consulting Engineers and JBA Consulting) were available to answer questions from the members of the Council.

# 2.7.3 Advertising of Public Consultation

Advertising of the Public Consultation Event was undertaken by the Environmental Team, in the local press in the week preceding the event. This included an advert in the local publications; Cork Independent, The Corkman, The Carrigdhoun, The Cork News and The Southern Star, in addition to adverts in two national daily newspapers; The Examiner and The Evening Echo. In addition, notices were placed on the local radio in the week and weekend preceding the event. The event was also well publicised locally through distribution information on local websites and through text alerts.

## 2.7.4 Literature Available for the Consultation

Brochures and Questionnaires were available at the exhibition on the 17th of July. Stamped addressed envelopes were provided to those who wished to return questionnaire by post. Information in addition to the questionnaires was also accepted on the evening of the event or subsequently by post.

A Constraints Study Public Consultation brochure was produced for the scheme, which showed the Study Area under consideration and provided a brief explanation as to the process involved and the options being considered. Brochures were freely available to the members of the public and interested parties, both during and after the exhibition. A copy of the brochure is attached in Appendix 2C.

A questionnaire with pre-printed questions was provided to each attendee, in association with the brochure. This provided an opportunity for members of the public to express their views on the Study Area shown and to provide information regarding flooding in their area, in addition to other comments they may have had relating to the design or the Environmental Constraints Study. A prepaid envelope was also provided for the return of the questionnaire. A copy of the blank questionnaire is attached in Appendix 2D.

# 2.7.5 Public Consultation Exhibition Posters

The format of the Constraints Study Consultation exhibition was based on a number of scheme posters. The posters included:



- Scheme Objectives and Overview
- Constraints Study
- Study Area Map Archaeological & Ecological Sites
- Statutory Process
- Public Involvement

A copy of the exhibition posters are included in Appendix 2E.

## 2.7.6 Public Attendees and Response to Public Information Day

Members of the public visiting the exhibition were invited to sign a visitor's book to enable a record of the number of attendees to be maintained. A total of 44 attendees signed the attendance book at the event in Cork City Hall.

Visitors to the exhibitions are considered to have in the main understood the proposals as presented at the exhibition. Comments received generally related to the level of flooding in the past, and most especially during the 2012 and 2013 events. Some members of the public brought photographs or maps of their property or demonstrated to project team staff the location of their property and their general concerns regarding the level of flooding and damage which arose from the events. In addition to provision of information about flooding, members of the public also provided information regarding previous maintenance of the river and their suggestions relating to potential flood alleviation measures.

Contact details were taken from members of the public who had additional information or had recorded flood levels, for the purposes of calibrating the hydraulic model. A total of 22 questionnaires were returned either at the exhibition or shortly thereafter by post. Submissions were made by a number of members of the public both at the public consultation event and by post or email following the event. The information generally provided related to flood levels, photographs of recent local flooding and articles regarding flooding history in Cork. This information was provided to the Design Team to assist in the production of the flood model when ascertaining the levels of flooding in previous events.

Overall feedback from members of the public was that they were happy to have been involved in the Public Consultation; they felt like their views were being heard, but wanted to see action arise out of the information as soon as possible.

#### 2.7.7 Second Public Information Day

The second Public Information Day for the Lower Lee (Cork City) Drainage Scheme was held in Cork City Hall foyer on Tuesday 29 July 2014. The purpose of this second Public Information Day was to provide information to the local community on the emerging preferred Lower Lee (Cork City) Drainage Scheme.

The event was opened to the public from 3pm to 9pm. A total of 181 attendees signed the attendance book at the event in Cork City Hall. Approximately 54 people returned completed questionnaires (Appendix 2D). In advance of this event, a briefing was held for the City and County Councillors on Monday 28<sup>th</sup> July 2014 at 3.30pm.

At the Public Information Day on the 29<sup>th</sup>, posters (Appendix 2E) were displayed describing the process to date, the various options assessed, a preliminary impact assessment, summaries of surveys undertaken and drawings showing the emerging preferred Lower Lee (Cork City) Drainage Scheme. Brochures were also available (Appendix 2C).



The majority of people that attended the Public Information Day reacted positively to the proposals presented on the day and felt that the proposals are appropriate for the area.

The following was noted in relation to people's verbal and written comments on the day:

- Several people commented that they were optimistic the issue of flooding would be dealt with based on the proposed works.
- Some concerns were raised in relation to diverting water into other channels, with concern that different areas could then flood. It was noted that the buildings on the north side quays have not flooded in living memory.
- Many people had personal experience of having their property flooded
- There were concerns that the proposed embankments would exacerbate flooding, while other people suggested embankment locations, and their use for cycling and walking
- Suggestions were made for types of infrastructure to be used, and the locations for these
- The suggestion was made that dredging the existing river channel and clearing drains and shores would reduce flooding
- Several people suggested that development be restricted on green areas upstream
- A number of people note that the release of water from hydro-electric dams needs to be more carefully planned
- Many people provided information of where floods occur, and the route that floodwater takes based on their own experience
- It was suggested that a flood storage lake/dam be created upstream to prevent high water levels.
- Several people noted that current maintenance of river channels (dredging) was insufficient, and need to be increased.
- One person noted that any high flood walls would encourage anti-social behaviour.
- It was noted that the proposed flood walls may look unsightly, and each location requires assessment to select a suitable defence type
- It was noted that the character of parks such as Fitzgerald's park should be maintained, and boating access via slipways should be maintained
- Suggestions were made that good maintenance of trash screens and man hole covers will be essential to the avoiding future flooding

The comments and queries raised at the Public Information Day were considered in the scheme design and during the preparation of the Environmental Impact Statement.

## 2.7.8 EIA Scoping

#### 2.7.8.1 EIA Scoping

Scoping is the process of determining the content, depth and extent of topics to be covered in the environmental information to be submitted to a competent authority for projects that are subject to an Environmental Impact Assessment (EIA). This process is conducted by contacting the relevant authorities and Non-Governmental Organisations (NGOs) with interest in the specific aspects of the environment likely to be affected by the proposal. These organisations are invited to submit comments on the scope of the EIA and Environmental Impact Statement (EIS) and the specific standards of information they require. Comprehensive and timely scoping helps ensure that the EIA refers to all relevant aspects of the proposed development and its potential impacts on the environment and provides initial feedback in the early stages of the project,



when alterations are still easily incorporated into the design. In this way scoping not only informs the content and scope of the EIA, it also provides a feedback mechanism for the proposal design itself.

An EIA scoping report, providing details of the works footprint and emerging preferred flood relief option, was prepared by McCarthy Keville O'Sullivan Ltd. in association with Ryan Hanley and circulated on 2nd November 2016. Comments of the relevant personnel/bodies in their respective capacities as consultees with regards to the EIA process were requested.

### 2.7.8.2 Scoping Responses

### Consultees

Appendix 2F lists the consultees who were circulated copies of the EIA scoping document on 2nd November 2016. A copy of the EIA scoping document and cover letter is presented in Appendix 2G. Copies of all scoping responses received by 6th December 2016 are included in Appendix 2B of this EIS and a summary of the responses are outlined in Table 2.2 (for 2016 Scoping) and Table 2.3 (2013 Constraints Scoping) below. The recommendations of the consultees have informed the EIA process and the contents of the EIS.

	iesponse sommanes
Consultee	Summary of Response
Gas Networks Ireland	There is a gas distribution network in the vicinity of the proposed network. A map was included to show the network.
Inland Fisheries Ireland	Requested further information on specific feature of the development (flow restriction in south channel).
Transport Infrastructure Ireland (TII)	Acknowledged receipt of Scoping pack
Cork County Council (County Manager)	Acknowledged receipt of Scoping pack
Fáilte Ireland	Forwarded on Fáilte Ireland's Guidelines for the treatment of tourism in an EIS
Office of Public Works	Acknowledged receipt of Scoping pack
Waterways Ireland	The project is not in Waterways Ireland remit, therefore they have no comment.
Coillte Teoranta	Acknowledged receipt of Scoping pack
ESB	Acknowledged receipt of Scoping pack
Department of Communications, Energy and natural Resources	Acknowledged receipt of Scoping pack
Development Applications Unit	Acknowledged receipt of Scoping pack
National Monuments Service, Department of Arts, Heritage, Reginal, Rural & the Gaeltacht	Acknowledged receipt of Scoping pack
Department of Environment, Community and Local Government	Acknowledged receipt of Scoping pack
An Comhairle Ealaion (The Arts Council)	No reply received at time of publication
Department of Agriculture, Food & the Marine	No reply received at time of publication
Department of Jobs, Enterprise & Innovation	No reply received at time of publication
Environmental Protection Agency (EPA)	No reply received at time of publication
Forest Service (Dept of Agriculture, Fisheries & The Marine)	No reply received at time of publication
Geological Survey of Ireland	No reply received at time of publication
Health & Safety Authority	No reply received at time of publication

	Table 2.2	Consultee Se	coping for 2016	response sun	nmarie
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HSE Southern Regional Health Forum	No reply received at time of publication
National Monuments Service	No reply received at time of publication
National Museum of Ireland	No reply received at time of publication
South West Regional Authority	No reply received at time of publication
Southern River Basin District Office	No reply received at time of publication
The Heritage Council	No reply received at time of publication
Eircom	No reply received at time of publication
Irish Water	No reply received at time of publication
Irish Water	No reply received at time of publication
Environment Section - Cork City Council	No reply received at time of publication
Planning Section - Cork City Council	No reply received at time of publication
Water Services Section - Cork City Council	No reply received at time of publication
Divisional Manager, Cork County Council	No reply received at time of publication
Director of Services, Cork County Council	No reply received at time of publication
County Engineer, Cork County Council	No reply received at time of publication
Communications Officer, Cork County Council	No reply received at time of publication
Archaeology Section, Heritage Unit, Cork County Council	No reply received at time of publication
An Taisce - The National Trust for Ireland	No reply received at time of publication
Bat Conservation Ireland	No reply received at time of publication
Birdwatch Ireland	No reply received at time of publication
Irish Farmers Association (Cork Region)	No reply received at time of publication
Cork Business Association	No reply received at time of publication
Cork Chamber of Commerce	No reply received at time of publication
Cork Historical & Archaeological Society	No reply received at time of publication
Port of Cork	No reply received at time of publication

Table 2.3Consultee Scoping response summaries for 2013 Constraints Scoping(excluding consultees that did not reply)

Consultee	Summary of Response
Minister for Jobs, Enterprise and Innovation	Acknowledged receipt of Scoping pack
Department of Agriculture, Fisheries, and the Marine	Offered a detailed map of forestry for the area. Mentioned that a comment would be made at a later date.
National Roads Authority	Forwarded best practice guidance, including considering future local authority road plans, and the existing road network.
South Western River Basin District	The Drainage Scheme should comply with the Water Framework Directive
Department of Agriculture, Food and the Marine	This department has no relevant information to offer that would be of assistance.
Port of Cork	Requested that mapping information be made available. Several factors were highlighted to take into consideration.
Failte Ireland	Forwarded Failte Ireland Guidelines for the treatment of Tourism in an EIS
Cllr. Aindrias Moynahan	Highlighted one area where flooding occurs.



National Museum of Ireland Works should avoid known impacting on known caves in the area. Requested that any findings be reported and investigated.	Lower Lee (Cork City) Drainage Scheme	RYAN HANLEY in association with
	National Museum of Ireland	Works should avoid known impacting on known caves in the area. Requested that any findings be reported and investigated.
Inland Fisheries Ireland Offered fishery information. Commented on information required to carry out the EIS.	Inland Fisheries Ireland	Offered fishery information. Commented on information required to carry out the EIS.
Cork City Council Acknowledged receipt of Scoping pack	Cork City Council	Acknowledged receipt of Scoping pack
Department of Arts, Heritage and the GaeltachtRequested that a detailed archaeological assessment be carried out.	Department of Arts, Heritage and the Gaeltacht	Requested that a detailed archaeological assessment be carried out.
Cork Historical and Archaeological Society No issues at the time	Cork Historical and Archaeological Society	No issues at the time